

THE BIOARCHAEOLOGY OF COLLAPSE: ETHNOGENESIS AND ETHNOCIDE IN POST-
IMPERIAL ANDAHUAYLAS, PERU (AD 900-1250)

By

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This dissertation is dedicated to my family, Allyn, Richard, and Jaclyn.

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CHAPTER I

INTRODUCTION

Introduction: The Bioarchaeology of Collapse

This dissertation investigates how state collapse impacts and restructures the lifeways of subsequent populations. The disaggregation of complex societies can have significant biological, social, and cultural implications for the people who emerge from such transformations. As society is reconfigured, communities, sub-population groups, and individual human bodies are both conceptually and physically altered. Using the collapse of the archaic Andean Wari Empire (ca. AD 600–1000) and the post-imperial Chanka culture (ca. AD 1000–1400) of highland Andahuaylas, Peru, as a case study, this research comprehensively evaluates the nature of shifts in several key domains that would have been profoundly affected by Wari state collapse. Osteological, ethnohistoric, archaeological, and bio-geochemical methods are employed to test hypotheses related to mortuary practices and community organization, ethnic identity, violence, technical innovations, migration, health, and diet.

State collapse can dramatically alter how people physically interact with one another. Scholarship across disciplines, from anthropology to sociology and political science, has observed that eras emerging in the aftermath of collapse generally witness

persistent, recurring violence, ranging from interpersonal brawls to outright war (McAnany and Yoffee 2010; Schwartz 2006; Tainter 1988). However, although post-imperial eras may seem like times of deprivation and want, they may also be times of resilience and innovation. Collapse can also spur striking yet stalwart reformulations of group identity; that is, how people conceive of and represent themselves and others. Finally, tempestuous times can also generate novel migratory practices, emerging inequality, and pioneering technical procedures to cope with new, unique challenges.

Importantly, migrations across the landscape, specialized innovations, experiences of violence, and the embodiment of reformulated identities may be experienced differently by different groups of people. Cross-cultural ethnographic studies suggest that state collapse can create social repercussions such that particular segments of a population are specifically targeted and thus disproportionately predisposed to becoming victims of inequality, deprivation, and even violence (see Brubaker and Laitin 1998; Hinton 2002; Gould 1999; Boskovic 2005; Talbot 1995). Such may have been the case in the pre-modern past as well.

The Nature of Collapse

“Collapse” is a process that involves the decline or dramatic restructuring of systems of infrastructure and administration necessary to the functioning of complex polities, such as states (*sensu* Eisenstadt 1964). Collapse also implies the disintegration of political hierarchies. Systems of ranking, management and succession are invalidated as the ideological basis of leadership also disaggregates (Tainter 1988). When leaders can no longer convincingly evangelize, pilgrims forsake sacred sites, and associated

iconography is abandoned or destroyed (Janusek 2004). In short, people are no longer united by shared beliefs. Concomitant social transformation can occur as whole classes of people cease to exist, including professional soldiers, bureaucrats, intermediate elites, craft specialists, and religious personnel. In archaic states, social, political, economic, and ideological systems are so tightly imbricated that the disaggregation of one institution contributes to the instability and fragmentation of others

Many scholars suggest an underlying cause of collapse is due to environmental changes (see Diamond 2005), be they cataclysmic natural disasters, or sustained, detrimental climate shifts. Rather than employing an environmentally deterministic paradigm, this dissertation takes the position that the seeds of state collapse are sewn by decision-makers in the face of novel challenges. For instance, although somewhat dependent on the environment, it is usually the mismanagement of economic resources (e.g., maize or camelid wool) and not necessarily changes in net production, which weaken political hierarchies. The disintegration of traditional modes of production and the demise of systems of transport and communication (e.g., roads) may inhibit intra- and inter-regional economic production and movement as well (Dillehay and Kolata 2004; Kolata 1992). Without hierarchical administration of goods, imperial infrastructures cannot be maintained and systems of redistribution may fall back on communal or kin-based organization (Tainter 1988). Group identities may be profoundly altered or newly created following state fragmentation as people can no longer define themselves vis-à-vis the state.

What emerges following collapse, whatever the cause, is a socio-political system that is radically different in its organization, but may still maintain lingering vestiges of

more ancient traditions. This research investigates how novel iterations of society are regenerated, and evaluates how lifeways were impacted by such processes.

The Case Study: The Post-Imperial Chanka of Andahuaylas

For 400 years during the Middle Horizon, the Wari Empire thrived in Peru's central highlands, situated a mere 100 km west of Andahuaylas. For reasons still unclear, sometime between AD 950–1050, Wari imperial authority and its attendant infrastructure began to fragment. Previous research shows that the subsequent era, known as the Late Intermediate Period, was characterized by abrupt changes in settlement and subsistence patterns and evidence of increasing conflict and isolation both in the Andes generally (see Covey 2008), and Andahuaylas, specifically (Bauer et al. 2010).

Following Wari collapse, the Chanka Society emerged as a formidable and distinctive presence in Andahuaylas (Markham 1871, Bauer et al. 2010). Scholars have generally characterized Chanka society as an independent polity based on two complementary ranked groups, called *hanan* (the upper moiety) and *hurin* (the lower moiety). Each moiety was composed of an amalgam of nested *ayllu*. Members of the same *ayllu* maintained common landholdings, communal burial crypts, and claimed descent from a common ancestor through real and imagined kinship (Salomon 1995; Isbell 1997). Documentary evidence suggests that members of the same *ayllu* within Chanka society shared a common language, dress, and belief system, among other collective practices of affiliation (see Hostnig et al. 2007). Because *ayllus* within Chanka

society were bound to certain territories on the landscape (Julien 2002), they can be geographically distinguished to some extent in terms of residence and burial.

However, archaeological characterizations of “Chankaness” remain enigmatic. While common architectural features and ceramic forms suggest that dispersed groups in Andahuaylas shared cultural practices and a sense of common affiliation, evidence of regional hierarchy is conspicuously absent; Chanka settlements lack public storage buildings, iconography denoting a state religion, and administrative and elite architecture (Bauer et al. 2010, Kellett 2010). These patterns suggest a “flattening” of status differences between people following Wari collapse. Moreover, hilltop settlements built and occupied in Andahuaylas between AD 1000–1100 (Bauer et al. 2010:80; Bauer and Kellett 2010; Kellett 2010) consist of defensive features like walls, ditches, precipices on three sides, and lookouts. Caches of used, functional weaponry, including mace heads and sling stones, are ubiquitous at Chanka sites (Gomez 2009). These material signatures suggest at least periodic concerns about community defense against violent attacks during the post-imperial era.

Finally, ancient documentary evidence also suggests that the post-collapse Chanka experienced spectacular levels of violence. Emerging ethnohistoric research indicates fierce competition among different Chanka ethnic groups for agricultural and pastoral territory (Sabine Hyland, personal communication 2012). For instance, early colonial legal documents relate several testimonies of Chanka *ayllu* leaders dispossessing rivals by “pulling crops from the root and slinging stones” (Hostnig et al. 2007 [1612]:491). The Chanka were also known to crack the skulls of their enemies with war

clubs and transform the corpses of the vanquished into drums, which warriors would beat loudly as they entered into battle (Montesinos 1920 [1642]).

In the early 1400s, the Chanka suffered an epic military defeat against the Inca (Betanzos 1996 [1551]), a seminal event that marks the coalescence of the Inca empire (ca. AD 1400–1532). The victory over the Chanka is often attributed to a strategic alliance between the Inca, and a cultural group in Andahuaylas known as the Quichua. The Quichua maintained small enclaves throughout the province, and sustained an uneasy relationship with their Chanka neighbors.

Although historic portrayals depict the Chanka as a capriciously bellicose society that emerged from the ashes of a crumbling archaic empire, an important question remains: Did Wari collapse in fact restructure subsequent post-imperial populations in Andahuaylas? And if so, what were the bio-cultural consequences of this transformation?

Research Questions

In order to approach issues related to the bio-cultural impacts of state collapse, this dissertation addresses the following research questions:

1) Did the disintegration of Wari ideology spur novel mortuary traditions in Andahuaylas? What was the basis of mortuary collectivity in Andahuaylas?

2) Did the disintegration of Wari social and political hierarchies instigate reformulations of group identity, as determined through practices of affiliation which permanently altered the body (e.g., cranial modification)?

3) Did Wari socio-political fragmentation lead to an increase in violence during the post-imperial era? If so, was violence indiscriminate and haphazard, or were certain age, sex, cultural, or ethnic group disproportionately victimized?

4) Was the post-imperial era a time of technical stagnation, or is there evidence of technological and methodological innovations (e.g., trepanation) developed to confront novel challenges?

5) How did Wari collapse impact patterns of migration and transhumance? Did Wari fragmentation cause post-collapse mass migrations in Andahuaylas or rather the more limited movement of sub-population groups across the landscape?

6) How did Wari disintegration impact health and diet? Did certain dietary staples like maize become scarce? Did consumptive practices change from imperial to post-imperial times? Was the health of specific communities or sub-population group more negatively impacted than others?

If Wari collapse was indeed a traumatic event for local near-hinterland populations in Andahuaylas, it is expected that human remains from the early Late Intermediate Period (the early post-imperial era, ca. AD 1000–1250) will reflect such social disruptions. However, if Wari fragmentation was a “non-event” in Andahuaylas, local lifeways are expected to remain consistent between imperial and post-imperial eras.

The Social Bioarchaeological Approach

This dissertation employs a comprehensive social bioarchaeological approach to directly evaluate how local Andahuaylan people were impacted by dramatic societal restructuring in the wake of Wari imperial collapse. In this approach, human skeletal remains are the primary unit of analysis, bio-geochemical makeup and gross morphology are conceptually understood as products of synergistic social, cultural, and bio-physical forces shaped by bio-cultural (“life”) experiences (Agarwal and Glencross, 2011:1; See

also Sofaer 2006 and Tung 2012). The goal of this research is to use a number of complementary anthropological methods and lines of data to systematically reconstruct the lived experiences of individuals, segments of society, and entire populations in order to more fully understand social processes in past societies (Agarwal and Glencross 2011:3). Because the life experiences of an individual are sedimented into their bones (Larsen 1997), analysis of human remains is the most direct way of understanding the bio-cultural consequences of state collapse in the ancient past.

The bioarchaeological approach employed in this dissertation is comprehensive and synergistic. Based on both lab and fieldwork, skeletal, artifactual, bio-geochemical, ethnohistoric and ethnographic data are incorporated within their social and environmental archaeological context. Osteological evidence will be used to address a number of outstanding research questions using fairly straightforward observations and associations documented in similar types of bioarchaeological studies (Tung 2012). Patterns of migration, health, diet, gender, biological affinity, body modification, and mortuary practices gleaned from the skeletal record and are assessed to better understand how they factor in to the reformulation of group identity and variable experiences of violence. These data are then used to elucidate how ancient lifeways and social organizations were renegotiated in eras emerging from tempestuous socio-political transformations.

Overview of Materials and Methods

This research focused on the systematic recovery and excavation of human skeletons (N=477) from 17 cave ossuaries and one circular tomb from five sites in

Andahuaylas and Chincheros Provinces (Apurimac Department), in highland Peru. Remains pertain to the Middle Horizon (MH, ca. AD 600–1000) and the subsequent Late Intermediate Period (LIP, ca. AD 1000–1400). Human remains from post-imperial cave ossuaries derive from two distinct, infamous historical cultural groups: the warlike Chanka, and the beleaguered Quichua (Cieza de Leon 1996 [1553]).

Standard bioarchaeological methods were employed in the analysis of human remains (Buikstra and Ubelaker 1994) and registered in an MS Excel and SPSS statistical database for multivariate analysis. All recovered skeletal material was assessed and inventoried. The age and skeletal sex of each individual was determined based on sexually dimorphic characteristics (Brooks and Suchey 1990, Hoppa 2000, Lovejoy et al. 1985). Data was also collected on intentional, anthropogenic cranial vault modification, a proxy for ethnic identity, using standards established by Buikstra and Ubelaker (1994) and Torres Rouff (2002), and a new methodology developed by the author. To obtain a general health index of the population, crania were examined for the presence and severity of lesions, called porotic hyperostosis, indicative of compromised well-being (Walker et al. 2009; Stuart-Macadam 1992; El-Najjar et al. 1976; See Buikstra and Ubelaker 1994 for scoring methods). To ascertain how violence was experienced in Andahuaylan society, skeletal elements were examined for evidence of trauma (Galloway 1999, Lovell 1997). The number of wounds, trauma lethality, and the location of affected areas on bone were documented. Dental abnormalities with suspected traumatic etiologies, including ante-mortem tooth loss and dental fractures, were also recorded (Hillson 1996, Lukacs 2007). Together, these data are will demonstrate how wound

patterning, frequency, and lethality corresponded with age, sex, cultural affiliation, and ethnic identity at different sites over time.

In order to address how individuals coped with violence, the presence, location, style, and healing status of cranial trepanations were assessed (see Andrushko and Verano 2008). Data on non-metric cranial traits were collected and analyzed by Christine Pink in order to illuminate patterns of biological affinity before and after Wari collapse. Finally, in order to elucidate patterns of diet, residential origin and mobility, Ellen Lofaro processed 39 human teeth and four animal teeth for radiogenic strontium isotope analysis and stable carbon and oxygen isotope analysis.

Data gathered from diagnostic human remains were correlated with AMS radiometric dates which facilitated analysis of skeletal individuals from different temporal periods and geographic zones. Finally independent variables like sex, age, cultural affiliation and ethnicity were statistically correlated with attributes of dependent variables including health, diet, mobility and violence characterized by the type, extent, and treatment of sustained injuries.

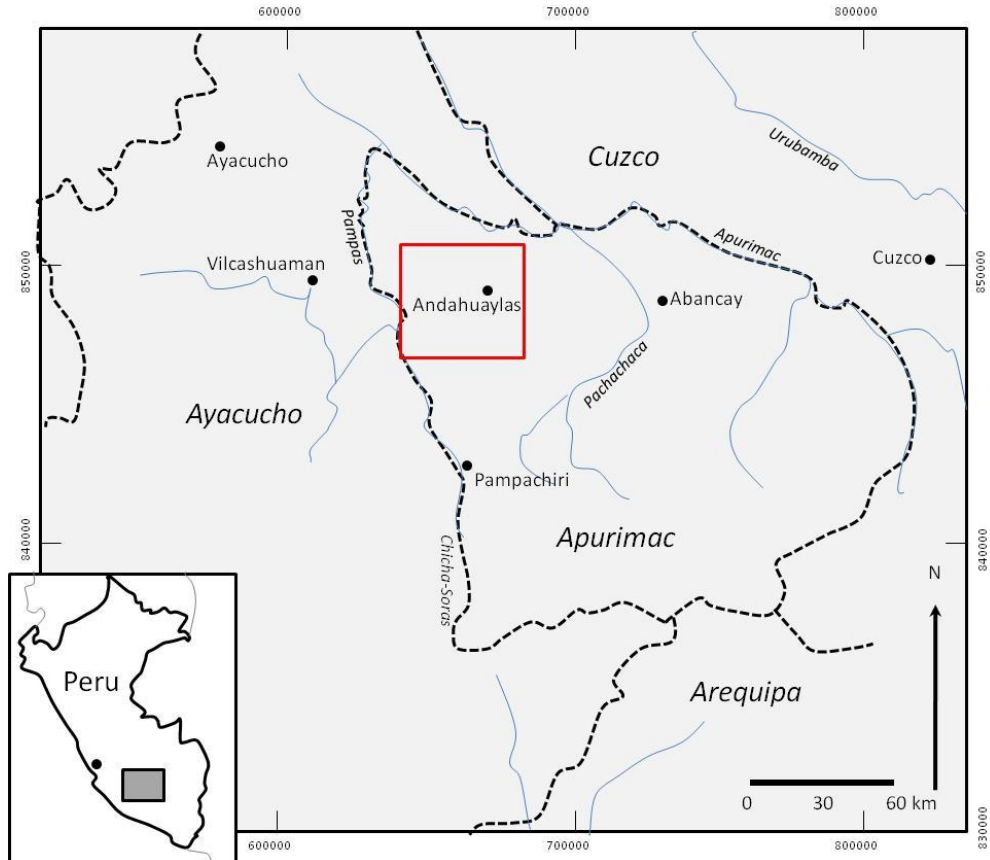


Figure. 1.1. Map of the south-central Peruvian highlands (study region outlined in red).

The Structure of the Dissertation

Chapter 2 describes the environment of Andahuaylas, followed by a discussion on the nature of Wari imperial presence and collapse in the region. Next, archaeological and ethnohistoric data are marshaled to summarize current understandings regarding the post-imperial groups that emerged in LIP Andahuaylas, most notably the Chanka and the Quichua. Chapter 3 interrogates the bioarchaeological consequences of collapse, and presents the research hypotheses. In Chapter 4, the study sites and sample collections are

presented. The second half of this chapter describes the standard methods used to analyze commingled skeletal remains.

The results of this study are presented beginning in Chapter 5. Artifactual mortuary data is presented and reliable AMS radiocarbon dates are reported which will confirm temporal associations of Middle Horizon and Late Intermediate Period contexts. The following section reports the results of the mortuary demographic skeletal data. Interpretations and a summary of results conclude the chapter.

A discussion of trauma and violence prior to, and after Wari collapse, is detailed in Chapter 6. Trauma frequencies, lethality, and distribution are compared between sites and over time. Patterns in trauma are also compared between sub-population groups based on age, sex, cultural affiliation, and ethnic identity. The cranio-spatial distribution of trauma in Andahuaylas is also reported to illuminate possible motivations for violent encounters, including ethnocide: violence directed towards identifiable ethnic groups. A summary of the trauma data is presented at the end of the chapter.

Chapter 7 reports results on the emergence and variability of cranial modification in Andahuaylas. This timing of cranial modification implementation is discussed, and data is presented on how modification correlates with sex, site, and cultural affiliation. Interpretation and summary sections explain why modification is a reliable proxy for ethnogenesis. Ethnogenesis is understood in this dissertation as the emergence of cultural distinctions which come to prominence as novel boundary markers.

Chapter 8 reports the results of trepanation use in Andahuaylas as an innovative medico-cultural procedure which articulated with novel understandings on how to treat an unwell body. Trepanation frequency, methods, standardization, and survival rates are

presented. Evidence of peri-operative procedures and experimentation is also reported. The interpretation and summary sections of this chapter posit that more than just a proxy for technical innovation in the aftermath of the empire, trepanation provides a lens by which to observe how culturally informed understandings of illness and well-being were transformed in the aftermath of the Wari Empire.

In Chapter 9, data is presented on how migration and social inequality may have been impacted by Wari collapse. Population movements, consumptive practices, and the general well-being of local communities are assessed using osteological and bio-geochemical methods. First, non-metric cranial data and bio-geochemical results are presented to evaluate how collapse differentially impacted mobility in post-imperial Andahuaylas. Results from non-metric data are used to determine if Wari collapse resulted in reduced gene flow, increasing isolation, and the organization of communities along bipartite *ayllu* lines. Strontium isotope analysis is then employed to determine if there were new migratory patterns during the LIP.

As people moved up and down vertical Andean landscapes, they would have had uninhibited access to a range of produce. However, in the aftermath of collapse, access to crucial food staples and fresh water sources may have become more restricted. Thus, data from carbon and oxygen isotopes are presented in order to evaluate if disparities existed in terms of consumptive practices. Finally, because where people live, and what people eat can impact their health, results from the analysis of porotic hyperostosis are presented in order to reconstruct ancient health profiles. The chapter concludes with an interpretation and summary of results.

Chapter 10 concludes with a summary of the findings. Data presented in this dissertation demonstrates that migration and inequality, the nature of violent interactions, and the boundaries which defined ethnic groups were drastically, but variably, transformed following socio-political upheaval in the ancient Andes.

CHAPTER II

ENVIRONMENT, HISTORY, AND ARCHAEOLOGY IN ANDAHUAYLAS

Introduction

This chapter presents information on the archaeology, ethnohistory, and environment of the Andahuaylas region during the Middle Horizon and Late Intermediate Period. The nature of Wari imperialism and retraction in the region is summarized, and colonial-era documents and previous archaeological research are drawn upon to investigate the post-imperial societies that emerged in Wari's imperial aftermath.

The Andahuaylas region is located in the southern portion of the Andean *sierra central*, which comprises the western part of the modern Apurimac Department in central, highland Peru. The Andahuaylas region is composed of two provinces: Andahuaylas and Chincheros. The region is bordered by the Pampas River to the north and northwest, the Chicha-Soras River to the west and south, and the Pachachaca River to the east (see Map, Fig. 2.1). Rugged peaks that reach up over 5000 masl rise abruptly from valley bottoms as low as 1800 masl. Given the large expanses of high *Puna* grasslands (over 4000 masl), much of Andahuaylas is geographically well-suited to high-altitude subsistence practices, like pastoralism.

The mortuary sites that form the basis of this dissertation study are all located near the juncture of the *Kichwa* ecotone (located between 2700–3500 masl) and the *Suni*

zone (3500–3800 masl) (Pulgar Vidal 1981). In Andahuaylas, the *Kichwa* zone currently supports major indigenous cultigens like maize, as well as minor cultigens like legumes, kiwicha, quinoa, and potatoes (Kellett 2010:30). In the *Suni* ecotone tubers and tarwi can be cultivated, and the rolling grassland hills make for accessible grazing by camelids. Like other areas of the *sierra central*, Andahuaylas has a wet and a dry season. The warmer, rainy season lasts from November through April (punctuated at its height in February-March by carnival season, when crops are harvested, physical relationships are consummated, and organized ritual fights take place in rural communities throughout the region). The cooler, dry season lasts from May through October and is characterized by greater fluctuations in diurnal temperatures (Kellett 2010:30-33).

Environmental Context: Drought in Andahuaylas

Deteriorating macro-environmental changes are often cited as an important underlying cause of state collapse. In the Andes, the fragmentation of several prehistoric polities have been attributed to largely unforeseen environmental calamities, ranging from extend droughts in the circum-Titicaca region (see Janusek 2004), to catastrophic ENSO (El Nino Southern Oscillation) flooding (van Buren 2001) on the Peruvian north coast (Dillehay and Kolata 2004). As an agro-pastoral society, worsening environmental conditions in Andahuaylas, including drought and frequent frosts, would have reduced the amount of available land for grazing and planting. Competition for economic resources and the failure to manage the redistribution of food and luxury goods could have been a catalyst for increasing conflict both before, as well as after Wari collapse. Similar patterns have been observed elsewhere in the highland Andes.

Pinpointing the timing and duration of environmental changes in south-central Peru, specifically, is crucial in order to gauge the role that increasing drought may have played in the collapse of the Wari Empire, and how these challenging conditions may have structured the lifeways of people eking out an existence in the aftermath of imperial fragmentation in Andahuaylas, a formerly prosperous near-hinterland province.

There is ample paleo-ecological evidence to suggest that the south-central Peruvian sierra also endured dramatic climatic changes over the past 2,000 years, alternating from cooler, wetter periods to hotter, more arid periods (see Thomson et al. 1994; Kolata 1993; Hilyear et al. 2009; Binford et al. 1997; Abbott et al. 1997; Valencia et al. 2010; Chepstow-Lusty et al. 2009). Some scholars posit that a prolonged drought was responsible for Wari collapse ca. AD 1000/1050. While the current consensus suggests that in general, the Late Intermediate Period (LIP) was significantly more arid than the preceding Middle Horizon (the time of the Wari Empire) (see Bauer et al. 2010), Wari fragmentation appears to have occurred several centuries prior to an era of worsening drought in several imperial provinces, including Andahuaylas. Recently published data from sediment cores drawn from Laguna Pacucha, in central Andahuaylas, suggest that regional aridity intensified only during the second half of the LIP, worsening sometime after ca. AD 1250, some two centuries after Wari's dissolution (Kellett 2010:221; Valencia et al. 2010; Kane 2011; See also Arkush 2008). Before this time, climate changes were less significant and more manageable.

Furthermore, isotopic data gleaned from human dentition in Andahuaylas reveal no significant changes in climate-sensitive consumptive practices from late Wari through early post-Wari times (see Chapter 9 and Lofaro et al. 2011). These data appear to

indicate that environmental shifts did not significantly impact the availability of crucial crops like maize, which continued to form a substantial part of the diet in early LIP Andahuaylas.

Although paleo-climatic data appear to indicate relative environmental stasis during the crucial centuries that witnessed Wari's fragmentation and the ensuing early LIP, tumultuous social and cultural changes were occurring in Andahuaylas. The genesis of novel ethnic identities, as well as the targeted killing of identifiable ethnic groups, appear to have been cultivated by seeds sown in Wari's socio-political disintegration, rather than macro-climatic undulations. In sum, this research takes the position that documented changes in early post-imperial Andahuaylan lifeways were not adaptations to a worsening environment, but rather more strongly structured by Wari collapse itself.

The Nature of Wari Imperialism

Wari is a class of polity usually characterized as a state or empire (Schreiber 1992). States are political systems composed of a centralized authority that rule over a large non-contiguous territory and integrates diverse ethnic groups. Material infrastructure and systems of tribute and redistribution are also characteristic of states. In the archaeological past, states may be identified through rank-site hierarchies of first- through fourth-order sites, from capitals and regional centers, to colonial outposts, and finally local villages (Isbell and Schreiber 1978). States also invest in infrastructure, from roads and storage units to military garrisons. Iconography denoting a state religion is usually prevalent in both heart and hinterland. Finally, material signs of social differentiation and inequality are usually present. This differentiation may be reflected

horizontally (e.g., artifacts denoting different occupations) and vertically (e.g., the variable quality of artifacts possessed by royals, elites, intermediate elites, and commoners) (Schreiber 1992; Tung and Cook 2006).

Wari was one of the first pristine empires to emerge in the Americas (Isbell 2008) (ca. AD 600–1000). Its capital, Huari, near modern-day Ayacucho, was a massive city, at covering at least four square kilometers. The capital was home to some 30,000 people who lived in multi-storied compounds divided by high, thick-walls (Isbell 2000). Wari nourished its population—and likely flourished as an empire—through innovative terrace agriculture, supported by complex irrigation systems fed by high-altitude springs; technology created in the face of challenging arid environmental conditions (Ortloff 2009).

Table 2.1. Andean chronology.

		Polity/Cultural Group		
Era	Epoch/Phase	Peru	Andahuaylas	Approximate Dates
Early Horizon		Chavin	Muyu Moqo	800–200 BC
Early Intermediate Period		Regional Polities	Qasawirka	200 BC–AD 600
Middle Horizon	1A	Wari	Warified, Qasawirka	AD 550–650
	1B			AD 650–750
	2A			AD 750–900
	2B			AD 900–1000
Late Intermediate Period	1	Regional Polities	Chanka, Quichua	AD 1000–1250
	2			AD 1250–1400
Late Horizon		Inca	Chanka and others	AD 1400–1532

Wari emerged from the formative Huarpa culture ca. AD 500—600 at the beginning of the Middle Horizon. Traditionally, the early era of Wari cultural development, termed Epoch 1 (MH1), is characterized by organic urbanization in the capital city, and a focus on religious proselytization in the heartland and near-hinterland. Wari southern imperial expansion and consolidation began in earnest in the 7th century AD (Williams 2001; Tung 2007a). This era of imperialism is traditionally known as Epoch 2 (MH2, ca. AD 700/750) (McEwen 2005). Accompanied by distinctive iconographic motifs, much of Wari's strategy of conquest and consolidation involved militarism as well as elaborate rituals (Tung and Knudson 2011). Colonial outposts were established in hinterland provinces and the heartland was significantly transformed as agricultural production intensified (Isbell 1977; Vivanco and Valdez 1994). At Huari, artifactual remains and iconography attest to increasing secularization, economic specialization, and wealth (Isbell 1997; Isbell and Cook 1987). During MH2, the demand and importation of non-local durable goods increased (Craig and Jennings 2001; Edwards 2011) as did interregional exchange of prestige goods and staples (Jennings 2006). Craft specialists in the capital fabricated inimitable ceramics, forged metal and shell objects d'art, and wove exquisite textiles (Grossman 1983). Those portable, finished goods, wrapped in distinctive Wari iconographic motifs, were exchanged throughout the Andes (Isbell and Schreiber 1978; Perez 1999). At the same time, Wari likely supported its desire for foreign goods through llama caravans (Isbell and Silverman 2008), which expanded long-distance trade and the volume of goods that could be moved across the landscape.

Wari conquest extended to people, different vertical ecological niches, and non-agro-pastoral resources (e.g., mining) (Kaulicke 2001; Schreiber 1992; Valdez 2011; Vaughn et al. 2007) and the state radiated economic, military and ideological power into the provinces (LaLone 2000:89). As an expansive empire, Wari needed to co-opt local leaders, raise an army, and mobilize large amounts of human labor for public works projects; this required large crops yields. Most scholars suggest that Wari ruled through a “network of regional administrative centers” that organized extraction, storage, and redistribution of resources (Jennings 2006:265), using a general political strategy that has often been characterized as a “mosaic of control” (Schreiber 1992). In regions with low populations and little complexity, Wari tended to established outposts and concomitant infrastructure—a process known as “direct” control. In contrast, in areas where there was a higher level of socio-political complexity, Wari ruled “indirectly,” by co-opting local leaders who aided in the reorganization and management of local economic systems. The enfolding of local elites and manipulation of local political structures likely occurred through the bestowment of prestige goods during festivities which created a class of dependent elites who affirmed social differences through feasting, fictive kinship, and luxury items (Schreiber 1992). As a state preoccupied with rank and status, Wari used divisive strategies like exclusionary feasting and also ancestor mummy capture to reify social and political hierarchies (McEwen 2005). These mechanisms were likely employed to coerce emerging elites to detach themselves from the obligations and bonds of local kin and instead ally and affiliate with the state (Isbell 2000). The Wari also employed the threat of force (and actual force) as tactics of coercion (Tung 2012).

Bioarchaeological and Archaeological Evidence of Wari in Andahuaylas

Material culture and radiocarbon dates indicate that Wari's presence was primarily experienced in Andahuaylas during Middle Horizon Epoch 2, between the 8th and 11th centuries AD, but the exact nature of this presence remains imprecise.

Grossman's (1972, 1983) stratigraphic excavations at the ancient village site of Waywaka in 1970–71 were the first to employ radiocarbon dates, and the first which provided a reliable cultural sequence for the Andahuaylas Valley. Grossman demonstrated that prehispanic occupations in Andahuaylas extended from the Initial Period (2000–1000 BC) through the Late Horizon Inca Period (ca. AD 1400–1532). At the deepest levels (dating to 1500 BC), Grossman uncovered the remains of at least fourteen people, interred individually in tightly flexed positions in simple pits. River cobbles had been placed over the burials and gold foil and a worked lapis lazuli bead was placed in one individual's mouth. Because osteological evaluation was not the focus of Grossman's research, there is only a cursory review of the skeletal material, which includes males, females, and sub-adults.¹ A photo of an excavated cranium appears to show slight modification. Although his focus was not the MH and LIP, Grossman documented local Qasawirka ceramics (ca. 300 BC–AD 1000) which emulated Wari motifs, as well as late Wari style (MH2) ceramics.

Bauer, Kellett, and colleagues' (2010; Kellett 2010) systematic surveys and limited excavations in northern Andahuaylas Province confirmed the longevity of the Qasawirka ceramic style. The technical conservatism of local Qasawirka ceramics may have been a means of reinforcing community affiliations through the maintenance of

¹ Remains were sent to the University of San Antonio Abad, but have not yet been located by the author.

local traditions. However, the limited range of attributes represented by Qasawirka pottery was certainly impacted by Wari's presence in Andahuaylas. New forms, colors, pastes and images entered the region, and some local potters emulated imperial styles with varying degrees of success in an attempt to place their work within the "international" (*sensu* Isbell 2008) imperial cultural milieu.

During MH2, many of the over 400 Qasawirka sites were abandoned in northern Andahuaylas (Kellett 2010:78), as "fourth-order" (Isbell and Schreiber 1978) Wari installations expanded into new ecological zones in order to exploit high-altitude agro-pastoralism (Bauer and Kellett 2010). Radiocarbon dates show that these Wari villages were established after ca. AD 700 at somewhat higher elevations than the local Qasawirka sites, but generally below 3700 masl. Bauer and his team's (2010) survey work documented that at least a third² of all Middle Horizon settlements (N=66) had imperial Wari-style ceramics.

In western Andahuaylas Province, in San Antonio de Cachi District, the recently reported site of Patahuasi (3900 masl) (Gomez n.d.), is replete with Wari-style orthogonal architecture and a characteristic D-shaped ritual building. This probable Wari outpost (Isbell, personal communication 2012) might have been used to manage camelid herds and organize copper and salt mining labor during the Middle Horizon.

In southern Andahuaylas Province, in Pampachiri District, survey and excavation work by Meddens (1985; Meddens and Branch 2010) in the Chicha-Soras River Valley

² This figure might be higher. Bauer and colleagues (2010) documented 405 Qasawirka sites and 66 Wari sites. However, given the longevity of the Qasawirka culture (300 BC—AD 1000), it is unclear how many Qasawirka sites were abandoned, and how many were functioning during the Middle Horizon (AD 600—1000).

documented clear evidence of Wari imperial incursion in the region, exemplified by Yako (.65 ha. 3330 masl), a site established during MH1. Yako is composed of a motley arrangement of circular and quadrangular building, over a dozen rubble mounds, and one large D-shaped structure made from “rough fieldstones set in mud mortar with lines of thin, slab-like stones with flat faces irregularly spaced throughout the wall” (Meddens and Branch 2010:157). During MH2, agricultural production intensified in Pampachiri as terrace agriculture was introduced (Kemp et al. 2006) and additional Wari sites were established in previously unoccupied zones (Meddens and Branch 2010). The largest of these new sites, Chiqna Jota (9 ha. 3450 masl), contained over 200 buildings, had at least three sunken plazas, and was occupied through the Late Intermediate Period (until ca. AD 1400). Plaster-covered orthogonal and cellular buildings at Chiqna Jota follow Wari construction tenants, and both Yako and Chiqna Jota were associated with Wari imperial ceramics (specifically Ocos, Vinaque, and Black Decorated styles) (see Menzel 1968).

The incomplete remains of at least six adults (at least three were males) were tentatively associated with the D-shaped building at Yako. One skull was apparently modified and included a trepanation on the frontal bone. However no artifacts were found with these burials, which, due to their location below a fallen wall outside (rather than inside) of the D-shaped building, may be the result of looting or post-Wari redeposition (Meddens and Branch 2010).

Near Yako, at the communal cave tomb of Charrangochayoq, Meddens reports the construction of “small rectangular rooms, with white plastered walls and rectangular windows” (Meddens and Branch 2010:158), built in a large rock shelter. The tomb is dated to the Middle Horizon, but was used continuously through the Late Intermediate

Period, suggesting that cultural integrity was maintained in this region following Wari's dissolution at the end of the Middle Horizon. Meddens reports finding one cranium with modification "similar to the type found at Yako" (Meddens and Branch 2010:163). However, due to the commingled arrangement of human remains at Chanrrangochayoq and its long period of use, direct radiocarbon dating of human remains is necessary to confirm that the modified cranium is indeed from the Middle Horizon.

Given its high, flat location on the *Puna*, Meddens (1985) convincingly argues that Pampachiri was exploited by the Wari Empire during the Middle Horizon for the purposes of camelid breeding and herding. He cites camelid iconography, wool textiles, and great quantities of camelid remains as evidence for intensified animal husbandry. The establishment of extensive terracing in the region by Wari (evidence for agricultural intensification) was likely realized to support pastoralists and others in the Chicha-Soras Valley. Gomez (n.d.) noted a similar pattern of imperial incursion at Patahuasi in western Andahuaylas. Taken together, these data suggest Wari's influence in Andahuaylas was present, but somewhat uneven. As modeled by Schreiber's (1992) mosaic of control, the empire was variably invested in Andahuaylas. Wari leaders likely orchestrated a strategy of indirect and direct statecraft in the region, variably altering local settlement patterns, architectural configurations, and artifactual assemblages.

Reasons for Wari Investment in Andahuaylas

Archaeological evidence clearly indicates a foreign imperial presence in Andahuaylas during the later Middle Horizon. The province likely existed as a "small subdivision within a broader regional administrative unit" (Schreiber 1987:278). There

are several reasons Wari may have invested in Andahuaylas. First, the province is strategically located and would have been an obligatory artery for Wari goods, soldiers, caravans, and administrators traveling from the imperial capital of Huari in Ayacucho, east towards Pikillacta in Cuzco, and south to regional highland centers like Pampachiri, Chiqna Jota, Collota, and Jincamocco (Meddens 1985; Schreiber 1992; McEwen 2005; Jennings 2006). Andahuaylas was economically valuable as well. Known for its exquisite textiles and extensive trade networks, Wari had to rely on and manage large herds of camelids which could be culled for their wool and meat, and saddled up in large caravans. Evidence of this investment, from industrial-sized corrals to ample *Puna* grazing lands and even mold-made ceramics in the form of camelids, are abundant in Andahuaylas. Finally, Andahuaylas is also rich in mineral resources. Wari likely benefitted from the robust salt and copper veins that flow through the region (Kurin, Pink, and Boulanger, n.d.).

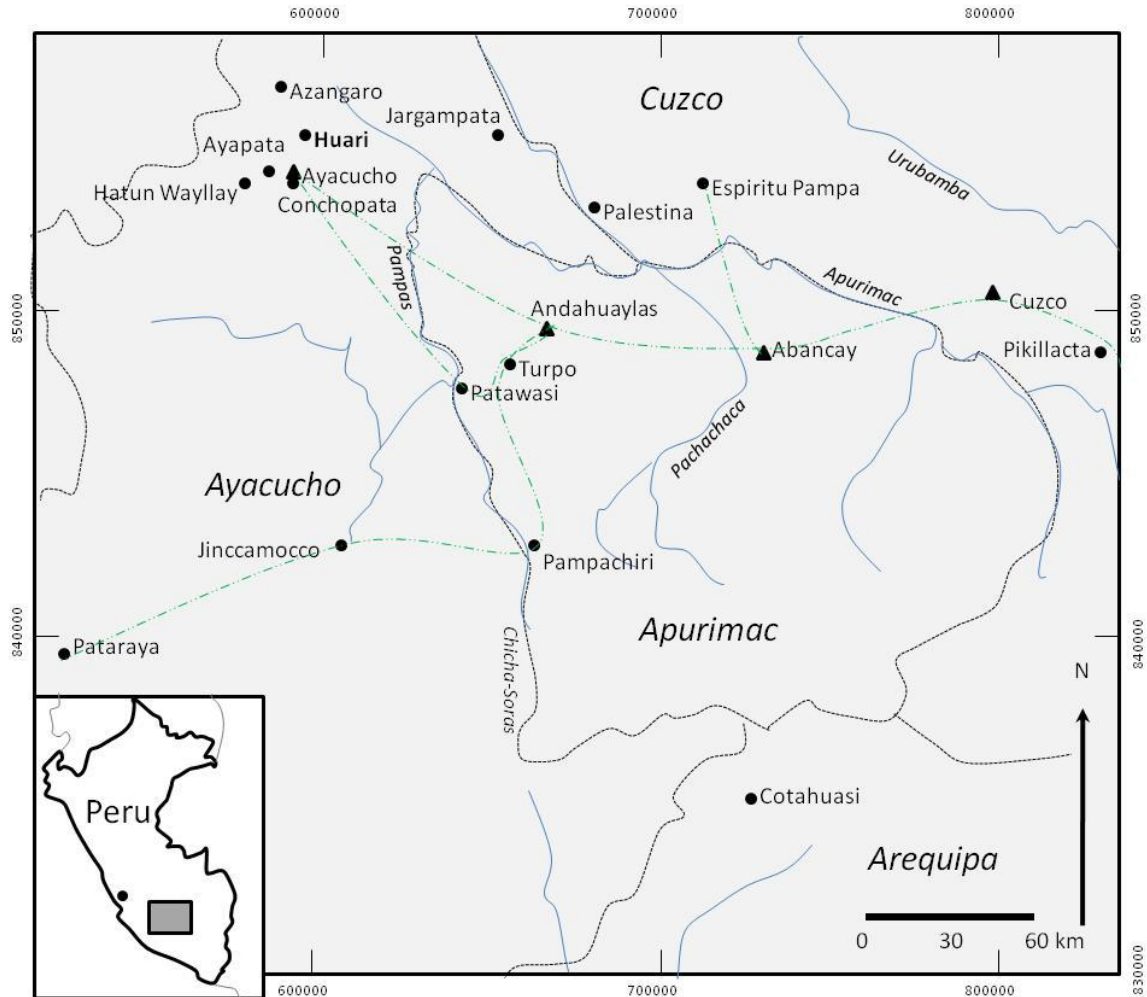


Figure 2.1. Known Wari sites in the south-central Peruvian highlands. Dashed lines are probable Wari roads.

Unlike other hinterland regions subsumed within the imperial sphere (see Tung 2003, 2007b), Wari's incursion in Andahuaylas was not violent, nor was violence an outgrowth of Wari's investment in the region. Warrior iconography is absent on ceramics from the region, defensive architecture is lacking, and most directly, human remains from the era demonstrate a low frequency of non-lethal cranial injuries (see Chapter 6). And although Andahuaylas was a crucial transitory region, Wari's control of the Andahuaylan body politic seems to have been limited to material goods and economic reorganization,

and not modification of the body itself (e.g., cranial modification, see Chapter 7). Finally, despite archaeological correlates which indicate that Wari introduced novel terracing strategies and intensified camelid pastoralism in the region, to date, there is no evidence of foreign-born Wari colonists living in Andahuaylas (see Chapter 9). While the scene in Middle Horizon Andahuaylas appears to have been one of relatively peaceful assimilation and integration, such unanimity ultimately did not last.

The Nature of Wari Collapse

After some four centuries of imperial rule, the Wari Empire collapsed. Reasons for fragmentation remain unknown and it is unclear if Wari collapse was a seismic phenomenon that emanated from the core and rippled out, or a corrosive phenomenon where provinces broke away and ultimately undermined the cohesion and survival of the capital. Given that site abandonment on a regional scale can signal imperial retraction (Cameron and Tomka 1996), Wari's more-or-less contemporaneous withdrawal from all of its major imperial provinces, with no signs of anticipated return, is a key proxy for widespread state fragmentation.

Radiocarbon dates indicate that the capital city of Huari was abandoned and left "destroyed and desolate" (*sensu* Lumbreras 1999) around the mid-11th century (Finucane et al. 2007). In the hinterland provinces, the abandonment of Wari outposts was varied, spanning several generations in many cases. At some Wari outposts there is evidence of planned, tactical retractions, while other colonial outposts evince signs of hasty, unanticipated withdrawal.

For instance, at the massive installation of Pikillacta, in Cuzco, construction of the final sector of the complex was cancelled around ca. AD 850–900, perhaps anticipating future problems (McEwen 2005). Rooms were cleaned and sealed, offerings were deposited, and sectors were deserted before ever being finished. Nevertheless, the unexpected acceleration of Wari collapse may account for why other sectors of Pikillacta show evidence of hurried, perhaps even violent, abandonment. A site-wide burning episode and a decapitated skeleton found strewn over a wall (Verano in McEwen 2005) attest to the conflict that may have accompanied the provincial capital's abrogation.

Pikillacta's possibly violent end contrasts with findings from Pataraya, a small colonial outpost staffed by elites and retainers for some 200 years during MH1 and MH2. Abandonment at Pataraya was an orderly affair that lasted several weeks to months (Edwards 2010) *terminus post quem* ca. AD 922.

Another pattern of retraction is seen in Moquegua, in southern Peru, where Wari constructed a massive complex at the summit of a steep mesa called Cerro Baúl. At Cerro Baúl, abandonment was slow and methodical, ca. AD 1000–1050. Planned, sequential ritual closure of the site suggests that the residents had an orderly retreat. Some scholars (Schreiber 2001; Edwards 2010; Williams 2002) suggest that the abandonment of the site was related to changes in political and diplomatic relations with the neighboring Tiwanaku state, rather than Wari imperial disintegration (Moseley et al. 2005; Goldstein 2005). A likely scenario suggests that Tiwanaku's retreat from Moquegua (and the migration of Tiwanaku subjects up valley to the Wari-controlled region) made Cerro Baúl's presence as a locus of diplomatic engagement between Tiwanaku and Wari unnecessary (Williams 2002). Taken together, evidence from imperial installations

throughout south-central Peru suggests that Wari collapse was an extended process, which may have persisted for several generations between the mid-10th and mid-11th centuries AD.

Table. 2.2. Wari Site Abandonment in South-Central Peru.

Wari Site	Heart or Hinterland	Site Description	<i>Terminus Post Quem/</i> Dates of Abandonment	Skeletal Evidence of Violence @ <i>Terminus?</i>	References
Huari	Heartland	Capital	1050	Yes	Tung 2008
Conchapata	Heartland	Elite Second City	1000	N/A	Isbell and Cook 2002
Pikillacta	Hinterland	Eastern Provincial Capital	850/900–1000/1100	Yes	McEwen 2005
Cerro Baúl	Hinterland	Southern Provincial Capital	1000–1050	N/A	Williams 2002
Azangaro	Heartland	Urban Center	1000	Yes	Anders 1991; Finucane et al. 2006
Pataraya	Hinterland	Outpost-Weigh Station	922	N/A	Edwards 2010
Jinccamocco	Near-Hinterland	Outpost-Agriculture	1000	N/A	Schreiber 1992
Yako	Near-Hinterland	Outpost-Herding	1000	N/A	Meddens and Branch 2010

Archaeological Evidence of Wari Collapse in Andahuaylas

The nature of Wari collapse in Andahuaylas remains unclear, but Wari's retraction ca. AD 1000/1050 coincides with striking changes in local lifeways. Although Wari's presence in Andahuaylas appears to have been somewhat variable, its retraction from the province seems to have been uniformly tumultuous.

Throughout the province, Qasawirka ceramics suddenly disappeared, after some 1300 years of stylistic stability and uniform distribution. Settlement patterns also shifted dramatically. In the Pampachiri region of southern Andahuaylas, Yako was swiftly abandoned as part of Wari's socio-political withdrawal from the region at the end of Middle Horizon Epoch 2 (ca. AD 1000) (Meddens and Branch 2010:167).

In northern Andahuaylas, almost all the Qasawirka and Wari sites were abandoned between ca. AD 1000–1100, as populations moved to high altitude ridge and hilltop settlements, located between 3500–4000 masl (Bauer and Kellett 2010; Kellett 2010).

These densely agglutinated, permanently occupied settlements ranged from 1–15 hectares in size, and consisted of dozens to hundreds of 2–3 meter wide circular structures, organically arranged into patio groups. Building stones were opportunistically quarried from local bedrock. Corral complexes were located nearby, within a 60-minute walk of sites. Settlements often lacked nearby freshwater sources, and many consisted of defensive features like walls, ditches, precipices on three sides, and lookouts. These material signatures suggest at least periodic concerns about community defense against violent attacks during the LIP. Based on excavation data, Kellett (2010) interprets the shift to hilltop settlements during the early Late Intermediate Period as an adaptation to climatic changes. He argues that high-altitude pastoralism was newly emphasized in the post-imperial era as a risk reduction strategy in the face of increased aridity and drought, rather than due to instability catalyzed by Wari collapse. However, isotope geochemistry, ice and lake core data from the south-central Andes, and Laguna Pacucha in Andahuaylas (Chepstow-Lusty et al. 2003; Thomson et al. 1994; Kane 2011; Hillyear et al. 2009; Valencia et al. 2010; Ortloff and Kolata 1993) suggest that the most intense period of

drought in Andahuaylas began several hundred years after Wari's disappearance, after ca. AD 1250 (Kellett 2010:221; Valencia personal communication 2011; Guido personal communication 2011). Evidence from the Peruvian *altiplano* also supports a late LIP drought. A 200-year lag between Tiwanaku collapse and the construction of fortified hilltop sites in the Lake Titicaca Basin (ca. AD 1275) suggest that recurring violence during the post-state era was largely spurred by drought and attendant resource scarcity (Arkush 2008, 2009).

Data presented which was derived from directly dated human remains (see Chapter 6), investigates when violence peaks in Andahuaylas, relative to major environmental and social changes. If violence is spiking in Andahuaylas after the end of the MH, but before consequential climatic transformation during the later LIP, then we must reconsider the idea of violence being an outgrowth of, or adaptation to, macro-environmental changes.

By the end of the Middle Horizon, Wari's economic, ideological, and political infrastructure was stressed. Systems of production and redistribution, the role of ritual in an increasingly secularized society, and foreign affairs could have been strained as military, diplomatic, and bureaucratic systems became increasingly ineffective. Wari's disappearance in Andahuaylas in the early to middle 11th century was accompanied by the breakdown of road networks, dramatic shifts in the style and quality of artifacts, transformations in the nature of iconography, the disappearance of regional hierarchies, and demographic expansion (Isbell 2008; Bauer et al. 2010; see also McAnany and Yoffee 2010; Yoffee 2005; Tainter 1988; Schwartz and Nichols 2006). In some cases, Wari or Wari-affiliated retainer populations were tactically disengaged and withdrew,

while in other instances abandonment was unexpected and accompanied by violence (Williams 2002; McEwen 2005). In areas where Wari's presence could be described as "influence" more than control, collapse instigated changes in systems of trade and exchange and in the social and political relationships represented by those material artifacts. In Andahuaylas, the swift abandonment of Wari-affiliated sites, the absence of Wari goods, and the repudiation of Qasawirka ceramics around AD 1000, suggest a dramatic retraction or rejection of Wari ways and influence in the area. Ultimately, the collapse of Wari created a political vacuum that caused significant civil unrest (Conlee and Schreiber 2006; Tung 2008; Finucane et al. 2007; Glowacki 2002; Kemp et al. 2006; La Lone 2000; McEwan 2005; Moseley et al. 2005; Nash 2002; Schreiber 1987, 1992; Williams 2002; Topic and Topic 1987; Arkush and Stanish 2005). Such post-imperial unrest has been characterized most infamously in the saga of the Chanka of Andahuaylas.

Chanka Ethnohistory

Approaching Documentary Sources

Drawn from oral history, the plight of the post-imperial Chanka was meticulously recorded in colonial-era texts. These ethnohistoric sources provide some clues about the lifeways of late prehispanic groups in the Andes; the earliest sources date to the time of Spanish conquest. The most vivid descriptions of late prehispanic lifeways come from the chronicles, a collection of travelogues and official histories written by colonial administrators, overzealous priests, mestizo elites, and ruffians-cum-soldiers. Other documents that inform on the present study of the Chanka are legal and procedural

documents related mostly to judicial cases of land tenure disputes in the 16th through early 19th centuries.

Descriptions in the chronicles are generally plagued by the biases, inaccuracies, and inconsistencies of informants and authors. Guevara-Gil and Salomon (1994) caution that native social structures depicted through colonial texts are not mimetic representations of real life. These ideal reconstitutions (especially in procedural texts) usually do not account for demographic fluctuations due to catastrophic events like violence, epidemics, and immigration. Rather, depictions of social structure in Colonial texts had to fit Spanish administrative and ideological paradigms while also reaffirming the traditional “immemorial” (*ibid.*) legacy of native leaders. While early colonial native lords had some authority when it came to providing ethnographic testimony or “providing social structure suitable for direct rule” (Guevara-Gil and Salomon 1994:25), later *kurakas* (native lords) were strained by factors like Spanish labor and tribute obligations. Privileges and cultural understandings, once based on kinship, gave way to those based on political office.

However, these documents are not fabrications; *visitas* (census documents) and other legal documents for regions like Andahuaylas, “truthfully record[ed] a process by which social order under[went] real and effective change” (Guevara-Gil and Salomon 1994:25). Thus, even procedural documents can shed light on “motives and organization techniques” used to record social organization (*ibid.*). Throughout this dissertation, these colonial-era documents are cautiously employed to aid in the identification of Chanka and Quichua communities; reconstructed genealogies are used to clarify the social basis of tomb and mortuary cave collectivity.

Chanka Historical Ethnogenesis and Violence

Among pre-Incaic cultural groups, none is as well known as the Chanka. The infamy of the Chanka emerges from their crucial role in official Inca history. Oft characterized as a complex polity where brilliant war captains led thousands of troops to conquer and decimate neighboring populations, the Chanka apparently made several forays towards Cuzco in attempts to subdue the Inca until ultimately vanquished by the Inca Lord Pachacutic in a decisive battle that catalyzed the consolidation of Tawantinsuyu. In other words, the Inca-Chanka war was a nation-making event for the Inca. For the Chanka, it was the literary end of a manifest destiny unfulfilled. However, the characterization of the Chanka as fierce warriors has been cemented into historical consciousness. Yet given that they were major rivals (or at least literary foils) of the Inca, the chronicles (whose authors largely relied on Inca informants) tend to illustrate an overwhelmingly static and largely negative view of the Chanka. Even their origin legend conforms to common pan-Andes tropes like migration, antagonisms, and conflict, rather than revealing the nuanced cultural machinations of a prehistoric society.

According to chroniclers, the Chanka emerged after Wari collapse, during a time period Inca Garcilaso de la Vega (1968 [1613]) has called the Age of *Auca Runa* (warlike men). This mythic era of Andean prehistory was defined by military engagement, territorial conquest, and political subjugation. Ayacucho-born Felipe Guaman Poma de Ayala (1980 [ca. 1615]) relates that the epoch is characterized by population expansion and conflictive resource procurement, with people living on hilltop fortresses (called *pukaras*), governed by *señores* (hereditary lords) and *sinchis* (military leaders).

Sarmiento de Gamboa (2007 [1572]:104) points to the Huamanga area—the former Wari heartland—as the place of Chanka origins. Spanish military captain Pedro Cieza de Leon (1996 [1553]:284) notes that the Chanka-affiliated Pocras and Iquichanos “tribes” still occupied the region around the ruins of Huari in the 16th century. Sarmiento (2007:104-105) argues that the founders of the upper and lower Chanka moieties were instead two *sinchi* brothers, named Uscovilca and Ancovilca who emerged from two high altitude lakes called Urcococha and Choclococha, in Huancavelica. At death, the brothers were embalmed by descendants and carried into battle.

Ethnohistoric texts tend to characterize the Chanka as a coalition of smaller *ayllus* that only come together for means of conquest and defense. For example, in his *Comentarios Reales*, Garcilaso de la Vega (1968:299-300) notes the Chanka nation is composed of many smaller units, writing, “The denomination ‘Chanka’ encapsulates many other nations like the Huancohuayllu, Utunslla, Vilcas, Yquichanos, Morochucos, Tacmanas, Quiñuallas and Pocras; they who boast ascendance from various parents, some from springs, some from lakes, other from the heights of the mountains.”³ Garcilaso’s mention of multiple origin places, suggests that Chanka society may have been composed of distinct ethnic groups or lineages. Royal cosmographer Sarmiento de Gamboa (2007 [1572]) notes that the Chanka were organized according to *ayllus* and moieties with dual (upper and lower) divisions at every nested socio-political level.⁴

³ Original: “Debajo de este apellido Chanca, se encierran otras muchas naciones como son Hancohuallu, Utunsulla, Urumarca, Vilcas, Yquichanos, Morochucos, Tacmanas, Quiñuallas y pocras; las cuales se jactan de descender de varios padres, unas de una fuente, otras de una laguna, otras collado muy alto.”

⁴ Original: “Habían venido asentar al valle de Andahuailas y ahí habían hecho dos parcialidades. Uscovilca que era el mayor y el mas principal instituyo su tierra y llamo lo Hananchanca (Antahuaila) y Ancovilca hizo la otra parcialidad (Uranmarca) llamándola Urinchanca.”

While Chanka political authority and social organization is mentioned in ethnohistoric texts, unique markers of Chanka ethnic identity are largely lacking. Cieza de Leon (1985:211) remarks that, “They all had long hair, delicately braided, and arranged with some wool cord that came to fall below their chins.”⁵ Cieza also notes that the Chanka wore woolen shirts and *mantas* (mantles), lived in round, stone houses, and buried their dead in caves surrounded by “treasure and apparel.”

The Chanka were also notoriously bellicose. Warfare appears to have been a common—even defining—feature of Chanka society. Encounters between the Chanka and their rivals were brutal and excessively violent. For instance, Betanzos (2004:244) illustrates one particularly gruesome episode of ethnocide where,

Inca Yupanque... had set in the ground many posts from which [the Chanka] would be hanged. And after being hanged, their heads would be cut off and placed on top of the posts. Their bodies would be burned, turned into dust, and from the highest hills cast to the winds so that this would be remembered. Thus the Inca Yupanque ordered that nobody dare bury any of the bodies of the enemies who had died in battle so that they would be eaten by foxes and birds and their bones would be seen all the time.

In other instances, entire communities were exterminated, as,

Babies were torn alive from the womb, hanging them by their umbilical cords from their mothers’ legs. The rest of the lords and ladies who were prisoners were tortured by a type of torture they call *chacnac* [whipping], before they were killed. After being tormented, they were killed by smashing their heads to pieces with battle axes they call *chambi*, which are used in battle.

⁵ Original: “Todos traen cabellos largos, entrenzados menudamente, puestos unos cordones de lana que les venía a caer debajo de la barba.”

Monzon's ([1583] 1881:222) reports of inter-ethnic violence in proto-historic and early historic Andahuaylas note that Vilcas (Ayacuhco) tribes constantly fought with their "near neighbors," the Chanka using, "slings and stones with holes in which had been inserted a stick, which they call...*collotas*."⁶ Ondegardo de Polo (1873:163) suggested that the endemic inter-ethnic violence of the early Colonial period usually did not occur between "an Indian and another of the same village, but between one village and another." Ondegardo's observation of inter-group animosity appears to be confirmed by an 18th-century court dispute from Andahuaylas in which Chanka locals from the Cuncataca barrio attempted to legally (then violently) dispossess intrusive *forasteros*, (non-local people) who had settled in the zone (see Hostnig et al. 2007).

Even Chanka genesis is colored by violence. Following their migration to Andahuaylas in times immemorial, Cieza de Leon (1985:111) describes how the Chanka defeated the previously residing Quichua cultural group in a bloody battle. Bernabé Cobó, a Jesuit priest whose 1653 *Historia* borrows heavily from earlier works by chroniclers Polo de Ondegardo, Cristobal de Molina, Jose de Acosta, and Garcilaso de la Vega (see Urton 1999:31), relates that the Chanka, "were natural leaders, [who] resented taking orders from others.... [They] took as their leader a brave Indian named Ancohuallo," and were so brave, that "by their efforts they had won many lands and dominions" (Cobó [1653]1983:25). During the time of Inca Viracocha, Chanka *sinchi* brothers Astoyguaraca and Tomayguaraca led thousands of warriors towards Cuzco

⁶Original: "Los naturales de esta provincial [Guamanga]...trian guerra con los indios Chancas, provincial de Andaguaylas, que son sus más cercanos vecinos. Y que peleaban con hondas y con unas piedras horadadas con unos palos atravedados en ellas. Que llaman en su lengua *collotas*."

(Cieza de Leon [1553] 1996). The Chanka brothers were described by Sarmiento as pillaging “thieves and cruel tyrants” (2007:104) who threatened to “dye [their] spears with the Incas’ blood” (*ibid.*:111).

Chronicler Juan de Betanzos, a Spaniard who spent much of his adult life in Peru, where he married an Inca princess, learned Quechua, and socialized with the descendants of Inca elite, recounts a slightly different version of the myth. His official history, published in 1557, was completed by order of Antonio de Mendoza, the Viceroy of Peru. According to Betanzos’ (2004 [1557]: vi) elite Inca informants, Uscovilca is identified as the head of the upper moiety Chanka, but was supported by six war captains divided into three paired infantry units: Mallma and Rapa, Yanavilca and Tecollovilca, and Guamanguaraca and Tomayguaraca. Uscovilca sends Mallma and Rapa to conquer Condesuyu (southwestern Peru), and Yanavilca and Tecollovilca to conquer Antisuyu (the Amazon jungle), while the rest of the brigade heads towards Cuzco. With the threat of the advancing Chanka, a fearful Viracocha Inca flees Cuzco with his heir, Urco, leaving his youngest son, Inca Yupanqui, and a couple of the boy’s friends behind to defend the city. The battle between Inca Yupanqui and the Chanka is vicious, with hand-to-hand combat and weapons yielding high numbers of killed and injured. The Chanka are said to have employed lances, halberds, axes, clubs, slings, and round shields during conflict (Betanzos 2004:20). Confrontations involved “the Chankas thrusting their long spears, [and] the Incas [fighting] with slings, clubs, axes, and arrows” (Sarmiento 2007:113).

Eventually, the young Yupanqui defeats the Chanka, aided by the *purunraucas*, fieldstones transformed into warriors. The Chanka *sinchis* are all killed in battle and Yupanqui places their heads on tall spears, “so their own men would see them. Once [the

Chanka] saw the heads, they doubted they could win without leaders, and all left the field and tried to flee” (Sarmiento 2007:113).

In mestizo chronicler Pachacuti Yamqui’s ([1613] 1993:92) version of the battle, the Ancohuayllos (a macro-*ayllu* from the Ranracancha region of northwestern Apurimac) (Fig. 2.1, Map of region) and the Chankas form a confederated unit that unsuccessfully fights against the Inca. After a hasty retreat, Yupanqui follows his enemies to a place called Quizachilla, where Chanka *sinchis* Tomayhuaraca, Astohuaraca, and Huasco Tomayrimac are beheaded. The heads of these war captains are presented to Yupanqui’s father, Viracocha Inca. Finally, the demoralized (but not yet defeated) Ancohuayllos and Chanka score a minor victory when an Inca general/royal family member named Vilcaquiri is killed by a Chanka warrior, “hurling a stone” (Pachacuti Yamqui [1613] 1993:92), before being ultimately overwhelmed by Yupanqui’s Inca forces at the Apurimac River.

In the end, all the chroniclers agree that the Chanka are summarily defeated by the Inca. Upon victory, Yupanqui takes the name Pachacutic (literally the World Transformer/Fin de siècle-maker), and the era of Inca imperial expansion begins in earnest.

Although this climactic battle is often set within the reigns of Viracocha Inca and his son Pachacutic Inca Yupanqui (Pachacuti Yamqui 1993; Juan de Betanzos 2004; Cieza de Leon 1996; Polo de Ondegardo 1873; Sarmiento de Gamboa 2007; Jose de Acosta 1954; Cobó 1983), other authors move the action back chronologically, placing the decisive battle during the time of Inca Roca and Yawar Huaccac (Gutierrez de Santa Clara 1905; Cabello de Balboa 1951; Poma de Ayala 1980; Cobó 1983). Cobó, for

example, states that Inca-Chanka aggression emerged during the time of the earlier Inca Roca (1983:128), who “cut the throats of the majority of the Chankas who were killed in battle,” but that they were only fully subdued later during the reign of Pachacutic who (1983:137) “finally pacified the Chanka.” The chronological ambiguity surrounding Chanka aggression and demise is key and may indicate that the “decisive battle” between Chanka and Inca (as well as “warfare” in general) was actually a longer, more drawn-out period of mutual conflict.

In sum, it is clear from the chronicles that Chanka identity and organization follow common themes of Andean origin and settlement myths described for groups throughout the Andean sierra (Urton 1999). Tropes include Chanka origins from the distant lake Choclococha in Huancavelica Department, the antagonistic relationship between the migrating/invading Chanka and the autochthonous Quichua, and later Inca (Urton 1999:40), and finally the idea of a ranked society led by warlords. These paradigmatic elements, while spectacular, really do not reveal much about unique aspects of Chanka culture. Thus, if the goal is to reconstruct Chanka origins and society in the aftermath of Wari collapse, we must turn to other, less fantastical, lines of data, such as legal documents and archaeological skeletal evidence.

Cultural Groups in Late Prehispanic Andahuaylas

A wealth of information on prehispanic social organization and identity in Andahuaylas comes from colonial-era procedural legal documents. Unlike the chronicles, which served to inform Europeans (including administrators, kings, and ecclesiastical

authorities) on the history and customs of the Andes, this class of documents had a much more limited audience. The documents reviewed in this dissertation primarily consisted of judicial appeals concerning land tenure disputes. In most instances, cases were brought by *kurakas* on behalf of their *ayllus*, except in one notable case, described below.

One of the most important documents that elucidates Chanka social organization and ethnicity is a *cedula* (land grant) awarded by Francisco Pizarro to Diego Maldonado on April 15, 1539. Known as the *Encomienda of Andahuaylas Consisting of the Upper Moiety Chanka, Lower Moiety Chanka and the Quichuas of Vilcaporo*,⁷ this document lists sixty-three towns, their *principales* [chiefs], and their moiety and ethnic affiliations, making clear distinctions between Chanka and non-Chanka groups. Decades later, these same 63 towns were reduced to 13 *doctrinas*, which, for the most part, still serve as district capitals today: Andahuaylas, San Jeronimo, Talavera, St. Joan Evangelista [probably modern-day Chicmo], Guancaray, Turpo, Chuyllanansana [Chullisana in Cachi District], Ola [Colay], Vlca [Ulca], Charanba [Chaccrampa], Guayana, Onamarca, and Pambachiri.⁸ By the late 1600s, Andahuaylas was divided into two *doctrinas*: the Chanka of the *Puna*, and the Chanka of the Valley (see Hostnig et al. 2007; Bauer et al. 2010).

Late prehispanic and early colonial population declines in Andahuaylas are hinted at in the *Encomienda*. These declines may be attributed to Inca and Spanish imperial policies, and not mass Chanka exodus or annihilation at the end of the Chanka-Inka war.

⁷ Original: “Hananchangas y Orinchangas con los Quichuas de Bilcaporo”

⁸ Andahuaylas is not referred to in the document. The toponym comes up only in later documents. For instance, Andahuaylas is listed as a *tambo* (weigh station) by Cristobal Vaca de Castro (1908:444 [1543]). Vaca de Castro identifies the *parcialidades* (administrative units) Andaguaylas, Oponguanche, Chuquicocha, and Vilar Puraychita. The Andahuaylas *tambo* was tentively identified by the author and project co-director in 2011, located in a section of the Valley known as Aranjuez.

Julien (2003) estimates that based on the number of registered tributaries, the population covered by the *Encomienda* in 1539 had at least 7,500 households and at least 120 families at every settlement—around 40,000 people. Using Toledan *visitas*, Cook's (1981:227) population estimate for Andahuaylas in 1573 is around 30,000 individuals, with a 2–2.5% yearly decline until 1602. The neighboring *repartamiento* of Cayara (where the study site of Ranracancha is located) had a population of about 3,000 in 1573 but also saw yearly population declines of over 2%.

The *Encomienda* itself was discovered in a folder belonging to an illegitimate son of Diego Maldonado. As such, Sabine Hyland (personal communication 2010) has suggested that the document may be an elaborate forgery drawn up to settle inheritance disputes. According to Hyland, the 1539 document occurs as a “copy” in a 17th century property claim put together by Maldonado's illegitimate son, who may have forged documents elsewhere. Nevertheless the author of the document had intimate knowledge of settlements in Andahuaylas. This is evinced by the fact that settlements are grouped together by region and ordered in such a way that more or less follows major river valleys and (pre)-Inca highways; the document was clearly created with the help of someone who was extremely familiar with the local geography.

The late ethnohistorian Catherine Julien, who transcribed the document in 2002, identified 13 of 68 (19%) toponyms in the *Encomienda* using modern maps of the region. In 2010, Kellett and colleagues (see Bauer et al. 2010) were able to identify 30 towns (48%) based on several months of survey in the region. Our project was able to confidently identify 52 of 68 (76%) toponyms and towns listed in the document.

Following Julien (2002), toponyms that lack cultural affiliation are presumed to be members of either the upper or lower moiety Chanka.

The cultural affiliation of sites was used to determine where excavations would be carried out. In the present study, toponyms were identified with the assistance of Enmanuel Gomez, the project co-director, Auro Altimirano Ramos, a school teacher who has spent over 40 years in rural villages throughout the province, and eight other middle-aged and elderly local informants from the province. Although certain toponyms are common (e.g., Cochabamba), in the case of two or more toponyms, we opted to include the toponym that was geographically closest to the toponym listed before or after it in the document. We also relied on 16th–19th century legal documents (see Hostnig et al. 2007) to identify toponyms that no longer exist, or whose names have changed.

Table 2.3: Groups in the region following the order given in the 1539 *Encomienda*.

Toponym Named in 1539	Modern Place Name/ Reference	Modern District	Reduccion/ Doctrina	Kuraka	Macro Cultural Group/ Social Category
Layoguacho	Ccoyahuacho	San Jeronimo	San Geronimo	Chuquicondorlapa	Chanka
Pomahuacho	Cotaguacho	Pacucha	San Geronimo	Bonbo	
Guamanilla	Sr. de Huanta Sanctuary	Andahuaylas	Andahuaylas	Condorsuka	
Capaçalla	Sr. De Hunaca Sanctuary	Andahuaylas	Andahuaylas	Hasto	
Ogoro	Ongoy	Ongoy	Ongoy	Llactaconas	
Banbamalca	Pampamarca	Talavera	Talavera	Guasco	
Quevilla	Ladilla (Achanchi)	Talavera	Talavera	Guancho	
Lacacha	Ccaccacha	Talavera	Talavera	Sulcaguaman	
Chuayapa		<i>Unidentified</i>		Tomaynanpa	
Caquesamarca	Saccasamarca	Chicmo	Talavera	Marasguaman	
Guayaconi	Huasipara?	San Jeronimo	San Geronimo	Ororo	Es Chachapoya
Pacocha	Pacucha	Pacucha	San Geronimo	Pacovilca	Chanka
Guataray	Huancaray	Huancaray	Huancaray	Yanas	
Orcomalca	Orjonmarca	Talavera	Talavera	Sutaya	
Yslana	Ismana	Talavera	Talavera	Allauca	
Pocollo	Pucullu	Pacucha	San Geronimo	Coyla and Mayma	
Gualguayo	Huallhuayocc	Andarapa	San Geronimo	Guamanbilca	Chanka

Cochabamba	Cotabamba	Andarapa	San Geronimo	Tibianaypa	
Chuquibanba		<i>Unidentified</i>		Alcaila	
Guarillane		<i>Unidentified</i>		Chochuman	Son Quichuas
Cocas	Cocas	Andarapa	San Geronimo	Asaca	
Sillusque	Silcahue	Pacucha	San Geronimo	Cachaya	Chanka
Yanama	Yanaccma	Turpo	Turpo	Lanas	
Tororo	Toruro	Turpo	Turpo	Ynda	Son Quichuas
Aymayba	Aynabamba*	<i>Unidentified</i>		Navihasto	
Chuchunbe	Chumbibamba	Talavera	Talavera	Suca	
Banbamalca	Bambamarca (Ayapata)	Huancaray	Huancaray	Guamanlapa	
Cocpalla	CCapaccalla (CCoplla?)	Andahuaylas	Andahuaylas	Guaraca	
Queca	Quecapata*	<i>Unidentified</i>		Guasco	
Lamay	Lamay Cascabamba	Chicmo Talavera		Quillichangas	
Chuquisguayo	Chuspiguacho	Talavera	Talavera	Naupacondor	
Pupca	Pupusa	Kaquiabamba	San Geronimo	Guachaca	
Pomachaca	Pumachaca	Ongoy	Ongoy	Magula	
Andasco	Antasco	Huancaray	Huancaray	Curitomay and Tomaycondor	
Quenoabilca	Quinuavilca*	<i>Unidentified</i>		Llangare	
Laracalla	CCarancalla	Andahuaylas	Andahuaylas	Quequehasto	
Opabacho	Oponguache*	<i>Unidentified</i>		Llacaguabeya	
Tolpo	Turpo	Turpo	Turpo	Guascopachua	Chanka
Andaquechua	Belen Anta	Turpo	Turpo	Chuqillapa	
Ococho	Ococho	Huancaray	Huancaray	Ala	
Tiquillo	Tecllo	Huancaray	Huancaray	Quiquimalca	
Magusycamalca	Maucallacta	Cachi	Chullisana	Maqui	
Lachi	Cachi	Cachi	Chullisana	Quequi	
Chilaceni	Chullizana	Cachi	Chullisana	Bilcasana	
Capacalla	CCapcca	Cachi	Chullisana	Sulla	
Cola	Kula	Cachi	Chullisana	Chocollo	
Ayachica		<i>Unidentified</i>		Lastas	
Chiara	Chiara	Chiara	Chiara	Suca	
Paracaya	Parocay*	<i>Unidentified</i>		Guachobilca	
Chacana	Chaccrampa	Chaccrampa	Chaccrampa	Husco	
Loraya	Toraya	Turpo	Turpo	Hasto and Lapa	
Suya		<i>Unidentified</i>		Chngaguasco	
Yanapasco		<i>Unidentified</i>		Curisica	
Chunbihallanga		<i>Unidentified</i>		Guacharondoy- magula	
Guyana	Huayana	Huayana	Guayana	Chuquicamaoca	
Omamarca	Umamarca	Umamarca	Unamarca	Sibopaucar	Son Orejones
Bilcabamba	Vilcabamba*	<i>Unidentified</i>		Calbacuri and Sevinda	Chanka
Alcaracay		<i>Unidentified</i>		Moygua	Es Orejon
Yatubi		<i>Unidentified</i>		Toca	Chanka
Chua		<i>Unidentified</i>		Aocasibi	Es Orejon
Aymaras	“Mitmakuna”	Aymaraes	Aymaraes	Guachaca	Aymaraes
Mayamarca	Mayamarca*	<i>Unidentified</i>		Chauca	Yauyo
Cahbibanba [Sallauparco]		<i>Unidentified</i>		Horcoguaranga	Es Tucuyrico Orejon

Guancabamba	Huancabamba	Andahuaylas	Andahuaylas	Chuquilanqui and Cubilica	Guanca and Yauyo
Quebincha	Huinchos	Andahuaylas	Andahuaylas	Guamancagua	Chanka
Yanaca		<i>Unidentified</i>		Guaraca	Son Changas
Sondor	Sondor	Pacucha	San Geronimo	Guascarquiguar	Mamaconas and Yungas de Limatambo; Collasuyu

* = Possible (early) modern name, but toponym not geographically located

By the time the *Encomienda* was written in 1539, Andahuaylas was home to a plurality of cultural and social categories like the *Orejones* (Inca nobility), Incas, Yungas (lowlanders), Yauyos, Chachapoyas, Aymarayes, and a few resistant Quichua enclaves. This diversity is probably the result of a well documented Inca economic and political strategy of forced resettlement (*mitma*) and corvee labor (*mit'a*) (Rowe 1957).

Just as foreign groups were being resettled in Andahuaylas, pockets of Chanka *mit'a* and *mitma* laborers could be found in locales as diverse as Andahuaylilas in Cuzco, Lucanas in Ayacucho, in the quicksilver mines of Huancavelica, and possibly Lamas, in northeastern Peru (see Cook 1981:227; Cobó 1983; Monzon 1881). Other towns in the *Encomienda* are clearly communities established and/or governed by the Inca (see Wernke 2006). Three towns are led by *Orejones* and another town is populated by *mitmakuna* from Aymaraes, a province just southeast of Andahuaylas. The areas of Mayamarca and Chabibanba (still unidentified) are led by a Yauyo (and ethnic group from the central coast) and a Tucuyrico, an Inca captain and administrator, respectively.

In sum, the *Encomienda* sheds some light on the pluricultural nature of Andahuaylas in the years after conquest. Although it clearly reflects migratory practices that were likely instituted as part of Inca imperial policies, pre-Incan cultural groupings

may also be inferred. This is especially true given areas that many communities appear to have maintained their pre-Incaic Chanka (or Quichua) identities.



Fig. 2.2 Sites in the present study.

***Ayllus* and Ethnicity**

Documentary evidence strongly indicates that the *ayllu* system was the primary form of Chanka and Quichua social organization. *Ayllus* are malleable, nested, scalar social units which have been variously described as collectives of individuals joined by real and imagined kinship (Salomon 1995; Isbell 1997), people who share a common origin place (*pacarina*) and ancestor (Urton 1999), and corporate groups that maintain rights to communal landholdings (Cunow 1929). Crucially, kinship and kin obligations

are important organizing principles in *ayllus*. *Ayllus* can contain exogamous kindred, where boys of one *ayllu* marry girls of another *ayllu* (Betanzos 2004), but *ayllus* may also exist as endogamous bilateral or patrilineal descent groups (Rowe 1945). Like Betanzos, Skar (1982) views the *ayllu* as an asymmetric affinal alliance system of wife givers and wife receivers (and their *compadres* and families). Essentially factions, *ayllus* need a leader (Isbell 1985), but few institutionalized positions exist. To compensate, people attain power and prestige through activities like the cargo system or by being an exceptional fighter. However, to execute leadership responsibilities effectively, “big men” (Skar 1982:169) have to rely on the support of their allied kin, affines, and *compadres*. In this sense, the size of *ayllu* depends on how many people a leader can mobilize.

Spatially, *ayllu* can mean residential sector, village, district, or region (see Wernke 2006). *Ayllus* can be organized along stacked, vertical ecological niches (throughout steep terrain), or horizontally (e.g., along a valley system) (Murra 1972). In Andahuaylas, boundaries between paired *ayllus* followed the natural and social topography. Frontiers were demarcated by rivers, *huayccos* (streams), *puquios* (springs), roads, caves, *chullpas* (tombs), and mountain peaks (Hostnig et al. 2007 [1612]).

On a scalar level, the minimal *ayllu* is composed of the *wasifamilia*, household corporate units that share work obligations and whose organization is expressed in relation to other groups. On the other hand, maximal *ayllus* may represent moieties in a single village, several villages, or an entire region or cultural group. Regardless of scale, *ayllus* are nested, and consist of people classed together and recruited on diverse principles of conceptualized opposition to other groups (Skar 1982:169). With *ayllus*,

“there can be no high segment without a low segment [and] awareness of the other half creates a consciousness of one’s individual position in society” (Skar 1982:192). Thus, two moieties of a village are only an *ayllu* when confronting another village.

Archaeologically, nested, dual *ayllu* organization may have existed in Andahuaylas as early as the LIP. Kellett (2010) has convincingly argued that hilltop communities are economically integrative facilities, where labor pooling was based on shared occupational activities of herding, and agriculture, creating bi-ethnic socio-settlements (Kellett 2010:14-16;196-7). Genetic bio-affinity data also appears to confirm endogamous bipartite moiety organization (see Chapter 9). Because constructing settlements in spatially restrictive areas limited population size and growth and architectural expansion, larger sites in Andahuaylas “budded off” into small hilltop communities in order to accommodate increasing aggregation and population growth (Kellett 2010:288-90). A similar pattern is reflected in LIP mortuary contexts (see Chapter 5).

A Note on Terminology: Lineage, Ayllu, Ethnicity and Cultural Affiliation

Conceptually, *ayllu* is distinct from ethnicity and cultural affiliation. In this dissertation, *cultural affiliation* refers to macro-group identity: Chanka, Quichua and Inca, whereas *ethnicity* will refer to a supra-*ayllu* identity that is neither scalar, nor nested. Here, ethnicity is a more-or-less immutable social category that is assigned before birth, and inscribed on the body soon after. This social category was most likely reckoned through unilineal kinship, a practice that was shared by, but varied within different *lineages*, ancestor-focused extended descent groups (see Chapter 7).

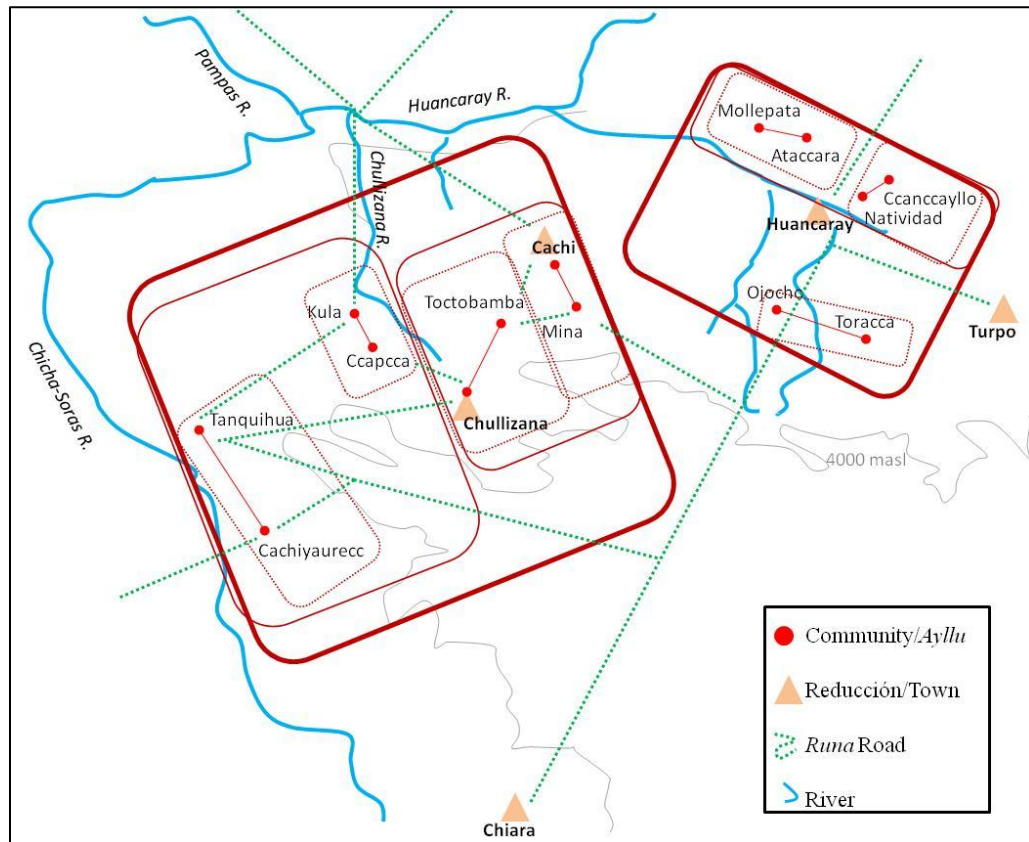


Figure 2.3. Scalar nature of *ayllus* in study region following ethno- and oral history. Paired settlements are connected by dots and lines. Sites come together to form increasingly expansive *ayllus* (higher level = thicker boxed outline).

***Ayllus* and Violence**

As complementary entities, whenever parts of an *ayllu* or different *ayllus* come together, violence is always a possible outgrowth of interaction. Skar's (1982:160) ethnographic research suggests inter-village raiding for cattle and women contributed to high rates of violence in contemporary Andahuaylas; as much as a third of crop is stolen in any given year. Informants relate that "people were killed in these confrontations and...villages' livestock was severely depleted...That part of the flock that the robbers'

couldn't carry with them was rendered useless... The robbers would cut up all the remaining sheep and urinate on the carcasses" (Skar 1982:226). Retribution for these acts was swift. Skar himself witnessed a case where a cattle rustler was caught and killed by being made to eat poison, with the approval of the headman (*Varaoq*), whose other responsibilities included settling disputes and meting out punishments—both physical and punitive.

Violence between competing *ayllus* and moieties has also been observed in contemporary Andahuaylas. In these cases, conflicts stem from inherent inequalities in the *ayllu* system. These inequalities are manifested through access to resources like water sources, agricultural fields, or prime grazing areas. For instance, Skar (1988:150) noted that villagers in upper moiety Matapuquio (in east-central Andahuaylas) have access to ten *puquios*, while the lower moiety has access to only five. Those with more political power or closer to *huayccos* and *puquios* tend to get more water, while those with less power, or those who live farther away, receive less. The consequences of these inequalities can be a matter of life or death. Households that have to rely primarily on rainfall to water crops and feed animals can be devastated in times of drought. Thus, when times are lean, water and field access is a potent catalyst for violent confrontation.

Parts of an *ayllu* or different *ayllus* come together in conflict during periodic or internecine events. These encounters, called *takanakuy*, still occur during festivals and funerals (see Bastien 1973) and likely have prehispanic antecedents (see Tung 2012; Andrushko 2007). In Andahuaylas, these engagements are often lethal. The location where conflict takes place depends on whether antagonisms emerge between communities or within communities. In Andahuaylas, intra-village fights occurs where the two *acequias*

(canals) for moieties meet (Skar 1982:192), while inter-village fighting takes place up in the *puna*, between the villages. As Skar (1982:192) reports:

Taking careful aim at each other's legs, [fighters] would take turns whipping their opponents as hard as they could, sometimes crippling each other for life. The winners of such fights were extremely popular among the women and were also held in high esteem among the men. The Copisa fighters all fought as representatives of their villages and aided each other as large scale fighting between highland and lowland villages broke out.

Intra-community violence was also highly structured, with most conflict taking place during the Day of the Dead, on November 1st.

During this *fiesta* people gathered first in their core *ayllu* and finally converged on the cemetery. As they danced and poured libations on the graves of the deceased of the past years, ritual fighting broke out in which stones were thrown and slingshots used. The lines of conflict were moiety-based and...were an expression of moiety antagonism.

To summarize, both ethnographic and ethnohistoric accounts strongly support the existence of the *ayllu* as the primary unit of social organization in post-imperial, late prehispanic Andahuaylas. By the early Colonial Period, Andahuaylas was home to a plethora of cultural groups. Chroniclers highlight that violence was endemic, and was often mediated by cultural or ethnic distinctions. Finally, legal documents support the assertion the Chanka and the Quichua were cultural groups autochthonous to Andahuaylas, whose identities appear to have only coalesced in the aftermath of Wari collapse.

Conclusion: Andahuaylas During Imperial and Post-Imperial Eras

Data from previous archaeological studies as well as a rich, emerging historical record paint an intriguing portrait of Andahuaylas during the Wari and Chanka (post-Wari) eras. After ca. AD 700, during Middle Horizon Epoch 2, small Wari installations expanded into the steep slopes and high-altitude grasslands in Andahuaylas. Local Qasawirka sites were abandoned as Wari transformed the landscape through innovative terrace architecture, sophisticated hydraulic management, intensified camelid breeding and herding, and mineral extraction; (Bauer and Kellett 2010; Meddens and Branch 2010; Gomez, n.d.). Changes in settlement patterns, architectural configurations, and ceramic style indicate that Wari was variably invested in the region, employing a strategy of indirect and direct statecraft. Somewhat unique to contemporaneous regions (Tung 2012), Wari's incursion in Andahuaylas was not violent, nor was violence an outgrowth of Wari's investment in the region. Nestled within a network of regional capitals, major Wari imperial highways crisscrossed Andahuaylas, and the stability of the region would have been crucial to ensure continued local production as well as the unimpeded flow of ideas, goods, and people throughout the state.

Between the 10th and 11th centuries AD, Wari disintegrated. Although the precise timing, order, and causes of Wari fragmentation remain unknown, Wari's withdrawal from Andahuaylas is concomitant with dramatic changes in cultural assemblages and settlement patterns, which point to shifting power relations and even turmoil among different post-imperial groups. Traditionally, this tumult has been attributed to climate changes. Worsening environmental conditions, including drought and frequent frosts, would have spurred population relocations and reduced the amount of

available land for grazing and planting, prompting competition and conflict. Yet although the Late Intermediate Period in Andahuaylas was more arid than the preceding Middle Horizon (the time of the Wari Empire), paleoclimatological data indicate the most intense period of drought occurred well over two centuries after Wari's decline (Hilyear et al. 2009; Valencia et al. 2010). These data suggest that striking changes in early LIP lifeways may be structured by the reverberations caused by Wari's disappearance in Andahuaylas rather than by macro-climatic fluctuations.

The documentary record also refers to tumult among post-imperial populations in Andahuaylas. The most infamous of these groups, the Chanka, appear to have engaged in frequent violent conflict with other cultural groups, including the Quichua and the Inca. Although accounts of the Chanka written by Spanish and Mestizo chroniclers have little basis in the extant archaeological record, procedural documents from Andahuaylas indicate that many communities maintained their Chanka (or Quichua) cultural affiliations despite later Inca and Spanish *mit'a* and *mitmaq* population relocation and labor policies. Despite ethnic and cultural diversity, Andahuaylan groups were organized along a dual, nested *ayllu* system, which seems to have fully developed in the Late Intermediate Period.

In order to better understand how different post-imperial populations in Andahuaylas responded to Wari imperial collapse, this study investigated human remains from four sites and one museum collection:

- 1) Turpo, a Middle Horizon tomb;
- 2) The Natividad Museum Collection of crania from LIP Chanka caves in Turpo;
- 3) Cachi, an upper moiety LIP Chanka community;

- 4) Ranracancha, a lower moiety LIP Chanka community, and
- 5) Pucullu, an LIP Quichua enclave community.

The following chapter introduces testable hypotheses used to evaluate the bio-cultural impacts of Wari collapse in Andahuaylas.

CHAPTER III

THE BIO-CULTURAL IMPACTS OF COLLAPSE

Introduction

Archaeological inquiry has recently focused on understanding what state collapse practically entails and why it occurs (Tainter 1988; Schwartz and Nichols 2006; McAnany and Yoffee 2010). State fragmentation has historically been attributed to a host of factors, from invading hordes, to bacchanalian decadence and mismanagement, to environmental calamity, or even the wrath of an unforgiving deity (see Tainter 1988). Yes despite intriguing avenues of inquiry by anthropologists, sociologists, and political scientists on predicting why or anticipating when an empire may collapse or a state may “fail,” an important question remains: how might state collapse restructure local populations?

This chapter evaluates how societies may regenerate in the aftermath of state collapse. The research introduces bioarchaeological correlates, which can be used to determine how individuals, sub-population groups, and entire regions may have been variably impacted by Wari fragmentation. Subsequent sections present testable hypotheses related to five domains that tend to be dramatically restructured in post-imperial eras: 1) social structure and mortuary practices; 2) violence; 3) ethnicity; 4) technical innovation; and 5) mobility and inequality.

Collapse and Post-Imperial Regeneration

Collapse is not a finite apocalyptic event, but rather a process of social and political reorganization. When an empire collapses, people still exist, and underlying institutions may survive and stabilize at lower levels of differentiation (Nichols and Weber 2006:38; Eisenstadt 1964:378-79). As communities become unburdened from tribute requirements, people unpend from state-related labor commitments (Morris 2006). Provinces are restructured, reorganized, and recuperated, and “traditional ways of life may strengthen or reemerge to provide security and a foundation on which to build a new political system” (Conlee 2006:100).

In post-imperial eras, newly crafted political systems tend to consist of leaders who maintained power accrued during the imperial era, as well as those emerging elites who take advantage of the situation to consolidate power and legitimize authority. For instance, after Wari collapse in Nazca, rituals closely associated with the former empire were abandoned (Conlee 2006:109). Subsequently, a new power structure afforded individuals from different swaths of society to consolidate political power (Conlee 2006). Post-imperial intra-site differences indicated increasing inequality, and a greater number of elites (Conlee 2006:112). However, non-elite behaviors were also altered as new forms of socio-political organization were developed.

Even so, the cultural tropes from previously existing states can limit the range of responses available when post-imperial populations are confronted with new or reemerging circumstances or challenges. In some cases, like in Moquegua, in southern Peru, state incursion inhibited the political and economic expansion of local post-imperial groups (Sims 2006). When Wari and Tiwanaku retreated from the province, overarching

administration disappeared, leaving unemployed middle-managers behind without state direction and oversight, as well as local elites ill-equipped for statecraft and administration (Sims 2006:120). The lack of reemerging centralization in Andahuaylas suggests a similar scenario might have been taking place there as well.

Socially, post-imperial regeneration often specifically relies on the “widespread acquisition of power by a newly significant ethnic group,” and the use of “real or feigned-but nonetheless vital-ethnic affiliations” (Nichols and Weber 2006:41). In Andahuaylas, Wari’s collapse may have facilitated the development of factions and novel ethnic groups. During the early LIP, leaders of these factions may have accumulated and maintained power through tactics like controlling mineral extraction, engaging in communal and exclusive rituals involving dead ancestors, and probably warfare.

Although collapse is viewed as an inherently volatile process, the actual degree of post-collapse instability in a region will vary depending on how it articulated with the former state, and what local people thought of external control (Kolata 2006; Schwartz 2006:14). In Andahuaylas, Wari largely managed the province without direct administration (a case of what Kolata [2006:215] calls “hegemony without sovereignty”). Archaeological evidence suggests that imperial control was applied through the tactical use of force and/or coercion, as well as conspicuous demonstrations of cultural superiority. Even if Wari administrators were sequestered in walled outposts far away, and even if interactions were prosaic or periodic, local Andahuaylans likely became complicit in their own subjugation; foreign ideals became embedded in local thought and practice, transforming interpersonal relationships and senses of individual and group identity. This process produced Warified Andahuaylans who were “strategic subjects, not

committed citizens” (Kolata 2006:215). Because the apparent nature of Wari’s presence in Andahuaylas was an extractive relationship, and not an integrative relationship, the fissures of collapse likely generated “new institutions, new social practices, and...new forms of historical consciousness” (Kolata 2006:219), in several domains of post-imperial Andahuaylan lifeways.

The Bio-cultural Impacts of Collapse

Imperial collapse is composed of a series of transformative socio-political, economic, ideological, and cultural processes, which can impact local populations biologically and leave permanent morphological changes on bone. Using the human skeletonized body (primarily the cranium) as the primary unit of analysis, the following sections detail how imperial collapse not only causes major transformations in how people represent, and interact with one another, but also evaluates how collapse subtly impacts the more “mundane activities of daily life” (Tung 2012:3). Five domains— aspects of human lifeways—are evaluated: 1) social structure and mortuary practices; 2) violence; 3) ethnic identity; 4) technical innovation; and 5) mobility and inequality. The possible bio-cultural impacts of each domain are hypothesized based on previous scholarship, and the material, osteological, and bio-geochemical correlates for each outcome are presented.

1) Mortuary Practices and Social Structure

Mortuary contexts are often structured by the beliefs and practices the living have about death and the dead (Chesson 2001; Carr 1995; Dillehay 1995; Metcalf and Huntington 1991). In cases of state collapse, mortuary beliefs based on imperial ideologies tend to disintegrate as peoples' beliefs about life and death are fundamentally altered (Schiller 2001). Consequently, mortuary culture may be dramatically transformed. In Andahuaylas, tomb styles, skeletal demographic profiles, and artifact assemblages from the Middle Horizon and the Late Intermediate Period are expected to be distinct.

One type of tomb, called a *machay*, is a small, anthropogenic cave hewn into natural bedrock, and is the contextual focus of this study. Practically, *machays* were created to collectively store human remains, but because caves are often looted, few researchers have been able to determine the basis of burial collectivity (but see Baca et al. 2012). To date, most of our knowledge concerning the demographic and social composition of burial caves comes by way of ethnohistory and the work of funerary archaeologists (Dillehay 1995; Salomon 1995; Cieza 1996; Rossi 2002; Doyle 1988; Duviols 1986; Parsinnen 1993; Hyslop 1977; Mantha 2009).

At its most fundamental level, *machays* contained dead, decaying bodies and there is some evidence burial caves were used to opportunistically and indiscriminately dispose of corpses, which are known to be polluting (Harris 1982:54). Chroniclers detail accounts of hurried, haphazard disposal. Montesinos ([1642] 1920:xxii), for instance, relates that the Chanka war dead, and those who died from "plague" that emerged from the dead, had to be properly disposed of in sepulchers.

If *machays* are being used as plague-ridden mass graves, we may expect a large number of war casualties (young adult males) or massacred individuals (wounded individuals of all ages) with evidence of animal gnawing and scavenging (evidence they were left out in the open) (Wiley and Emerson 1993) to be unceremoniously and haphazardly deposited in caves. Few grave goods would be expected, and there would be no evidence of post-depositional feasting or offerings.

However, given the evidence from Andahuaylas and other areas of the highland Andes, alternative hypotheses are also needed to explain the basis of cave collectivity. Most scholars contend that the bones in *machays* represent dead apical (first-buried) ancestors (see Dillehay 1995; Salomon 1995; Doyle 1988; Duviols 1986). These mummies, termed *mallquis*, were recognized, remembered, and venerated by descendants. If *machays* in Andahuaylas were used only to inhume founding ancestors (“elites”), we would expect caves to be filled with apical ancestors like the mytho-historic Chanka progenitor Uskowillka. In other words, caves should contain the remains of older adult males (and possibly their wives). Sexually immature juveniles would not be present, since they cannot leave descendants, and under this model could not be elite founders of *ayllus*. Archaeologically, sumptuary grave goods and evidence of frequent feasting would be expected as well.

Alternatively, or perhaps more specifically, lineage (probably patrilineage) is hypothesized to be the most likely basis for *machay* collectivity in LIP Andahuaylas. Colonial extirpation testimony relates that different descent lines (lineages) from the same *ayllu* were interred in caves that budded off from one another (Duviols 1986; Doyle

1988). It also appears that direct descendants had detailed knowledge of patrilineal lineages and their corresponding caves (Cobo [1653] 1983).

More recently, mtDNA, Y-STR, and autosomal STR analysis has been employed to elucidate uniparental and biparental kinship among late prehistoric *chullpa* (above-ground sepulcher) skeletons from late prehispanic Arequipa (Baca et al. 2012). Baca and colleagues' (2012) MtDNA and microsatellite autosomal data results indicated that skeletons buried within a single *chullpa* were more closely related to one another than those buried in different *chullpas*, a sign that burial collectivity was structured to some extent by biological kinship (extended family groupings). In one *chullpa*, Y-chromosome microsatellite data revealed that all male skeletons were kindred, while relatedness coefficients demonstrated that these male kindred likely derived from different generations. However, in another *chullpa*, genetic data revealed that two individuals had different fathers but the same mother, and two other individuals had the same father but different mothers. Similarly intriguing, mtDNA evidence collected from Wari-era skeletons at Conchopata (Ayacucho) revealed that females in those tombs belonged to different haplogroups. These results suggest that some of the tombs were not based on matrilineal clusters (Tung 2012). Thus, although the rules for *machay* belonging appear to be based on patrilineage, socially idealized internment patterns appear to have been complicated by the realities of procreation.

Despite the absence of aDNA data from Andahuaylas, other bioarchaeological correlates may be used to determine if inclusion in a particular *machay* is indeed based on rules of cognatic descent. If patrilineal lineages are the basis of *machay* collectivity, then apical individuals should be surrounded by their descendants. As such, we would expect

males, females, and juveniles of all ages, and from “all walks of life” (that is, injured, uninjured, those with and without modification) to be buried together.

Table 3.1. Hypotheses on *machay* use

<u>Hypothesis</u>	<u>Expectations</u>	
	Bioarchaeological Correlates	Archaeological Correlates
<i>Machays</i> are used for haphazard secondary corpse disposal	No articulated individuals, evidence of significant animal scavenging	No evidence of feasting or grave goods
<i>Machays</i> are used to bury founding ancestors	Only articulated older adult males and females	Evidence of feasting and offerings
<i>Machays</i> are used to inhumate lineages	Caves include males and females and juveniles from all walks of life	Evidence of feasting, offerings and assorted, personal “heirloom” grave goods

2) Increasing Violence

Following the work of other anthropologists (Kelly 2000), this dissertation defines “violence” as an action characterized by the fact that participants employ deadly weapons⁹ with deadly force. The injury or deaths of other people are envisioned in advance, and this anticipation is encoded in the purposeful act of taking up lethal weapons.

Post-imperial societies often witness increasing conflict (Tainter 1988; Yoffee 2005; Covey 2008; Chase-Dunn and Taylor 1994). Violence may be persistent or recurring, and range in scale from domestic abuse, to small-scale scuffles, to raids and other acts of warfare (Arkush and Stanish 2005; Nielsen and Walker 2009; Brubaker and Laitin 1998; Tung 2008a). Proximate explanations for this trend include material poverty

⁹ This can be a physical weapon, like a club, or clenched fists.

(Torres Rouff and Costa Junquiera 2006), resource scarcity (Frye and de la Vega 2005; Arkush 2009), increased reliance on pastoralism (Kellett 2010), population migrations (see Bamforth 1994), and general socio-political instability (Cahill 2010). This study hypothesizes that Wari's imperial retraction from Andahuaylas caused a political vacuum, which transformed local inter-group relationships; these relationships were antagonistic and consequently involved physical violence.

There are strong indicators that Wari's collapse was an underlying catalyst for violence (Tainter 1988; LaLone 2000) at the end of the Middle Horizon. For instance, in the Wari imperial core, skull fractures increased from 24% to 70% after Wari collapse (Tung 2008a). This general frequency increase from the MH to LIP is also present among Wari-affiliated populations in the Cusco region (Andrushko 2007). At roughly the same time as Wari's disappearance, the Tiwanaku state, centered on the Bolivian altiplano, was also disintegrating (ca. AD 1100). In San Pedro de Atacama, an oasis located on the fringes of the former state, cranial fracture rates peaked at over 35% during the LIP (Torres Rouff and Costa Junquiera 2006).

These studies have shown that regions emerging from state collapse were plagued with resource scarcity, political instability, physical hardship, and violence. If the same processes were at work in Andahuaylas, then we would expect an increase in trauma between the MH and LIP. Moreover, if violence is indeed an outgrowth of Wari fragmentation, then the highest frequency of traumatic injury should occur during the early LIP (ca. AD 1000–1250). Conversely, if climate changes are the underlying cause of increased violence in Andahuaylas, then trauma rates should be highest during the later

LIP (after ca. 1250), during an era of intense drought in the region (Hilyer et al. 2009; Valencia et al. 2010).

Table 3.2. Hypotheses on traumatic injury

<u>Hypothesis</u>	<u>Expectations</u>
Wari collapse did not lead to conflict and violence	Cranial trauma frequencies do not increase significantly between the MH and early LIP
Wari collapse led to increasing violence	Cranial trauma frequencies increase significantly between the MH and early LIP
Environmental changes led to increasing violence	Cranial trauma frequencies only increase significantly during the late LIP (after ca. AD 1250)

The Demographic Impacts of Violence

Physical violence does more than injure an individual. The reverberations of state collapse and ensuing conflict can also impact the demographic profiles of subsequent populations; when adults of reproductive age are killed or displaced, future generations cease to exist. Nevertheless, violence may not be experienced equally by all members of society.

In cases of natural or social disasters or “catastrophes” like wars, flood, genocide, earthquakes, and famine, older juveniles and young adults may flee affected areas (Margerison and Knüsel 2002), fertility rates may decrease and infant mortality rates may increase (Jackes and Meiklejohn 2008:239; Wood et al. 1992). As stressed populations struggle to access resources crucial to maintain healthy mothers and babies, indirect factors like poor health conditions caused by insufficient water supplies, sewage problems, a lack of health services and professionals, and population displacement may also contribute to premature death in a population (Burnham et al. 2006).

However, more so than ailing health, excess mortality (premature death) following state collapse usually occurs on account of direct factors like increasing conflict (Depootere et al. 2004). For example, after the 2003 disintegration of Iraq's socio-political system, monitors observed significant increases in excess mortality due to violence that targeted adolescent to middle-aged men (Burnham et al. 2006). Despite the collapse of infrastructure and resource scarcity, there was no significant increase in non-violent deaths in post-collapse Iraq. The pattern in Iraq is not unique in post-collapse communities. Cross-culturally, when violence is the main catalyst for excess mortality, the highest rates of death tend to generally occur among adults in their prime (De Walque 2006:355, 358). While victims tend to be males, mortality may also be concentrated in certain social groups. For instance, in Khmer Rouge-era Cambodia (1975–1979), the social group most likely to experience excess mortality were well-educated, urban adults (*ibid.*:365). Similarly, Taylor (2010, 1999:42) noted that during the 1994 genocide in Rwanda, Tutsi women in their prime were killed in numbers equal to, if not exceeding those of men. Instead of being perceived as innocent non-combatants, Tutsi women were deliberately targeted for genocidal violence. In Andahuaylas, Wari collapse is hypothesized to have instigated violence which led to significant increases in trauma-induced excess mortality for late teens and adults in their prime (~16–45 years old); individuals in those age categories are expected to have the highest frequency of lethal peri-mortem trauma.

Post-Imperial Ethnocide

Aside from significant increases in violence in general, cross-cultural ethnographic studies suggest that state collapse can create social repercussions such that particular segments of a population are specifically targeted and thus disproportionately predisposed to becoming victims of violence (see Brubaker and Laitin 1998, Hinton 2002, Gould 1999, Boskovic 2005, Talbot 1995). Despite the great diversity of political, religious, economic, linguistic and other social affiliations in the modern world, conflict mediated by ethnic identity is still the most prevalent form of armed conflict experienced (Toft 2003:5). Such may have been the case in the pre-modern past as well.

Why does ethnic identity spur and structure violence? Previous studies suggest that violent attacks made along ethnic lines cause rapid and extreme ethnic polarization in society (Laitin 1995; Kaufmann 1996; Mueller 2000; Fearon and Laitin 2000). Moreover, antagonisms between ethnic groups may turn violent more often than groups organized along political or ideological lines because ethnic group members may conceive of each other metaphorically in terms of kinship, heightening emotions and sensitizing members to external (and/or existential) threats (Horowitz 1985). In these circumstances, lethal violence is conceived as a reasonable and justified reaction.

In ethnographic contexts, killing or causing serious bodily harm to members of a group based on recognition of their identity is considered ethnocide, or more generally, genocide (cf. United Nations Article II, 1948 on Genocide). This identity may be based on perceived ethnic (Lemarchand 1994, Waïttayapak 2002), religious (Seul 1999), socio-cultural (Bhavnani 2006), economic (Besançon 2005, Sen 2008) or political (Mann 2005) affiliation.

Widespread, sustained, and lethal ethnocidal violence likely existed prior to the formation of modern nation-states, and likely existed independent of ancient empires (Potter and Chiupka 2010). Yet models that suggest ethnocidal actions have not typically been applied to ancient societies. Rather, ethnocide tends to be viewed as consequences of expanding empires (Ferguson 1992). Generally, incidences of mass killings in prehistory are interpreted as the result of warfare between politically organized groups (Erdal 2006; Steadman 2008), massacres (Erdal 2010; Frayer 1997; Smith 2003; Novak 1999; Slaus 2010; Liston and Baker 1996; Milner et al. 1991), or killing sprees (Wiley and Emerson 1993; Tung 2008) linked to resource scarcity or other aggravating socio-political factors. In other instances, systematic, mass killings are defined in a ritual context as sacrifices (Benson and Cook 2001; Verano 2007) or as the sanctioned executions of undesirables like witches (Darling 1999; Santos-Granero 2004) or war captives (Verano 1986, 2007).

Yet, ethnocidal violence may be a more accurate way of understanding the motivation and interpreting the meaning behind acts of asymmetric physical aggression in post-imperial contexts. Catalyzed by the breakdown of Wari imperial control, ethnocidal violence may have been a strategic mechanism used to gain access over resources, build allegiances with like-minded members, completely eliminate rivals, and legitimize dominant authority and beliefs (Fearon and Laitin 1996; Gould 1999; Bhavani and Backer 2000).

Ethnohistoric accounts suggest that the Chanka were a newly emergent, populous, bellicose, ranked (*ayllu*-based), and likely segmentary (lineage-based) post-collapse society that, considering previous cross-cultural examples, could have employed

ethnocidal violence as a tactic of terror in the ancient past (see Chapter 2). In other words, Chanka society may have existed in a social milieu where this type of violence was deemed culturally appropriate (at least, by the assailants). If ethnocide indeed impacted Chanka communities, then trauma rates are expected to be significantly higher among those males, females, and juveniles whose ethnic identity was prominently and permanently inscribed on the body (e.g., using cranial modification).

In contrast, the contemporaneous Quichua subsisted as a small enclave community within a sea of large Chanka settlements. In contemporary situations of pervasive violence, like war or genocide, the formation of homogeneous cultural enclaves of minority groups is common, because they are easier to defend (Kaufmann 1996). Nevertheless, these residential “island” communities are still under the constant threat of isolation, raids, or sieges. Thus, this study hypothesizes that violence (determined through analysis of cranial fracture patterns correlated with age and sex) will be significantly distinct between Chanka and Quichua groups. Raids may have plagued the Quichua enclave, while ethnocide was a distinct possibility at the Chanka sites.

Table 3.3. Hypotheses on violence

<u>Hypothesis</u>	<u>Expectations</u>
Violence was enacted indiscriminately against populations in Andahuaylas	Cranial trauma frequencies are not correlated with age, sex, cultural affiliation or cranial modification
Violence was experienced differently within cultural groups	Cranial trauma frequencies and patterning are significantly different at Chanka and Quichua sites
Violence was enacted against specific ethnic groups	Cranial trauma is correlated with newly emphasized, prominent markers of ethnic identity (cranial modification)

3) Ethnogenesis

State collapse can spur the genesis of novel ethnic groups. Several scholars (Fearon 2005; Horowitz 1985; Bates 1983; Reycraft 2005:5) have all noted how ethnic groups and the practices that reproduce ethnic boundaries may be created or reformulated “in response to changed political boundaries” (Fearon 2005:4), as exemplified in cases of state collapse. This process of dramatic restructuring can be considered ethnogenesis. Ethnogenesis can be operationalized through the sudden and widespread appearance of novel traditions, which come to prominence as social boundary markers.

If ethnogenesis is the process by which novel ethnic identities are formed, then this begs an important question: what constitutes and structures ethnic identity in the first place?

Members of “prototypical” (Fearon 2005) ethnic groups trace their descent from a common ancestor and share a common language, religion, customs, a sense of a common homeland, and relatively dense social networks. However, these features do not have to be present, nor shared by all group members to define an ethnic group. For instance, the Roma do not claim a common homeland, Jews speak multiple first languages, and different Somali clans have indistinguishable cultural practices (Fearon 2003). Yet all these groups may be considered as “ethnic groups,” by both group members, as well as outsiders. Ethnic groups are thus self-conscious entities that exist in the minds of those who self-identify as members of that group (Anderson 1983). Ethnicity can become socially relevant when those distinctions are acknowledged, tacitly or implicitly, as people go about their day-to-day lives.

Ethnic groups cannot be defined by trait lists of cultural characteristics or perceived physiological traits. Rather, as Barth (1969:15) notes, “The ethnic boundary...defines the group, not the cultural stuff that encloses it.” These ethnic “boundaries” are patterns of social practice and interaction that give rise to, and subsequently reinforce, in-group members’ self-identification and outsiders’ confirmation of group distinctions (Sanders 2002:327). Practically, ethnic groups may draw contrasts along lines of material culture, geographic origin, language, religious beliefs, body modification practices, or dietary customs.

Nevertheless, because ethnicity is generally reckoned by descent and further ascribed soon after birth, it is largely unchangeable over one’s lifetime. In cases where ethnic groups are distinguished by permanent somatic features (skin color, eye color, even modified head shape, etc.), the cost of switching or attempting to pass between ethnic groups may be quite high, if not impossible (Caselli and Coleman 2002). So, although suites of shared cultural attributes often distinguish ethnic groups, these are not the constitutive units of ethnic identity, but rather the contingent ones.

Contrasts drawn between ethnic groups are not just a matter of biology; rather they are historically and politically contingent and embedded conventions. As boundary-markers, salient attributes emerge depending on where and how counter-positioning concatenates between groups. These articulations are themselves a consequence of the socio-historical and political context in which these interactions take place. Because of this, ethnic identity always must be reaffirmed throughout generations. Yet, although the material and social content which shapes ethnic identity is culturally constructed and changes over time, ethnicity is perceived as immutable (Torres Rouff 2002, 2007; Torres

Rouff and Costa 2006; see Barth 1969). In order for componential categories to become naturalized, intentionally visible boundary-marking practices are needed to maintain group identity over long periods of time (Barth 1969, Lim et al. 2007, Blom 2005; Wobst 1977).

In eras following the collapse of a state, ethnicity can also become politically relevant. Because passing between ethnic groups can be difficult, ethnicity forms a solid basis for forming coalitions. The largely intractable nature of ethnicity within a generation makes mobilization (the rousing of fellow members) and conflict a distinct possibility.

Ethnic groups are thus instrumental and situational coalitions that naturally form for a couple of reasons. First, it is easier to mobilize members that speak the same language and enact the same cultural practices, drawing on salient themes of common descent (kinship) and affiliation. Second, ethnic territories tend to encompass resources shared by a group of people. Agricultural terraces, large canals, irrigation systems and roads tend to be used and maintained by social groups that share both the responsibilities as well as the benefits of such resources (Fearon 2003). Thus, novel ethnic groups may form as situational, yet politically valent collectives, which draw on shared histories to enact common cultural practices as a means of reifying salient inter-group distinctions.

In eras following state collapse, ethnic violence and the (re)creation of ethnic identity form a recursive, often symbiotic relationship. When administrative, hierarchical, and occupational divisions in a non-contiguous, multi-ethnic empire (like Wari) crumble, instability often ensues and violence may erupt. If that violence is mediated along “immutable” ethnic lines, then the collective identity of both the assailants and victims

are newly cast in relationship to these reformed social and physical interactions (see de Waal 1994:3).

Because ethnicity is fluid, situational, and dynamic over generations, it has traditionally been difficult to assign bounded ethnic groups based on assemblages of material artifacts (Jones 1997). Thus, in order to investigate how ethnicity emerges in the bioarchaeological record, key attributes cannot simply be identified with a checklist, but need to be evaluated as correlates that demonstrate “patterns of interactions that link groups” (Sanders 2002:328). Because the body is a congealed record of social and physical interactions, it is a permanent record of intractable indicators of ascribed and achieved ethnic affiliation.

Cranial Modification as Correlate of Ethnogenesis

Because modification is inscribed soon after birth and is retained permanently through the life of an individual, it is a powerful marker of social affiliation and is a tangible signifier of the production of membership as ascribed by others in the group. Given that modification must be reenacted in every generation, its use over time and across space serves as a sensitive litmus test on the conspicuousness of the performance and expression of group difference over time.

Diachronic studies in the Andes show that cranial modification was used during both the emergence and the disintegration of states and empires (Torres-Rouff and Costa Junqueira 2006; Andrushko 2007). In Andahuaylas, there is no unequivocal evidence of modification use during the Middle Horizon, and modification was not practiced by the Wari (Tung 2003). The presence of modified crania in post-imperial mortuary contexts

suggest that this tradition became commonplace in Andahuaylas at some point after Wari’s decline.

In order to operationalize ethnogenesis, and determine whether it is occurring in post-imperial Andahuaylas, we must document evidence that “vestigial” cultural elements are becoming imbricated with new traditions after Wari’s disintegration ca. AD 1000/1050. Among LIP populations, ethnogenesis may be signaled if the same biological population suddenly adopts new boundary-marking cultural practices. In this study, cranial non-metric data are evaluated to inform on biological continuity over time (Chapter 9), while cranial modification implementation is considered proxy for novel social boundary demarcation (Chapter 7). If ethnogenesis is indeed occurring, then it is hypothesized that the use of cranial modification will significantly increase after Wari collapse.

Table 3.4. Hypothesis on ethnogenesis

<u>Hypothesis</u>	<u>Expectation</u>
Ethnic identity is not a significant means for social differentiation	There will be no significant increase in cranial modification frequencies from the MH to early LIP.

Social Rules that Structure Cranial Modification

Cranial modification is a socially ascribed boundary-marking practice amenable to bioarchaeological analysis. Permanent, altered head shape was achieved through the intentional deformation of an infant’s malleable skull using ropes and pads.

Cranial modification is perhaps the most salient corporeal indicator of social identity in the Andes (Cieza de Leon (1984) [1553]; Betanzos (2004) [1557]; Garcilaso de la Vega (1968) [1609–1613]). Studies have consistently demonstrated that cranial

modification in the Andes was employed to demarcate different sectors of the population, including social or ethnic groups (Torres Rouff 2008), occupational classes (Lozada and Buikstra 2002), moiety and residential descent groups (*ayllu* clusters) (Hoshower et al. 1995) and lineage, regional, or local group membership (Blom 2005). In Andahuaylas, all of these groupings could be considered “ethnic” since they all likely maintained similar subsistence and cultural/ritual practices, spoke the same language, wore similar clothing, had similar beliefs and a common sense of history, and claimed descent from a common mytho-historic ancestor. However, modification cannot simultaneously indicate situational, scalar, or nested categories of social affiliation like moiety or *ayllu*, while also denoting fixed lineage and occupation. One of the aims of this dissertation is to correlate cranial modification use with material, osteological, and bio-geochemical signatures in order to discern what specific type of “ethnic” groupings are being signaled by modification.

Although previous research suggests otherwise, cranial modification use and style may neatly correspond with cultural affiliation (macro-*ayllus*). If this was the case, then Chanka people and Quichua people are expected have distinct head shapes.

Modification use may also inform on possible correlations with bounded occupational groups (see Lozada and Buikstra 2002 for discussion of occupational distinctions in late prehispanic *señorios*). For instance, Kellett (2010) has argued that “bi-ethnic” Chanka socio-settlements may have been composed of two groups: pastoralists who worked in the highlands, and agriculturalists who worked in the warm valleys. If ethnicity (cranial modification) is based on occupational or status differences then we would expect those with and without modification to be living at different elevations,

eating different foods (only grown at specific elevations) and drinking water from different sources (one group perhaps drinking from *puquios* in the puna, and another group consuming river water from the valley bottom). These scenerios can be confirmed to some extent through bio-geochemical analysis (see Chapter 9). Osteologically, if modified and unmodified individuals conformed to separate occupational-ethnic groups, then they are not expected to be interred collectively in the same *machay*.

Correspondingly, we would expect grave-good assemblages to have some association with those occupations (Conkey and Hastorf 1990; Lozada and Buikstra 2002).

What other bio-cultural factors might structure “ethnicity” as it relates to cranial modification? It’s probably not sex because previous studies have consistently demonstrated that cranial modification is not structured by skeletal sex in the Andes (Blom 2005; Torres Rouff 2003; Lozada and Buikstra 2002). However, the lack of correlation between skeletal sex and head shape does not mean that gender doesn’t shape practices of modification use. Assuming that *machay* collectivity is structured by patrilineal (and patrilocal) descent, this dissertation hypothesizes that cranial modification implementation and shape is structured by matrilineal descent (Zuidema 1964), and that modified skull presence denotes an immutable kinship category (something like “first-born/primogenitor”) (see Scaletta 1985). In this case, modified and unmodified individuals of all ages are expected to be inhumed collectively and derive from the same (“local”) area, and have similar dietary patterns (both determined using bio-geochemical analyses).

Table 3.5. Hypotheses on ethnicity

<u>Hypothesis</u>	<u>Expectation</u>
Cranial modification correlates with rigidly defined occupational groups	Modified and unmodified groups will be associated with distinct artifact assemblages; they will be buried in separate <i>machays</i> .
Cranial modification correlates with sex, suggesting it is used to distinguish gender, not social identity	The frequency of modification use and modification style (head shape) will be correlated with skeletal sex.
Cranial modification is a marker of Chanka or Quichua cultural affiliation	Modification frequency and style (head shape) will be correlated with cultural affiliation; patterns of modification will be similar within the Chanka sites (Ranracancha, Cachi, and Natividad) but distinct from the Quichua site (Pucullu).
Cranial modification denotes a kinship category reckoned by unilateral (matrilineal) descent	Cranial modification use frequencies and styles are variable within <i>machays</i> across sites. Assuming mortuary patterns are patrilocal, females should show more variability in head shape

4) Trepanation as Technical Innovation

As empires wax and wane, new challenges may arise that require technological innovations. For instance, there is ample evidence which suggests that Wari’s innovative terracing technology was created in response to a severe drought ca. AD 550–650 (Ortloff 2009). Buoyed by high-yield maize varieties (Branch and Meddens 2010), Wari terracing was later exported to conquered regions in order to feed an ever-increasing empire. Aside from technological innovations, Wari’s incursion in provinces like Andahuaylas likely spurred an influx of new ideas, new material “horizons” (Rowe 1945), new raw materials, and new types of people with international identities.

When Wari collapsed, old technology (like terracing) was largely abandoned (Kellett 2010) and new innovations were adopted. This is not surprising. Despite the common perception that state collapse is a time of innovatory stagnation (Diamond 2005), technical advancements are likely to emerge in these eras as people struggle to

cope with novel challenges (Baker and Ausink 1996). State collapse may provoke an influx of new ideas as capable people (specialists) out-migrate from unstable areas back to home provinces (in this case, “brain drain” benefits the provinces to the detriment of the heartland).

From a bioarchaeological perspective, surgery is one such class of invention that is amenable to analysis. Specifically, this dissertation operationalizes cranial trepanation (surgery on the skull) to inform on technical innovation. Brain surgery is not easy, and rates of trepanation implementation, survival, and experimentation give us some insight on how the practice came about, how techniques improved, and what social rules mediated its use on a potential patient.

In this dissertation, trepanation is defined as a surgical procedure involving the intentional piercing and removal of a part of the cranial vault. This medico-cultural practice was likely realized to alleviate pain and intracranial swelling due to traumatic injury, neurological disorders, or other psychosomatic illnesses (Andrushko 2007; Verano 2003). Because trepanation methods directly bear on the survival of a patient, it provides a unique way to test hypotheses related to adoption of avant-garde medico-cultural procedures and informs on novel conceptions of intervention on an unwell body.

Table 3.6. Hypotheses on trepanation

<u>Hypothesis</u>	<u>Expectations</u>
Post-imperial Andahuaylas is a time of technical stagnation	No attempts at experimentation Methods are unstandardized and parochial; each site adopts a single technique
Post-imperial Andahuaylas is a time of innovation and information exchange, as illustrated by trepanation	Experimentation with different methods of trepanation methods are standardized and techniques are widespread at Chanka and Quichua sites

5) Mobility and Inequality

In addition to increasing violence, ethnogenesis, and technical innovations, two other aspects of lifeways may significantly change in the aftermath of collapse: mobility (the movement of people over the landscape) and social inequality. In this study, mobility is inferred from three lines of analysis: cranial non-metrics, strontium isotopes, and oxygen isotopes. In order to gauge inequality, this research evaluates variations in maize consumption within and among sub-population groups (culled from carbon isotope analysis). This data on maize access is then correlated with the presence of pathological cranial lesions indicative of compromised health. These two data sets are used to distinguish social inequality, represented by those who lived well, and those who had a “hard-knock life” growing up in the aftermath of Wari collapse.

Post-Imperial Mass Migrations or Limited Exogamy?

State collapse can spur striking changes in living conditions for subsequent populations. Perhaps most fundamentally, collapse may cause entire groups of people to perish or become permanently displaced. In Andahuaylas, ethnohistoric sources suggest that the Chanka migrated en masse from Huancavelica around the time of Wari collapse to the Valley of Andahuaylas, where they conquered and relegated the resident ethnic Quichua population into enclave communities (Lumbreras 1959; Gonzalez Carre 1992; Gonzalez Carre and Bragayrac 1986; Huerta Vallejos 1990; Lafone Quevedo 1913; Markham 1871; Navarro de Aguila 1983; Ravines 1980; Vivanco 2005; Sarmiento de Gamboa 2007 [1572]; Betanzos 2004 [1557]; Poma de Ayala 2006 [1616]; Cieza de

Leon 1996 [1553]; Rostworowski 2001; Rowe 1945; Moseley 1999; Lumbreras 1974; Gutierrez 1999; Perez et al. 2003; Ramos Gomez 2002). Mass migrations were not just inter-provincial. Settlement survey data from the Middle Horizon imperial capitals at Huari and Tiwanaku both demonstrate clear out-migrations from the core into the surrounding periphery (Schreiber 1992; Albarracin-Jordan 1996). If mass migrations were common after Wari collapse, we would expect the early LIP Andahuaylas population to be composed of first-generation migrants from faraway lands (perhaps Huancavelica),¹⁰ and genetically the early LIP population should be distinct from earlier, Wari-era Andahuaylan populations.

The “population replacement” model, which claims that the Chanka are not autochthonous to Andahuaylas, can be tested utilizing multi-variate analyses of cranial non-metric traits. In non-metric analysis, observed shared phenotypic characteristics are used as a proxy for shared genotype and thus biological affinity. Genetic relatedness in skeletal populations can be measured through a comparison of the frequency of traits that are strongly genetically controlled but generally unaffected by extrasomatic cultural or environmental changes (Turner et al. 1991; Del Papa and Perez 2007; White 1996; Rhode and Arriaza 2006; Cheverud et al. 1979; Sutter 1997, 2005).

In this study, multi-variate analysis and cluster analysis of amalgamated non-metric trait data (employing Mahalanobous D^2 distance testing and Principle Component Analysis) were employed by Christine Pink (University of Tennessee) to assess the relative genetic distance of different burial populations and help clarify

¹⁰ The mythical Chanka origin place is in Huancavelica. Although strontium isotope analysis on archaeological human remains has not yet been complete, geologists report that $^{87}\text{Sr}/^{86}\text{Sr}$ ratios for the region vary from .7045 to .706 (Rodriguez Mejia 2008:81), a range well below the Andahuaylas values.

migration trends at the population level (Pink and Kurin 2011; Papa and Perez 2007; Hauser and DeStefano 1989; Hanihara 2008; Hallgrímsson et al. 2005; Fabra et al. 2007; Sutter and Verano 2006). Increasing insulation in Andahuaylas after Wari collapse, would be reflected by a decrease in gene flow overall. The biological reality of endogamous Chanka and Quichua cultural affiliation would be reflected by significant genetic distance between those groups

Table 3.7. Hypotheses on biological affinity

<u>Hypothesis</u>	<u>Expectations</u>
Evidence of enduring population continuity in Andahuaylas after Wari collapse	No significant change in the distribution and clustering of cranial non-metric traits between MH and LIP sites
Endogamous cultural groups emerge in LIP Andahuaylas	Chanka and Quichua cranial non-metric traits cluster into distinct groupings

While non-metric data allows us to examine population movement on a large scale, bio-geochemistry allows us to trace the movement of individuals, and by extension, sub-population groups. A large, diverse body of scholarship has reported on how individuals and/or social groups move about the landscape in the aftermath of natural and social disasters. For instance, research from the Old World suggests that the *Barbaricum* migrations were not composed of invading hordes responsible for the fall of the Western Roman Empire; rather Rome's decline spurred mass population movements of *Barbaricum* people (Halsall 2008:37).

Rome is an exemplary case of state collapse provoking forced migration (or more precisely, displacement) (see also Patrick 2005). Often, this displacement is permanent. In modern Peru (1980–2000), only 20% of more than 600,000 displaced people returned to their pre-violence homes when the civil war ended (CVR 2003). These refugees (over

97% of whom spoke Quechua as their first language) tended to migrate to provincial capitals and Lima where they had distant kin or *compadres* and could easily reforge social bonds (Skar 1994). Almost all (99.4%) migrants cited the “threat of violence” as the prime motivation for moving out of their *comunidad*. Given that in Apurimac, 52.3% (192/368) of all indigenous communities were impacted by conflict over a 20-year period, local peoples’ fear of violence appears to be justified (PROMUDEH 2001:186).

Despite a seemingly “chaotic” milieu, research has shown that in eras following collapse, patterns of mobility are not haphazard but rather quite predictable. For instance, during the recent 2010 earthquake in Port au Prince, Haiti, the population of the capital city dropped 23% in the weeks and months after the disaster. In Haiti, post-quake destinations of fleeing Port-au-Princians correlated with normal mobility patterns structured by social bonds (Lu et al. 2012). Together, the Haiti earthquake and Peru civil war data reveal an important factor in “disaster-motivated” migration: people fled to areas where they had already formed social connections. Was this also the case in post-imperial Andahuaylas? If there is indeed evidence of in-migration in Andahuaylas, then who might these foreigners be?

Isotopic studies can be used to illuminate patterns of paleomobility on the individual level. In collaboration with Ellen Lofaro (University of Florida) and colleagues, this study examines strontium and oxygen isotope signatures culled from archaeological human dental enamel. These isotopes can be used to “source” remains to a geologic area, and thus determine residential origin. Following the food chain, the ratio of $^{87}\text{Sr}/^{86}\text{Sr}$ measured in human dental enamel ultimately reflects the ratios present in the bedrock of a geologic/geographic area (Knudson and Price 2007). Assuming an

individual consumed locally produced foods, signatures in their teeth will reflect the biologically available strontium in the geologic region in which the individual lived during the formation of those teeth. Similarly, although somewhat problematic (Knudson 2009), oxygen isotopes imbibed in water and eventually fixed in tooth enamel serve as proxies for climate, water sources, ecological zones, and by extension, residential origin (Ambrose and Krigbaum 2003). The method of analysis is relatively straightforward: “local” oxygen and strontium isotopic values are calculated using descriptive statistics; individuals with “outlier” values are deemed non-local or “foreign” (Wright 2005; Andrushko 2008).

Based on the scholarship concerning disaster and displacement, this research hypothesizes that migration probably occurred in post-imperial Andahuaylas. If so, then individuals with outlier (non-local) strontium and oxygen isotope signatures should be present in the LIP burial sample. Moreover, if migration is tied to social bonds, we would expect that all foreigners at a particular site will come from the same area. In other words, different sites will have foreigners from distinct areas, reflecting particular patterns of either male or female exogamy.

Table 3.8. Hypothesis on migration

<u>Hypothesis</u>	<u>Expectations</u>
Sectors of the LIP Andahuaylan population were mobile	Presence of individuals at Chanka and Quichua sites with strontium and oxygen isotope ratios that are significantly different from the local range

Gauging Inequality

Finally, in the aftermath of collapse, standards of living may decrease and social inequality may increase (Conlee 2006). In the Andes, these conditions may have been exasperated by the maturing *ayllu* system that was inherently unequal. Unhealthy diets and unhygienic living conditions might have impacted whole populations, or segments thereof. This study operationalizes inequality by combining food accessibility (gleaned from carbon isotope analysis) and compromised health or “frailty” (determined through assessment of pathological cranial lesions indicative of anemia) and comparing these correlations within different sub-population groups.

Dietary Heterogeneity

Among foods common to prehispanic Peruvian populations, maize was amongst the most highly-valued. A quotidian dietary staple, maize also had great symbolic value, and mediated ritual and political activities (Hastorf and Johannessen 1993).

Previous research from the Andes has documented that in some cases access to maize was restricted to certain social groups (see Berryman’s 2010 research on MH Tiwanaku basin sites), while in other instances, like that of the LIP-era Wanka society (Junin Department), elites and commoners enjoyed similar diets (Hastorf and Johannessen 1993). Bauer and colleagues (2010; Kellett 2010) have suggested that, due to climate changes, maize may have become relatively scarce over the course of the LIP in Andahuaylas. Less rainfall, fewer arable fields, increasing settlement agglutination, and more competition for territory would have impacted crop yields, and consequently, the diets of those who depended on a robust, yearly harvest.

The present study employs bio-geochemistry in order to evaluate dietary patterns as a way of indirectly measuring differential resource access. Relative maize consumption can be reconstructed through carbon isotope analysis. The $\delta^{13}\text{C}$ enamel values culled from this type of analysis provides a measure of the contributions of C_3 and C_4 plants (like maize) in the diet during childhood (Kingston and Harrison 2007). Increasing social inequality in LIP Andahuaylas would be confirmed if isotopic data reveals that there are groups that are consuming more maize, and groups that are consuming less.

Health and Frailty

Finally, this study investigates how state collapse may impact the physiological health of subsequent populations. Prolonged or chronic exposure to pathogens or malnutrition may be reflected in skeletal remains as pathological lesions (Wood et al. 1992). The systematic and comprehensive analysis of the frequency and severity of lesions across a population can be used to reliably reconstruct health indices.¹¹ Differences in health indices can then be used to infer inequalities based on social factors

¹¹ A significant debate in bioarchaeology is the so-called “Osteological Paradox” (Wood et al. 1992), where the health of a population might not be accurately reflected by the frequency and severity of pathological lesions indicative of disease. For example, those individuals who were healthy enough to survive an illness may have traces of the disease preserved as bony scarring on the skeleton, while those individuals with no bony scarring may have died quickly, before those lesions could develop. In this case, the population with skeletal lesions may be more healthy and “hearty” than un-lesioned populations. Paradoxically, a person with no lesions may have died quickly from a disease, or may not have experienced any disease at all. Nevertheless, other researchers have consistently shown that, despite factors which complicate paleodemographic analyses (demographic non-stationarity, selective mortality, and hidden heterogeneity in risks [Wood 1992:344-345]), pathological lesions are indeed signs of “frailty” (compromised health) and are generally correlated with increasing morbidity and lower mean ages-at-death (see Steckel and Rose 2002). In this study, the integration of multiple lines of data is employed to avoid the interpretive pitfalls of the osteological paradox.

such as age, sex, status or ethnicity. A wealth of archaeological evidence (Kellett 2010) demonstrates that post-imperial settlements in Andahuaylas provided natural vectors for disease. First, ridge-top settlements were overcrowded; the living, the dead, their animals, and their waste were compressed into small patio groups. This type of living arrangement could lead to a host of communicable infection diseases like tuberculosis, waterborne illnesses, and zoonotic pathogens. Furthermore, post-imperial settlements generally lacked water sources and the use of brackish water could have led to frequent viral or bacterial outbreaks (Morgan 2004; Sianto et al. 2009).

In this study, porotic hyperostosis (PH) was evaluated and interpreted as an indicator of compromised health. The characteristic diploic appearance of porotic hyperostosis is caused by marrow hyperplasia. In the Andean sierra these lesions might be caused by megaloblastic anemia (Walker et al. 2009). Megaloblastic anemia is caused by chronic dietary deficiencies and malabsorption of vitamin B12 and/or B9 (folic acid). This type of anemia may be a consequence of mostly vegetarian diets that lack iron (El-Najjar et al. 1976), a deficiency of nutrients derived from animal products (Walker et al. 2009), and/or gastrointestinal parasites and infectious diseases, which lead to nutrient malabsorption and diarrhea (Stuart-Macadam 1992; Blom et al. 2005).

If Wari collapse impacted accessibility to food and clean water, or prompted new types of unsanitary living conditions in overcrowded hilltop settlements, then rates of porotic hyperostosis are expected to significantly increase during the early LIP in Andahuaylas. However, not everyone in society may have experienced compromised health. Ethnographic research suggests that maligned ethnic groups in the aftermath of state “failure” may be denied access to crucial nutritive resources, or be forced to live in

squalid conditions (Patrick 2005). If such was the case in Andahuaylas, we would expect members of targeted ethnic groups (those with cranial modification) to have significantly higher rates of disease than other individuals in society (e.g., unmodified individuals).

Table 3.9. Hypotheses on health and diet

<u>Hypothesis</u>	<u>Expectations</u>	
	Diet	Disease
Health is unchanged	C ₄ (maize) consumption patterns do not change between MH and LIP	No change in rates of porotic hyperostosis between MH and LIP
Health is negatively impacted by Wari collapse	C ₄ (maize) consumption is significantly lower during the LIP	Significantly higher frequency of porotic hyperostosis from MH to LIP
Health is impacted only in certain social groups	C ₄ (maize) consumption is variable among different sub-population groups	Frequency of porotic hyperostosis is variable within different sub-population group

Conclusion: The Bio-Cultural Impacts of Wari Collapse in Andahuaylas

Given that the Wari maintained a largely indirect, yet entrenched presence in Andahuaylas, it is likely that Wari state collapse caused reverberations, which biologically and socially impacted subsequent populations. This dissertation evaluates how social and mortuary organization, violence, ethnicity, innovation, migration, and social inequalities were restructured among post-imperial Chanka and Quichua communities.

Based on previous scholarship of state collapse, the frequency of cranial trauma, i.e., a proxy for violence, is expected to increase in LIP. The fragmentation of Wari social and political institutions is also expected to spur the renegotiation of social relationships, performed through the implementation of cranial modification. As a prominent

expression of ethnic identity in the Andes, the restricted or widespread use of modification over time informs on ethnogenesis. However, because the creation of social difference is a process fraught with tension, the early LIP may have witnessed violence that overwhelmingly impacted particular ethnic groups.

Nevertheless, while imperial disintegration may be characterized by want and deprivation, those eras also witness resilience and innovation. As people cope with new challenges, novel technologies may emerge and be implemented by the population. Trepanation, or ancient cranial surgery, may have been one such innovation. If the post-imperial milieu provided a crucible for invention, then the adoption of the procedure, as well as evidence of experimentation, should be apparent on early LIP crania from Andahuaylas.

Finally, similar to other states, the collapse of the Wari Empire may have provoked population displacement, led to increasing rates of disease, and severely limited access to precious water sources and crucial food staples such as maize. In other words, patterns of migration may have changed, as social inequality was recast during the LIP. The next chapter introduces the sites and skeletal samples that are the focus of investigation, and summarizes the bioarchaeological methods used to assess human remains.

CHAPTER IV

MATERIALS AND METHODS

Research Design

In order to evaluate how Wari collapse restructured subsequent populations in Andahuaylas, it was necessary to enact a multi-stage research plan which included survey and excavation, laboratory analysis, and radiocarbon and bio-geochemical analyses. The aim of survey and excavations was to identify mortuary sites and recover skeletal remains from MH2 and early LIP mortuary contexts (ca. AD 900–1250). Established ceramic typologies were used to tentatively associate sites with either the Middle Horizon or Late Intermediate Period, while colonial-era land tenure documents were used to assign post-imperial sites to Chanka or Quichua cultural groups.

The phases of excavation were as follows:

A) Limited rescue excavations at a Wari-affiliated MH2 circular semi-subterranean tomb from Qatun Rumi in Turpo District (Andahuaylas Province). The skeletal remains of 36 individuals were recovered.

B) Excavations were then carried out at the upper moiety Chanka site of Cachi, in Andahuaylas, Peru. Intact and looted burial caves (*machays*) were identified and excavated in three sectors:

b₁) Sonhuayo Sector, a defensive habitation site occupied by pottery-producing and copper smelting agro-pastoralists,

b₂) Masumachay Sector, an uninhabited knoll with a plaza at its summit, and,

b₃) Mina Cachihuancaray Sector, an important salt mine.

At Cachi, the remains of at least 334 individuals were recovered from these three sectors.

C) The second phase of research included the survey, surface collection, and analysis of skeletal remains systematically recovered from open, disturbed (looted) caves from three sites in the region:

c₁) Machaybamba Cave, in the LIP Quichua enclave community of Pucullu in Pacucha District, Andahuaylas Province (MNI=34),

c₂) Ayamachay Cave in Llatanacu in Ranracancha District, Chincheros Province, a lower moiety LIP Chanka community pertaining to the Ancochuallo *ayllu* (MNI=32), and,

c₃) The Natividad Museum skeletal collection which derives from upper moiety LIP Chanka burial caves at Qasiachi, in Turpo (Andahuaylas) (MNI=27).

D) The third phase of research involved laboratory analysis of the Cachi, Turpo, Pucullu, Ranracancha, and Natividad samples. Data was collected on age, sex, trauma, and pathologies for all skeletal elements. In addition, data on trepanations, modification, and non-metric traits were collected from cranial remains. Samples of dentition were collected for strontium, carbon, and oxygen isotopic analyses. Contextualized organic material was collected for radiocarbon analysis and ceramics were collected for ongoing neutron activation analysis.

Site Descriptions:

Turpo (Middle Horizon)

In 2009, the construction of a road exposed a circular semi-subterranean tomb in an area known as Qatun Rumi (3206 masl), located on the slopes of the Qasiachi plateau in the modern community of Chaupimolle in Turpo District, Andahuaylas Province. Middle Horizon Epoch 2 ceramics and human remains were present in the road cut. Subsequent rescue excavations focused on the timely, yet systematic documentation and recovery of culturally diagnostic material from the (somewhat exposed) interior of the tomb. Culturally unaffiliated terraces are located near the tomb, although most are eroded and covered by vegetation, or are being re-used by local farmers who use the stones to demarcate property. In the middle of the Qasiachi plateau are circular structures. A prehispanic *runa ñan* road runs next to the site, and is still used by the community today.

Natividad (Late Intermediate Period)

Natural rock shelters used for burial are located at the top of nearly inaccessible slopes that extend in a generally linear fashion under the rocky outcrop that forms the summit of the Qasiachi plateau (3405 masl). Although covered by thorny vegetation, all the caves have been disturbed or looted in the recent past. Skeletal remains from these caves were taken to the community museum in Natividad in the 1980–90s. Ceramics derived from these caves conform to common styles of the Late Intermediate Period. According to Colonial-era documents, Turpo was governed by a *kuraka* named Guasco

Pachua in AD 1539, whose descendants maintained leadership in the region through at least the 18th century (Hostnig et al. 2007).

Cachi (Late Intermediate Period)

The archaeological complex at Cachi is located in San Antonio de Cachi District, Andahuaylas Province. Cachi has fertile and productive land, which is fed by a number of *puquios*. Today, like in prehistory, Cachinos are dedicated to agriculture, livestock, and salt rock mining from Mina Cachihuancaray. The complex itself is nestled within accessible slopes covered by xerophytic vegetation, thorny shrubs, and abundant scrub ground cover. Natural rock outcrops have been modified into burial caves. There are prehistoric terraces in generally poor condition; *qochas* (reservoirs) are located in the grasslands above the site. To facilitate excavation and subsequent analysis, Cachi was divided into three sectors: Sector I (Sonhuayo); Sector II (Masumachay); and Sector III (Mina Cachihuancaray).

Sector I- Sonhuayo

Sonhuayo (3365 masl) is a 5 ha. fortified habitation site located on a promontory that has clear views across three rivers to Chincheros Province (Apurimac Department), and the Department of Ayacucho. The site is covered with intentionally fractured groundstone *manos* and *morteros* as well as ceramic fragments. High concentrations of arsenic and zinc on pottery, revealed using neutron activation analysis, strongly indicate that copper smelting was also taking place at Sonhuayo (Kurin, Pink, and Boulanger, n.d.). The accessible south side of the site is protected by a wide ditch and a series of

concentric perimeter walls. Burial caves are located in various parts of the hill, and generally extend in a line under rocky outcrops. Caves tend to be built into the bedrock that forms the foundation of agricultural terraces; these terraces extend down the slope of the settlement. Throughout the site are agglutinated circular houses arranged into haphazard patio groups. Ceramics from Sonhuayo are primarily from the LIP, although isolated Middle Horizon sherds were present in some burial caves. Three intact caves were excavated, and surface remains and artifacts were collected from an additional six caves that were all badly looted.

Sector II-Masumachay

Masumachay (3380 masl) is a steep butte-like hill that has burial caves and terraces. The terraces, located in eastern and southern side of the hill, are in poor condition. The southern side of the hill also has a half-dozen circular structures. On the summit of Masumachay is a 16 x 9 meter rectangular plaza, which offers impressive panoramic views. The burial caves on Masumachay are hewn from bedrock outcrops in the middle part of the hill. Most caves are disturbed, but scattered human skeletal remains are associated with fragments of pottery and lithics from the late Middle Horizon and LIP. Two intact caves were excavated and surface remains were collected from a third cave that was heavily looted.

Sector III- Mina Cachihuancaray

Mina Cachihuancaray (3530 masl) is characterized by natural and anthropogenic caves used for burial during the LIP, and as early as the late Middle Horizon. Near the caves is the Mina rock salt mine, where extraction by hand has continued unabated for some ten centuries. Southwest of the mine is a large, natural burial cave called *Pukamachay*, which was badly looted. Human and cultural remains were collected from the surface. An intact, anthropogenic cave was also excavated in the Mina Cachihuancaray sector.

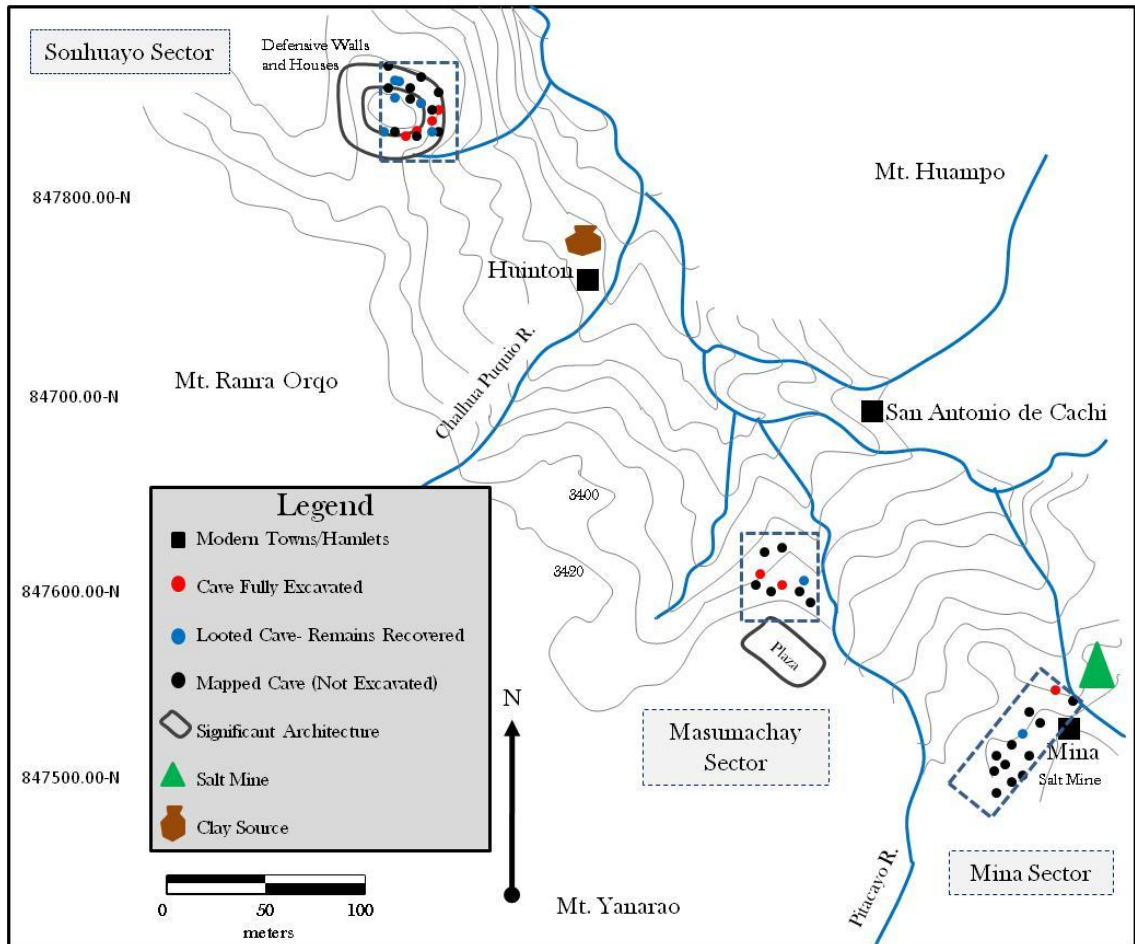


Figure 4.1. Map of Cachi Site

Mining, Ethnicity, and Violence in Cachi

Cachi is a well-documented upper moiety (*hanan*) Chanka community, and formed part of the *Puna* Chanka group during the Colonial Period. Aside from its abundant agricultural and grazing lands, Cachi's most valuable resource is its salt mine. The mine is the largest, most productive, and most important in the region. Ceramics from the mine suggest that various apertures have been exploited since at least the later Middle Horizon. Salt extraction in Cachi today differs little from the late prehispanic period. While homemade dynamite is now used to loosen rock, "nibbling" on the façade of the oldest parts of the mine suggests stone or bronze tools were used in prehistory. Gas lamps are still used by modern miners (as they help inform on oxygen levels), but torches were probably employed in antiquity. Labor is structured by gender: only males are allowed to enter and work the veins, and boys as young as ten years old accompany their fathers into the shafts. Miners carry loads of salt up to around 40 kilograms on their backs. *Mantas* (mantles) and *pellejos* (animal skins) are used as padding, while fiber ropes keep the rock in place during transport out of the shaft. The salt is loaded onto pack animals (and now flatbed trucks), and exported to surrounding communities, and sold by the *arroba* (1 *arroba* = 11.5 kg) at the Andahuaylas Sunday market. While most individuals in Andahuaylas city use the rock salt for their animals, people in Cachi chip small pieces of stone and dissolve them in water, creating brine that is used to season soups, eggs, and other dishes.

In prehispanic times, salt mining was likely a full-time task during the dry season (April–November), when access to subterranean veins was not impeded by rains and the possibility of flooding or erosion. Due to this fulltime work, occupational miners were

identified as a distinct tax or class bracket. Monzon (1881:179) remarked, “Those who [mined] do not give any other tribute or service...in all areas, they had salt mines that were enclosed and guarded, and in those places they had Indians who benefitted from [the salt], and stored it in deposits.”¹²

Mining was, and remains, a dangerous occupation. Extraction in narrow, claustrophobic conditions that “lacked the necessary [19th century] safety measures” (Arrancivia 1896:xx), often led to accidents. Interviews with miners and the health workers in Cachi inform on common injuries including crushed fingers and toes, broken lower limb bones from falls, and osteoarthritis on vertebral and arm and shoulder joints from salt extraction and carrying. Other problems include asthma and pneumoconiosis caused by breathing air full of dust and smoke particulates. Particularly dangerous shafts are abandoned by the community. For instance, for several generations, the “best” salt came from a shaft called *Desenbridora*, which can no longer be worked because of a lack of ventilation and structural instability.

Although Cachinos are dedicated to extracting blocks of red, gritty salt called *pukacachi*, they were not historically involved in intra-provincial transport; that task fell to other communities. For long-distance exportation, long caravans of llamas were used. Even as late as the mid-late 20th century, Cachi salt was transported to Andahuaylas City and far away provinces like Lucanas, Aymaraes and Abancay, Chincheros, Cotabamba, Ongoy, Soras, and even Arequipa and Ica.

¹² Original: “los que hacian esto no daban otro tribute ni servicio...tenian en todo la tierra Salinas acotadas y guardadas, y en ellas indios que las beneficiaban y ponian la sal en deposito”

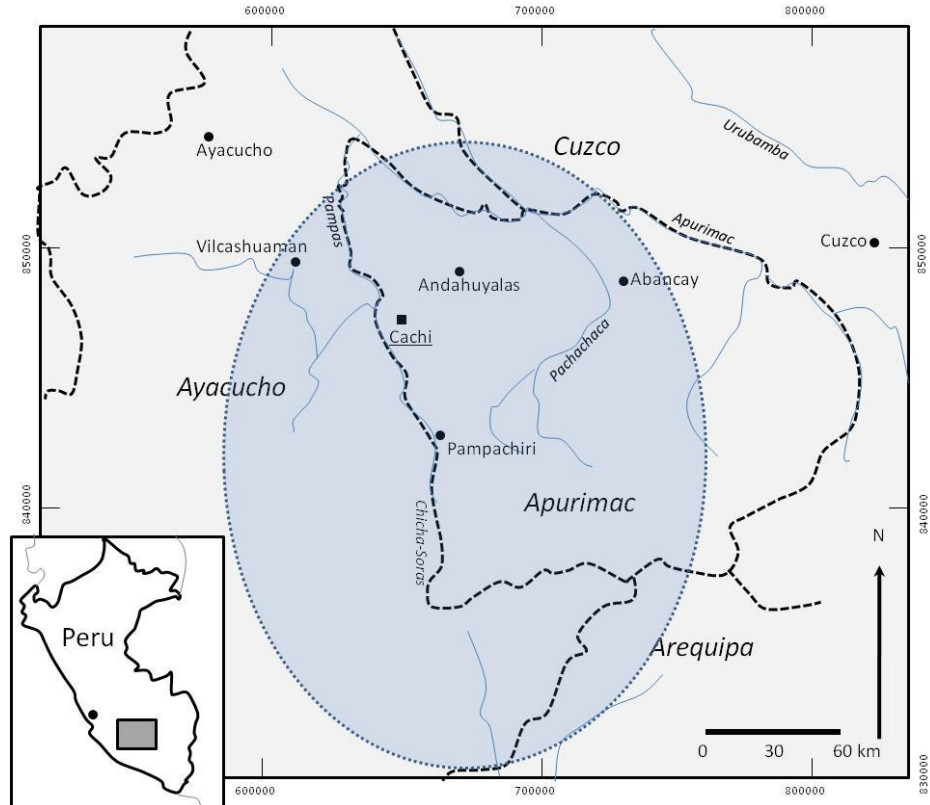


Figure 4.2. Distribution of salt from Cachi



Figure 4.3. Workers at the Mina Cachihuancaray salt mine in Cachi

The mine is a resource Cachinos will defend to the death (see Hostnig et al. 2007). In 1622 *kuraka* Apohuasco affirmed that the salt mines and *chakras* of his *ayllu* would be closely guarded “for all time, and since time immemorial.” Later, in 1677, *Repartador de Tierras*, Don Juan Antonio de Urrea noted that land and resource disputes were common in Cachi. Violence was aimed at people and at their agricultural fields. Combatants “threw rocks, pulled plants from the root and revolted.” Finally, despite inter-communal feuding, Cachinos remained steadfast in keeping other foreign *ayllus* out of the mines. Clandestine miners from nearby towns like Tocctobamaba and Chiara who attempted to open pits or enter shafts were quickly disposed of by violent means.

Although the mine was a highly guarded community-managed resource, every inhabitant in Cachi has the right to open a vein and extract salt from a communal shaft. These communal shafts are analogous to collectively held agricultural fields called *laymis* (or *tierras comunales*). However, veins varied in terms of extractable volume and salt quality (Arrancivia 1896:xxvii), and by the late 19th century, apertures were controlled by specific *ayllus*. The coexistence of both *ayllu*-managed shafts and communal veins likely has prehispanic antecedents.

Table 4.1. Shaft ownership and salt quality in Cachi in 1896

Name of Socavon	NaCl	MgCl ₂	Na ₂ SO ₄	Insoluble residue	Total	Extension (meters)
Mina Cachihuancaray	77.32	Trace	Trace	22.40	99.72	500
”de Manuel Chocre	94.38	Trace	.02	4.16	98.56	30
”de Benedicto Caro	83.18	.02	.01	16.20	99.41	40
”de Manuel Cartulin	73.80	.01	.04	25.04	98.89	50
”de Fransisco Choque	72.89	.01	Trace	26.00	98.99	50
”de Ambrosio Perez	57.65	.07	.01	42.00	99.73	20
”de Timoteo Martinez	90.21	.02	Trace	8.80	99.03	30
”de Marcelino Amoris	92.38	.02	Trace	6.89	99.29	200
”de Severino Malme	50.06	Trace	.01	48.80	98.97	20
”de Mariano RondeneI	78.98	.02	.02	19.08	98.10	10

Perhaps aided by a robust salt trade, several Cachinos ended up becoming the heads of huge macro *ayllus* that included hundreds of communities during the Colonial era (Table 4.2). Certain *ayllus* appear to have consolidated power by controlling valuable shafts. One such *ayllu* may have been the Mallmas. The Mallmas’ leadership roles in Andahuaylas were noted by Sarmiento (2007) in the 15th century, and the *Ayllu*’s authority in Cachi has been documented from as early as 1679, when Mateo Mallma served as *kuraka* of Chullisana, a lower moiety settlement a few kilometers from the Cachi salt mine. Fortunes rose and fell for the Mallmas. In the late 19th century, the *ayllu* mined the lowest quality salt in Cachi (see Table 4.1). Oral history narratives from some of Cachi’s older residents suggest that this inequality sparked violence; the Mallmas were known as a bellicose group that often tried to dispossess other families of their mines. Violence led to bruises, broken bones, and sometimes death.

Given historical accounts of Cachi, it is likely that mining was controlled locally by different *ayllus* in prehistory. Although mining was physically demanding, the rewards of controlling an important commodity like salt outweighed the risk of accidental injury or inter-community conflict. By the Colonial Period, *kurakas* from Cachi often assumed leadership of hundreds of lineages distributed over wide swaths of territory. Although perhaps not solely due to the mine, it appears that protecting salt veins and trade networks may have been a factor in fomenting higher-than-average levels of violence. Furthermore, the need to manage claims for mining rights among different *ayllus* may have prompted the need to implement ethnic markers like cranial modification to identify categories of individuals who had the right to extract salt.

Table 4.2. Leaders in Cachi

Year	Position of Authority	Name
1539	<i>Kuraka</i> principal	Quequi
1679	<i>Kuraka</i> principal	Juan Baptista de Mendoza
1718	Governor and upper moiety <i>kuraka</i> principal	Pedro Ocorima
1718	Lower moiety <i>kuraka</i> principal	Francisco Sairetupa
1718	Head of <i>ayllu</i> in Cachi	Juan Mallma
1718	Head of <i>ayllu</i> in Cachi	Geronimo Mallma
1724	<i>Kuraka</i> of lower moiety Valley Chanka	Bernardo Minaia [Minaya]
1724	<i>Kuraka</i> of lower moiety <i>Puna</i> Chanka	Felix Cardenas
1730	Governor of <i>Puna</i> Chanka	Nicolas Lopes Casango

Ranracancha (Late Intermediate Period)

Ranracancha pertains to an isolated region of northwestern Apurimac that Spanish chronicler Betanzos (2004:211) derided as the hostile “Omapampa wilderness.”

The cave where remains were recovered in this study is known locally as Ayamachay. It is a large, natural cave (3436 masl), used for multiple interment, but is now badly looted and poorly preserved. Ayamachay is located in the Llatanacu sector of Ranracancha District, Chincheros Province. At Ayamachay, the dead were deposited in the main, natural cave, and likely in hollowed niches above the cave, which are still sealed with clay-packed mortar stone walls. There are no other visible signs of prehispanic architecture in Llatanacu, but there are extensive, abandoned terraces about a 30-minute walk to the east. Based on the surface remains, Llatanacu was used during the Late Intermediate Period.

There is no mention of Llatanacu before the 20th century, and there are no archaeological references. Cieza ([1553] 1922:289-291) suggested that the population of the Ranracancha region was displaced during the Inca period, and the area was home to *mitmaes* because “los naturales, con las guerras de los ingas, murieron los mas dellos [the natives all died during the wars with the Inca].” However, procedural documents attest that Ranracancha was part of the *repartimiento* of Cayara, populated by members of the Anccoahuaylo *ayllu* (see Bauer et al. 2010; Kellet 2010), and likely conformed to the lower moiety macro Chanka cultural group.

Pucullu (Late Intermediate Period)

Human remains and artifacts from the Late Intermediate Period were recovered from the surface of one looted cave (3060 masl) in the Manchaybamba sector of Pucullu, in Pacucha District, Andahuaylas Province. This anthropogenic cave is located along a rocky outcropping near the summit of an almost inaccessibly steep hill that rises above

Laguna Pucullu. There are no visible traces of prehispanic architecture nearby. Despite the sparse evidence of prehispanic occupations in Pucullu, there are important archaeological sites near this area including Sondor, Achanchi, and Luisnayoq that date to the Late Intermediate Period and Late Horizon (Kellett 2010; Bauer et al. 2010; Bauer and Kellett 2010). Unlike the other LIP sites affiliated with the Chanka, Pucullu is identified as a Quichua enclave community, ruled by dual leadership in the 1539 *Encomienda*.

Historical accounts describe animosity between the Chanka and the Quichua. Upon their initial migration to Andahuaylas, the Chanka defeated the Quichua, and several hundred years later, the Quichua allied with the Inca against the Chanka (Cieza de Leon [1553]). Yet despite apparent historical enmity, the ethnic and cultural affiliation of the Quichua is still the subject of debate. Referencing the 1539 *Encomienda*, Julien (2003) posits that the “Quichuas of Vilcaporo” allude to a group from Cuzco led by a cacique named Vilcaporo. However, given the recent transcriptions of new documents from Andahuaylas (Hostnig et al. 2007) it seems more likely that Vilcaporo actually designates the region near Pucullu, located in modern Andarapa District. In 1573, “Vilcaporo” is listed as one of the *ayllus* in Andarapa, just downstream (north) of Pucullu, while an *ayllu* called “Quichua” conforms to part of the hurin (lower moiety) Chanka (Bauer et al. 2010:41). By 1594, “Achan Quichuas” and “Bilca Poros” are included in the list of hurin (lower moiety) Chanka *ayllus*. As Bauer (et al. 2010: 42) notes, “the increased number of Hanan Chanka and Hurin Chanka *ayllus* [over time] reflects the collapse of other neighboring systems and the incorporation of their population into the Andahuaylas tributary system.” It seems possible that what had once

been a distinct cultural group, was later amalgamated into the (less prestigious) lower moiety Chanka *ayllu* for administrative purposes. Finally, in the early 18th century, a man named Coyca, the direct descendant of the Quichua *kuraka* named in 1539, refers to himself as “Principal Indian, *cacique*, and legitimate governor of the town of Andarapa Vilcaporo, in this province of Andahuaylas” (Hostnig et al. 2007 [1745]).

Documentary evidence strongly suggests that the Quichuas were a distinct cultural group in Andahuaylas, and that Pucullu may have been a relatively isolated enclave community. This is highlighted in the 1539 *Encomienda*, which distinguishes between Quichuas from Andahuaylas and Quechuas (Inca) from Cuzco. In fact, a host of Incan administrative classes are identified (i.e., Incas, Orejones, Mamaconas, Mitmaes, and even a Tucuyrico). Given the unique nature of Pucullu as a probable Quichua enclave, and its historically documented animosity with the Chanka, it is expected that patterns of biological affinity, violence, migratory patterns, and ethnic markings will be distinct between groups.

To summarize, this project focused on the analysis of human remains recovered from four archaeological mortuary sites and one museum collection in Andahuaylas. One sample, from the site of Turpo, is a Middle Horizon Epoch 2 circular semi-subterranean tomb. It is thought that this tomb is representative of Wari-era burials in the region. The other sites and the museum collection derive from post-imperial early Late Intermediate Period burial cave contexts. While the Natividad Museum collection and the human remains excavated from *machay* cave burials in Cachi likely represent members of upper moiety Chanka *ayllus*, human remains from Ranracancha likely represent members of a lower moiety Chanka-affiliated *ayllu*, called Ancohuayllo. Finally, human remains from

Pucullu likely represent members of a non-Chanka cultural group known as the Quichua. MNIs (minimum number of individual counts) from each site are illustrated in the table below.

Table 4.3. Sample size

Site	Era	MNI	# Tombs/Caves
Turpo	MH	36	1
Natividad	LIP	27	1?
Cachi	LIP	338	14
Ranracancha	LIP	42	1
Pucullu	LIP	34	1
Total		477	≥18

Cave Excavations and Bone Coding

The goal of excavations were to recover skeletal remains from sites that temporally bracketed the era of Wari collapse (ca. AD 950–1050), from different geographic regions, and distinct cultural groups (Chanka and Quichua). Each site was divided into different sectors based on local toponyms. Sectors were mapped using handheld GPS units and kite and balloon photography, and were geo-rectified using Google Earth. All identifiable mortuary contexts (like caves or tombs) were mapped.

In this study, each cave was assigned a number and its location at the aperture was recorded using GPS. Excavation units placed in front of cave apertures aimed to reveal activity areas, while internal units followed the interior dimensions of caves. Internal units were further divided into z-axis (depth) sectors, and x- and y-axis levels. Loci of bone clusters, possible evidence contemporaneous internment events, were also recorded.

In this study, all human remains were excavated under the supervision of the author to ensure that burial position and skeletal elements were properly identified. Remains and artifacts were cautiously excavated with bamboo tools and animal-hair brushes, mapped, drawn, and photographed before being removed. Human bones were also assigned individual burial numbers. All bones were tagged and packaged together to keep them properly associated for subsequent lab analysis.

Samples for radiocarbon dating were collected in situ from well-contextualized human remains and associated organic material. Sample processing, analysis, and calibration were carried out at Beta Analytic Labs. A photo was taken before opening and closing units, and as each layer of commingled bone was removed. Excavations were also filmed using an iFlip digital video camera. Data recording forms documented artifact classes, human remains, special finds, and notable loci.

In cases of large or looted *machays*, it was common to observe bones eroding out of cave confines and dispersed down-slope from the apertures. Surface surveys thus covered a cone-shaped area extending from the mouth of the cave down to the closest subsequent feature that would have impeded tumbling bone (i.e., a wall, another cave, thick overbrush, or a ditch or canal).

In the lab, water-based white glue was used to mend broken bone and set to dry in rice-filled bins. Unlike acryloid B-72, Elmer's-style glue tend to be less brittle, holding up better after several years or storage, and can be easily removed with a Q-tip dipped in distilled, deionized water. Bones were labeled using clear nail polish, and ultra-fine tipped black permanent markers. Both pen marks and nail polish can be easily removed with acetone.

In total, 49,051 cranial and post-cranial skeletal elements and fragments representing at least 477 individuals were given 14,972 unique codes identifying the site, sector, cave, section, level, burial, box, bag, and bone number. However, this dissertation primarily focuses on diagnostic crania. All data were assessed statistically using SPSS, R v.2.1.2.2 and Excel.

Sampling Considerations

There were several sampling challenges in the current study. First, the recovery of osteological material was impacted by intentional post-mortem, post-depositional activities including delayed burial and periodic disinterment and reinterment (Isbell 1997; Salomon 1995; Duviols 1986). These mortuary customs caused human remains to become increasingly commingled over time. In other cases, excessive looting of *machays* significantly inhibited the recovery of skeletal material. While at the Natividad Museum, the collection is likely the result of cherry-picking. In these instances of biased recovery, post-cranial elements are usually lacking or significantly underrepresented. Finally, centuries of animal scavenging, root growth,¹³ soil acidity and temperature and humidity fluctuations compromised the structural integrity of skeletal elements (Paine and Harpending 1998). Despite sampling challenges, multi-factorial methods and multiple lines of data interpreted in their archaeological and environmental contexts were

¹³ Intriguingly, intact, sealed *machays* could always be located by identifying the bright, yellow buds of the *cruzkitchka* thorn tree. Excavations revealed that the roots of the *cruzkitchka* tended to wrap around bones, and emerge from cave apertures. In some cases, large sections of tree root—up to 8 cm thick—had to be carefully sawed away from cave interiors; back in the lab, the wood was separated into small sections and delicately removed from the bones.

employed to avoid interpretive pitfalls associated with paleodemographic limitations (Wright and Yoder 2003; Tung 2012; Torres Rouff 2003; Andrushko 2007).

Osteological Data Collection Methods

Analysis of Commingled Remains and MNI Determination

Following standard methodological procedures established by Tung (2003), each skeletal element was assessed on its own terms; the most prevalent sided element was used as the basis for the cave MNI (minimum number of individuals). Cave MNI totals were summed to produce a total minimum number of individuals. A separate cranial MNI was determined based on the number of diagnostic crania. Diagnostic crania have at least 75% of the vault and the face complete and/or include fragmentary crania that could be sufficiently mended so that cranial modification and trauma could be confidently evaluated.

Age Estimation

The determination of age-at-death for crania followed standard bioarchaeological methods (Buikstra and Ubelaker 1994). In cases of sub-adults, dental development and eruption were used to determine age-at-death following Hilson (1996) and Ubelaker (1989).¹⁴ In most cases, remains of children under about four years old were extremely fragmentary.

¹⁴ Post-cranial bones were evaluated based on size and epiphyseal development following standard rates of growth described in Baker et al. (2005) and Scheuer et al. (2008).

Likewise, adult aging methods for crania followed standards established by Buikstra and Ubelaker (1994). Cranial vault suture closure scores (from no closure to suture obliteration), were summed to determine an S-value correlated with mean ages (Buikstra and Ubelaker 1994:38). Dental wear (Scott 1979) was also used to determine age categories, since they correlated fairly well with basal cranial suture closure scores. Because remains were commingled, individuals were assigned into broad age categories which could be compared to other south-central Peruvian populations (see Tung 2012)¹⁵.

Table 4.4. Age categories for crania

<u>Age Code</u>	<u>Age Category</u>	<u>Years</u>
F	Fetus	In utero–Birth
I	Infant	Birth–4 years
C	Child	5–14 years
T ¹⁶	Teen	15–19 years
YA	Young Adult	20–34 years
MA	Middle Adult	35–49 years
OA	Old Adult	50+ years
A	Adult	20–50+ years

Sex Estimation

Cranial modification, trepanation, and other cultural modifications do not impact sexually dimorphic features on the crania (Torres Rouff 2003; Cocilovo 1975). In this study, sex estimation of the crania followed disciplinary standards (Buikstra and

¹⁵ To facilitate comparisons with other studies in the region (see Tung and del Castillo 2005), individuals over 15 years old were categorized as *adults*, while those individuals under 15 years old were classified as *sub-adults*.

¹⁶ A note on terminology: This study uses “teen” and “late adolescent” interchangeably. Individuals under ~15 years old are referred to in this dissertation as “sub-adults,” “youths,” or “juveniles.”

Ubelaker 1994). The sexually dimorphic indicators used were the mastoid process, nuchal crest, supraorbital margin, and glabella. Each feature was scored on a five-point scale (1 = most gracile/sharp, 5 = most robust/prominent) (Buikstra and Ubelaker 1994:21). When associated mandibles were present, the robusticity of the gonial angle, and the shape and robusticity of the mental eminence were also scored. Using nomenclature established by Tung (2003:93, 2012), crania were designated as male, female, probable male or female, or unknown (see Table 4.5). Because sexually dimorphic features are not expressed in individuals until after puberty, sub-adults under about 15 years of age could not be sexed, and were designated as “unknown.”

Table. 4.5. Sex categories for crania

<u>Sex Code</u>	<u>Sex Category</u>
F	Female
F?	Probable Female
M	Male
M?	Probable Male
U	Unknown

The Pathophysiology of Trauma

To ascertain how violence was experienced in Chanka society, skeletal elements were examined for evidence of trauma (Galloway 1999; Lovell 1997). Physical evidence of trauma on bone depends on several factors including the element affected, the weapon used, and amount of force applied. Properties of the bone itself are further affected by age, sex, and pathological conditions (Novak 1999). Despite remodeling, evidence of injury becomes sedimented in bone for several years, usually leaving residual deformities

that allow us to see the accumulative affects of violence over the life of an individual (Glencross 2011:395).

The minimum number and sequence of injuries can be calculated from the inventory and distribution of wounds impacts and fracture intersection and arrest lines (Kimmerle and Baraybar 2008; Lovell 1997; Jurmain 1999). Determining the etiology of trauma, either intentional or accidental, can be inferred through an assessment of the way (or mechanism) the injury was inflicted, where it was inflicted on the body, and how common that form of injury is in a population or sub-segment therein.

Because the location of the victim and the assailant's weapon can be deduced from the point of impact, we can determine victim positioning. For instance, if a significant proportion of total head wounds in a large sample of crania are clustered on the backs of female skulls, we can infer that those women were turned away (and possibly escaping) their assailants at the moment of impact; these sorts of "fleeing" wounds are common in cases of raids (Tung 2012). Overall, this class of data can help inform of the motivation for conflict.

Used in conjunction with wound distribution, trauma lethality can signal the likely intent of an assailant during a violent confrontation. Consequently, injuries on crania are classified as either (1) lethal or (2) sub-lethal. Sub-lethal, ante-mortem injuries bear evidence of bone remodeling (healing), while peri-mortem injuries, which occur at or around the time of death, do not (Lovell 1997). In cases where different types of violence can result in similar trauma distribution patterns, wound lethality can offer key insights on motivation. For instance, while multiple peri-mortem injuries facial on a single individual may be an example of excessive rage-filled "overkill" violence (Rautman and

Fenton 2005), multiple ante-mortem injuries on male left frontal bones (Tung 2012) or nasal bones (Walker 1997) are all indicators of the type of violence where the intent was to injure (but not kill) a competitor (Walker 1997:146).

Finally, standard rates of healing help indicate when an injury was received in relation to the time of death. Although bone remodels at a fairly consistent rate, actual healing times will be affected by a victim's age, health status, the extent and severity of injury, and any therapeutic intervention (Kimmerle and Baraybar 2008; Lovell 1997; Ortner 2003).

In this study, infant/child and late teen/adult trauma rates are calculated separately following standards established by Tung (2003, 2012). Data was collected on the location of affected areas on bone, including the side, region, and aspect. The number and types of fractures or defects were recorded and concomitant abnormal bone changes were described. Three classes of injury were observed in the present sample: penetrating injuries, sharp force trauma (SFT) and, most commonly, blunt force trauma (BFT) (Lovell 1997; Kimmerle and Baraybar 2008; Jurmain 1999). The timing of fractures was estimated based on healing. The mechanism of injury and the class of weapon used (if applicable) was classified by wound shape and size. The victim's position relevant to the direction of force was inferred based on impact location and radiating fracture direction (Lovell 1997, Galloway 1999). Dental abnormalities with suspected traumatic etiologies, including fractures and ante-mortem maxillary incisor loss (Hilson 2000, Lukacs 2007), were also documented. Together, these data were marshalled to evaluate how wound patterning, frequency, and lethality varied within distinct sub-population groups.

Determining Cranial Modification Presence and Variability

Despite a number of recent publications on modification in the Andes (see Hoshower et al. 1995; Torres-Rouff 2003; Lozada and Buikstra 2002), as well as standardized data collection forms (see Buikstra and Ubelaker 1994), there is not much consistency on how to define or identify styles and intensity of modification and how to gauge and interpret morphological variation. In this study, a couple of different methods were developed to quantify and qualify differences in cranial modification.

Each cranium was measured with a spreading caliper and measuring tape to inform on the presence, style, and intensity of modification. Because all modified crania were elongated using circumferential bindings which prevented parietal expansion, two simple methods were developed to tease out more nuanced patterns of modification variability. First, a numeric modification code was developed based on Buikstra and Ubelaker's (1994) cranial modification data collection form.

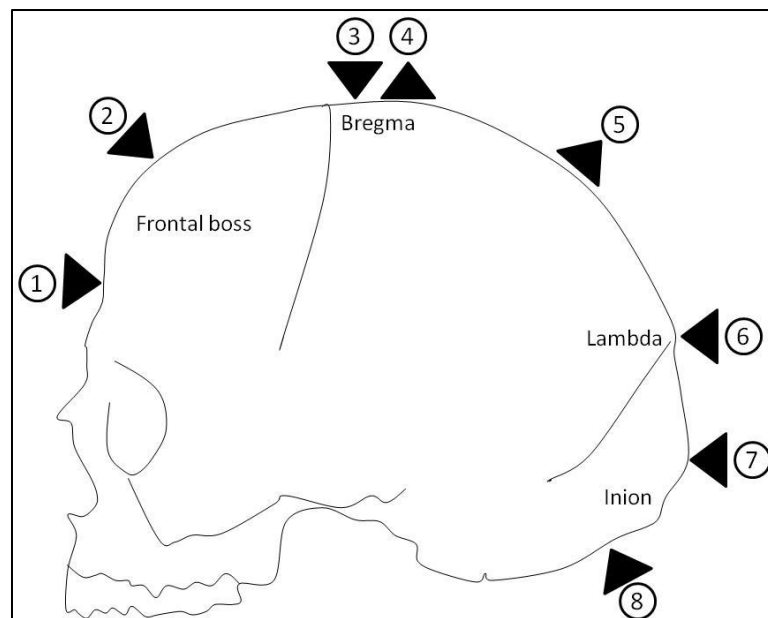


Figure 4.4. Modification code: Numbers demarcate areas where pressure from bands could have impacted osseous expansion (#1–3, 6–8) or compression (#4–5).

Using a numeric modification code based on planes of pressure was an efficient means of qualifying slight differences in modification techniques because the placement of bands on the skull ultimately accounts for the shape of the cranium. For instance, pressure applied to areas “6” (lambda) and “7” (above inion) on Figure 4.4 will give the posterior of the cranium an “erect” shape when viewed in profile, while force placed at “8” (below inion) gives the posterior skull an oblique shape. Finally, although rarely observed in Andahuaylas, modification may elevate the post-bregmatic area and sagittal suture (“4” and “5” respectively). Using a numeric code to qualify modification shifts the focus to the intention of the practitioner, and not unintended outcomes of the practice—like asymmetric modification or irregular pad or binding impressions. Like many permanent body modification customs (e.g., circumcision), the process of modifying the cranium may have been a more integral component of ethnic affiliation than the aesthetic of the end result.

Second, a simple ratio derived from cranial arcs and chord measures at four key osteometric points was developed. This “modification ratio” aims to convert modification intensity into a quantifiable continuous variable by measuring the relative roundness or oblongness of a cranium. As the cranium is compressed and ultimately modified by external pressure from bands and pads, the frontal bone is flattened, forcing bregma posterior. The occipital is forced anteriorly and superiorly, and the parietals are pushed superiorly and posteriorly relative to an unmodified cranium.

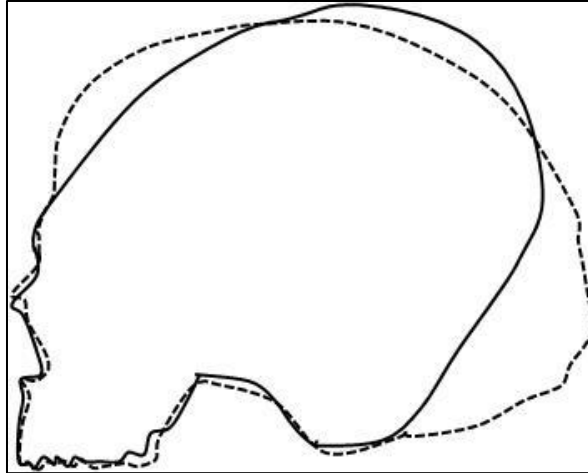


Figure 4.5. Profile view of modified and unmodified skull shape

Determining the modification ratio operates by measuring the cranial arcs and chords at nasion, bregma, lambda, and opisthion. First, to determine the relative flatness on the anterior of the cranium, the cranial arc value between nasion and bregma is divided by the chord length between those points. The same arc/chord calculations were made between bregma and lambda, and lambda and opisthion. Finally, these three values were used to create a modification ratio for the entire cranium. This was achieved by multiplying the nasion-bregma ratio and the lambda-opisthion ratio (which are forced medially in modification), and dividing by the bregma-lambda ratio (which is forced away from the center of the body). The rounder, and more “normal” the cranium the higher the ratio, while the flatter and longer the cranium, the lower the value.

$$\frac{((\text{Arc}_{\text{Nasion-Bregma}} / \text{Chord}_{\text{Nasion-Bregma}}) * (\text{Arc}_{\text{Lambda-Opisthion}} / \text{Chord}_{\text{Lambda-Opisthion}}))}{(\text{Arc}_{\text{Bregma-Lambda}} / \text{Chord}_{\text{Bregma-Lambda}})}$$

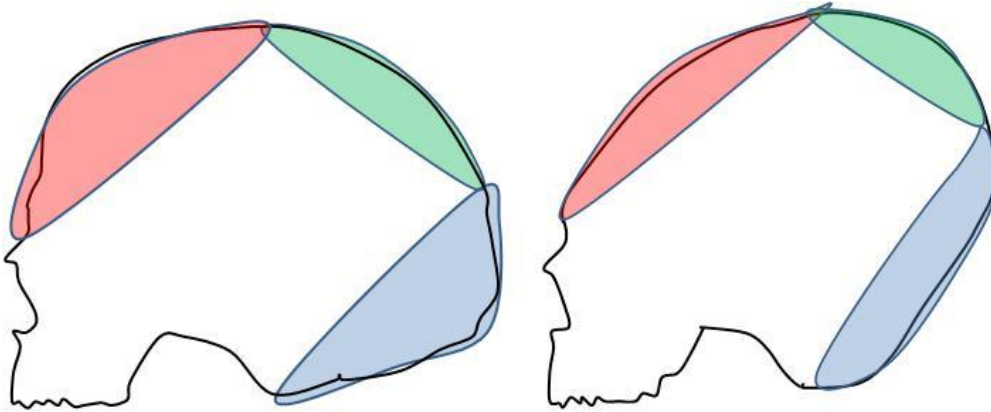


Figure 4.6. Modification Ratio

Finally, modification heterogeneity was also assessed. Standardization in modification practices would suggest that infants' heads are being bound by a single, or small group of practitioners using prescribed techniques. Conversely, great diversity in binding styles would suggest that modification is being practiced in the home, by parents or close kin. Although these individuals may have had a general knowledge of binding practices, they may have been performing it infrequently (see Arriaza 1988:17). Different *ayllus*, lineages, or ethnic groups may have shared a common ideal of desirable skull shape, but outcomes would be distinct and variable given the imprecision of modification techniques.

Evaluating Trepanation

Trepanation, i.e., ancient cranial surgery, was a technical innovation employed by post-imperial Andahuaylan populations to cope with novel challenges such as violence and sickness. Following Verano (2003) and Andrushko (2007; Andrushko and Verano 2007; see also Buikstra and Ubelaker 1994), all crania of individuals over five years of

age with at least four vault bones (frontal, parietals and occipital) were evaluated for evidence of trepanations. Trepanation method, location, size, degree of healing, and evidence of concomitant traumatic injury or pathology were also recorded.

In several crania, trepanation apertures were associated with “attempted trepanations,” perforations which did not reach the endocranium. There were also several instances of errant bore holes, or “praxis marks.” These contemporaneous actions were recorded as a single “trepanation event.”

Creating a Health Profile

Creating a health profile for an archaeological population remains difficult because differential susceptibility in all human skeletal samples impacts the presence of pathological lesions (Wood et al. 1992). Similarly, in cases of injury, bone healing and remodeling time will be affected by issues of frailty (Wood et al. 1992), which is affected by a victim’s age, health status, the extent and severity of a given pathology, the bone affected, and therapeutic intervention (Kimmerle and Baraybar 2008; Lovell 1997; Ortner 2003). Nevertheless, pathological lesions indicative of disease can still inform on general health trends when combined with multiple lines of data (Steckel and Rose 2002).

In this study, human crania were examined for evidence of porotic hyperostosis on the vault. Porotic hyperostosis, a proxy for compromised health, was coded as present or absent; visible lesions were coded as healed or unhealed. The degree to which porotic hyperostosis was expressed, and the location of porosity on the cranium were coded using Buikstra and Ubelaker’s (1994) Standard’s.

Conclusion

This chapter reviewed the macroscopic bioarchaeological methods used to assess human crania from Andahuaylas. Crania derive from four archaeological sites and one museum collection. The most ancient site, Turpo, dates to the later Middle Horizon. Human remains were also excavated from intact and looted Late Intermediate Period *machay* caves at Cachi, an upper moiety Chanka site, Ranracancha, a lower moiety Chanka community, and Pucullu a Quchua enclave settlement. Human remains from LIP *machays* at Turpo, now housed at the Natividad Museum, were also evaluated. In total, data was collected on at least 477 commingled individuals from at least 18 distinct burial contexts. Crania, the focus of the present study, were assessed for information on age, sex, trauma, trepanations, and porotic hyperostosis. Additional data and samples were collected for non-metric trait analysis and bio-geochemical testing (see Chapter 9). The next chapter presents the artifactual, AMS radiocarbon, and mortuary demographic data. These data are used to reconstruct and interpret mortuary practices during the Wari and post-imperial eras.

CHAPTER V

MORTUARY PROFILES: SKELETAL AND MATERIAL DATA

Introduction

This chapter describes the cultural and biological profiles of mortuary contexts in Andahuaylas. Cave burials, the focus of this study, are introduced and problematized as a unique crucible for interment during the post-imperial era. Subsequent sections report on the results of excavations in the Middle Horizon tomb at Turpo, and the Late Intermediate Period *machays* at Cachi, Ranracancha, and Pucullu. Excavated artifactual assemblages characteristic of each era are also presented. The results of AMS radiocarbon dating are interpreted in the context of observed depositional patterns.

The subsequent section reports sex and age-at-death profiles of the mortuary populations. Interpretations are drawn from paleodemographic theory as well as ethnohistoric and ethnographic data. Results from excavations and artifactual analysis suggest new mortuary practices were developed in Andahuaylas in the generations following Wari disintegration.

The Meaning and Significance of *Machays*

Andahuaylas, like much of the Peruvian sierra, witnessed a unique mortuary phenomenon during the early LIP: the proliferation of mostly small, anthropogenic

machay burial caves (see Salomon 1995; Duviols 1986; Doyle 1988; Arriaga [1621] 1968). *Machays* were created to collectively inhume the dead who played a profoundly important social role in structuring the lives of living descendants and were venerated and appeased through tangible, material offerings (Dillehay 1995). These offerings would usually include small, personal “utensils used during their lifetimes...sometimes gourds, sometimes vessels of clay or wood or made of silver or of seashells...spindles and skeins of spun cotton [for the women], and *tacllas* or hoes [for men] to work the fields, or the weapons they used in war” (Arriaga [1621]1968:27-28).

More than just crypts, *machays* also served as natural territorial indicators. Several documents from Andahuaylas (Hostnig et al. 2007 [1612] and [1626]) cite *machays* as legal boundary markers. For instance, Antonio Benites had “fields of wheat in Casacirca, located on the outskirts of San Jeronimo that are enclosed on the high end by ancient sepultures from the time of the Inca.” Similarly, Nicolas Casango’s lands were demarcated by “a road that leads up to a cave” (Hostnig et al. 2007 [1730]).

Cosmologically, *machays* are cavities hewn out of stone, a highly charged, multivalent material which has important transformative properties. Stone can transform into living things and living things can transform into stone. Famously, the *purunrauca*, warriors transformed from field stones and slaughtered the Chanka army (Urton 1999). Conversely, Andahuaylan contemporary oral history describes an event in time immemorial when the people of Laguna Pacucha were turned to stone by a vengeful water spirit. From the hardening of a baby’s malleable skull to the petrification of the dead, local Andahuaylans today talk about becoming more “stone-like” as they age. Because of their charged properties, ontologically betwixt and between, *machays* are

sometimes referred to as *t'occo* (openings/windows) that straddle the natural and supernatural world, and as such, are both potentially dangerous places.

Symbolically, *machay* are loci of ethnic and political origin and reproduce idealized social orders (Salomon 1995). Inca lore recounts how Manco Inca, his *panaca* (lineage), and allied ethnic groups emerged from a series of *machays* at Paucaritambo (Urton 1999). Ironically, Manco Inca's brother, Ayar Cachi, was eventually and fatally entombed alive in a small *machay*.

Historically, *machays* were said to hold the remains of *mallquis*, apical ancestors who were venerated as the progenitors of lineages and ethnic groups. Members of the same *ayllu* were collectively interred in well-known, named *machays* (Duviols 1986; Doyle 1988). Colonial extirpation testimony relates that different descent lines from the same *ayllu* were interred in caves next to each other.¹⁷ In central highland Peru, *ayllus* maintained several *machays* where less than a dozen and up to several hundred people were interred.

It also appears that communities, or at least members therein, had detailed knowledge of descent groups and caves. Testimony from extirpation campaigns relates

¹⁷ Translation: In three curious subterranean vaults above the old town, [were the remains of Marca Cuipac and his brother Paria Putacac] in the vault or *machay* called Choqueruntu, and their brother, Carua Runtuc, was in the other [cave] with his family where there were seventy-five heads from the *ayllu* Conde Ricuy; in the [cave of the] Chaupis Otuco and Xulca *ayllus*, there was Libiac Raupoma, Libiac Uchupoma, and his family who numbered forty-two heads; in the [cave of the] Allauca *ayllu* there was Libiac Rum Tupia with his brother Libiac Guacac Tupia, with forty-four heads of his family (Duviols 1986:52-53). Original: "Los tenían en tres bobedas muy curiosas debajo de la tierra arriba en los pueblo biejos llamados Marca Patacum entrados en ellas y toda su familia en la bobeda o *machay* Choqueruntu y su hermano Carua Runtuc estaba en otro con su familia donde abia setenta y cinco cabezas del dho aillo Conde Ricuy y en el aillo Chaupis Otuco y el de Xulca estaba libiac Raupoma Libiac Uchupoma y su familia que eran quarenta y dos cabezas y en el del aillo Allauca esta Libiac Rum Tupia con su hermano Libiac Guacac Tupia con quarenta y quatro cabezas de su familia... (Duviols 1986:52-53)... "Y asimesmo manifestaro los susodichos a Cuspa malqui con sinquenta y seis cuerpos de su familia y diejieron que abia cuerpos de cristianos rebueltos entre los jentiles" (Duviols 1986:289).

that bodies would be disinterred from church grounds and redeposited back to specific, named *machays*, known from social memory. Extirpators lamented when they discovered that the cave holding the remains of *mallqui* Cuspa and 56 of his family members also contained disinterred baptized remains, which had become commingled with the pre-Christian dead (Duviols 1986:289).

By all accounts, *machays* were tended to by a ritual specialist whose job it was to make offerings (which would continually alter depositional contexts), maintain an active memory of interred individuals, and remember the name of the cave itself. This was no easy task. Cobó (1964:165) reaffirms the patrilineal basis of *machay* collectivity when he relates, “not all living people venerated all the dead bodies, nor all their relatives, but rather those from whom they directly descended. In that respect, everyone could remember their father, grandfather, and great-grandfather...but not the brother of their father, nor of their grandfather, nor those that died without leaving descendants...while lords [were also recalled]...the memory of their children or grandchildren was lost in death” [my translation].

Yet *machays* are also associated with malevolence and sorcery (Dillehay, personal communication 2012). *Machays* in Andahuaylas are sometimes referred to as *wayrancalla wasi*, the houses where malevolent winds are housed. While *machays* pose a spiritual threat that is widely acknowledged in Andahuaylas, caves are auspicious for other reasons as well. Livestock rustlers and thieves hide in *machays*, Shining Path *terrucos* (terrorists) slept in caves, and government soldiers used caves to clandestinely dispose of victims. For miners and prospectors, large and/or deep *machays* pose clear physical risks. Short-term hazards include cave-ins, rock falls, suffocation, and other

accidents, while long-term risks associated with spending time in *machays* include bacterial or metal contamination and chronic respiratory problems (see Nash 1979).

Finally, Andahuaylans were likely aware that corpses are polluting, and could easily inflict sickness on the living (Harris 1982:54). As noted in Chapter 3, the biological threat posed by the dead was well-known. Montesinos ([1642] 1920:xxii) relates that after a particularly bloody battle in Andahuaylas between the Inca and the Chanka, the Inca Sinchi Roca,

Ordered that many sepulchers be built, in which were interred the bodies of those who had been slain in the battle; and he took especial care about this matter on account of the plague which had been caused by the decaying of bodies in former years.

Once desiccated or skeletonized and buried in caves or sepulchers,¹⁸ human remains were exposed to a host of taphonomic processes, including root growth, animal scavenging and gnawing, rock falls, “body-burn,” soil acidity and alkali variability, humidity and temperature fluctuations, earthquakes, and rain.

¹⁸ *Chullpas*, above-ground open mortuary sepulchers (Isbell 1997), may have been used in Andahuaylas to temporarily store human remains. Throughout the course of our survey work, we encountered several *chullpa* sites. These sites were located on windy saddles with wide viewsheds. They are associated with agricultural terraces and *apachetas* (passes with stone cairns) or *huacas* (shrines). Due to their small size, only ~2-3 adult mummy bundles would have been able to fit in each cylindrical sepulcher. Similar to food-storing *collqas*, *chullpas* in Andahuaylas might have been used to desiccate bodies (Sillar 1996), and may not have been intended for more permanent storage. Given the less architecturally integrated nature of *chullpas*, relative to *machays*, as well as practical space limitations, above-ground sepulchers may have been used intermittently, as either a desiccation stage of the mortuary process, or as a temporary, performative “showcase” for certain important mummies. Today, *chullpas* sites in Andahuaylas remain important loci of yearly, ritual, and festive congregation.

Excavation Results and Discussion: The Middle Horizon Tomb at Turpo

The stone-lined, circular, semi-subterranean tomb excavated at Turpo was similar to a circular stone-lined tomb from Beringa (Tung 2007a:251, Figure 11), a Middle Horizon site on the periphery of the Wari Empire in Arequipa; similar styles have also been observed in the Wari heartland in Ayacucho (José Ochatoma personal communication 2012).

Within the tomb, all individuals were either partially or completely disarticulated except one. The fully articulated individual, a middle adult male, was laid to rest above sterile soil, face down in a tightly-flexed position on a thin-beamed wooden pallet, likely fabricated for the occasion. Immediately above the articulated male was a thin bed of largely dispersed and extremely fragmentary human bone and teeth. Well-cobbled ground stone tools were recovered within the bone bed. This practice is not unique to the region: cobbles were used to cover flexed skeletal remains as early as the Initial Period in Andahuaylas (ca. 2000 BC–250 BC) (Grossman 1972).

Wari Style Grave Goods at Turpo

Several other classes of material artifacts recovered during excavation phases suggest Wari's influence was pervasive in western Andahuaylas. High-quality Vinaque, Wamanga, and late phase Epoch 2 Huari style pottery (see Menzel 1968:143-44) are present in mortuary contexts along with locally produced vessels emulating Wari motifs. Excavations also uncovered high-status Wari goods including a figurine pendant depicting an elite, collared individual wearing a four-cornered hat with crossed arms (Ochatoma 2007: 203-204) and pupil-less eyes (Cook 1992) (Fig. 5.1). Furthermore, a

fragment of a Wari face-neck jar near the aperture of the Mina salt mine at Cachi depicts an individual very similar to Wari Agent 102 (Knobloch 2002). This individual has black hair and sideburns and colored rectangular motifs on the cheeks. Knobloch (2002) argues that this individual played an integral role in the proselytization and subjugation of distant regions during Epoch 1B/2 (ca. AD 700). The appearance of Agent 102 and the Epoch 2 Wari pendant at Cachi (Knobloch personal communication 2012), as well as the presence of Middle Horizon Andahuaylans buried with objects that conform to Wari international tastes and styles (Isbell 2008:739) confirm that mortuary behavior was altered by Wari's presence.



Figure 5.1. Material evidence of Wari influence in Andahuaylas

Radiocarbon Dates at Turpo

In order to determine the *terminus post quem* of interment in the circular stone-lined tomb, a sample of wood from the burial pallet that was directly beneath the fully articulated apical male was selected for AMS radiocarbon dating. The sample (Beta-318796) was dated to cal. AD 880–990 (2σ), placing it squarely in the twilight of Wari's imperial existence during the later Middle Horizon (see Figure 5.4, Table 5.1).

Excavation Results: *Machay* Characteristics in Andahuaylas

Machays are located on the skirts of natural rocky exfoliations and cliff sides and necessarily conform to the natural topography. *Machays* are found both outside archaeological domestic settlements and within them. Spatial dimensions conform to the natural geomorphology, but internal wall divisions are sometimes built within the confines of larger caves. Smaller *machays* are hewn from the bedrock. Caves may be eventually sealed with boulders, and will often have thin, prepared earthen floors, and a stone bench or lip that runs across the aperture. Sometimes the stone benches extend in front of the cave aperture, outlining a rectangular or parabolic activity area. Feasting activity in these areas is inferred by the presence of butchered camelid remains and intentionally fractured large *chicha* beer *ollas* (vessels) (see Duviols 1986).

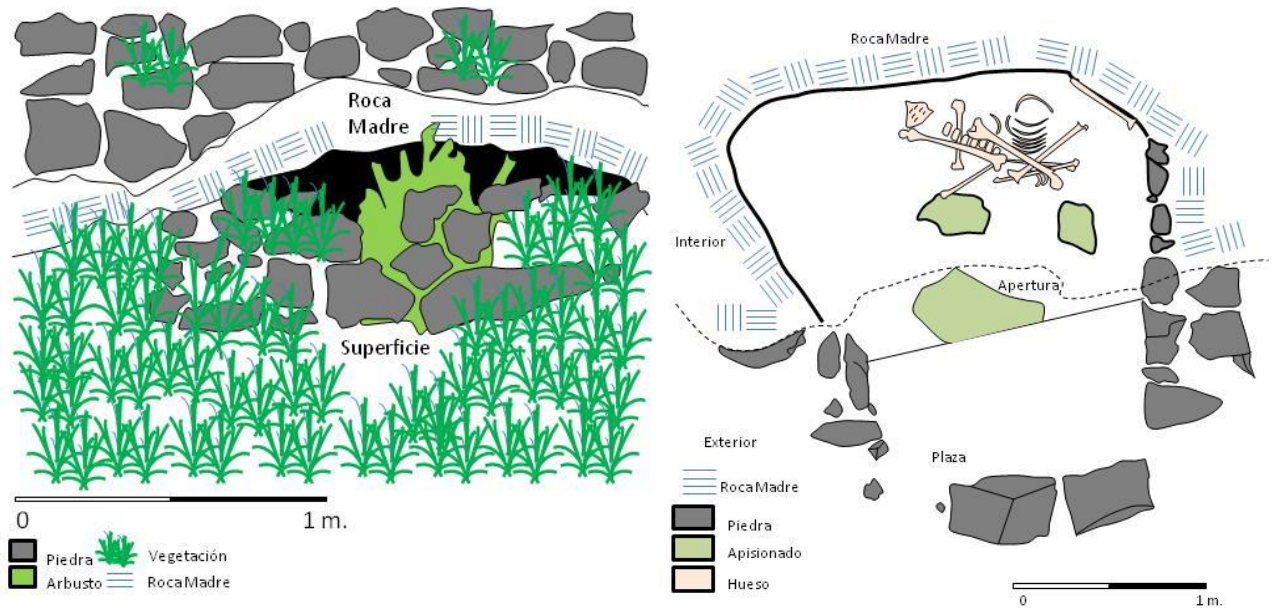


Figure 5.2. Anterior view (left) and plan view of Masumahcay Cave 2, Cachi Site.

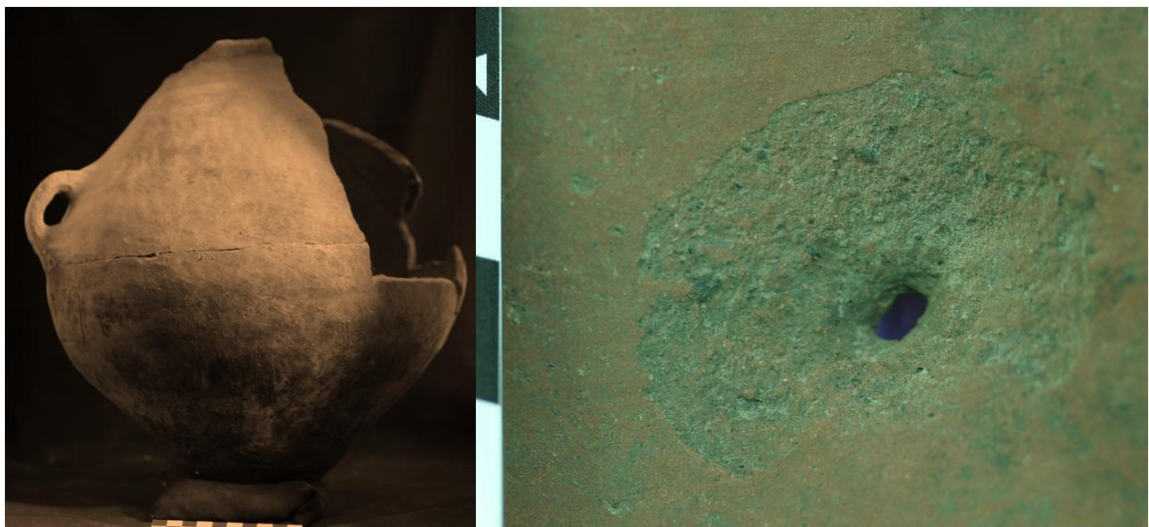


Figure 5.3. One of several partially reconstructed *chicha* vessels recovered from the aperture of a *machay* (left); intentional, acute dashing leaves an impact scar on the vessel interior (right).

***Machay* Grave Goods**

Because human remains were mostly commingled, it was usually not possible to directly associate artifacts with single individuals. Nevertheless, *machays* often contained non-functional miniature vessels. Other classes of artifacts included small personal items like spindle whorls, *tupu* mantle pins, weaving implements, and groundstone tools (see Figure 5.4). These artifacts tend to be associated with female domestic activities (Silverblatt 1987).



Figure 5.4. Late Intermediate Period miniature ceramics



Figure 5.5. Material indicators of female gender affiliation (copper *tupus* and weaving implements) in LIP mortuary contexts

Other classes of artifacts were present as well. Intact *machays* always contained paired stone and metal implements, including *liwis*, *aillos*, and *porras*. While these weapons could have been used for hunting, they are important indirect signatures of warfare and violence (see figure 5.6) (see Nielsen and Walker 2009).



Figure 5.6. Stone weapons excavated from LIP *machays*

Finally, the presence of both fox and puma skulls (without post-cranial elements) were likely used as totemic headdresses¹⁹ (Cobo 1983:133) (see Fig. 5.7). Today, communities in Andahuaylas still maintain this headdressing tradition during yearly festivals.

¹⁹ As Cobó (1983:133) describes it, “On top of [their heads] they wore lion skins. The entire animal’s body was skinned, and their heads were empty. Patens were placed on these heads; rings in their ears, and in place of their natural teeth, others of the same size and shape were used with *alijorcas* [sequins] on their paws.... These skins were worn in such a way that the head and neck of the lion came down over the head of the person wearing it and the animal’s skin came down over the person’s back.”



Figure 5.7. Totemic animal affiliation. Fox and puma skulls from *machays* (left) and modern use of curated animals to denote community affiliation in Andahuaylas

Some classes of artifacts in *machays* may pertain to collectives, and not individuals. For instance, several camelid-shaped *conopas* (talismans) were recovered from *machays* (see Fig. 5.8). Although Sarmiento (2007) says llama *conopas* are an “insignia of nobility,” Betanzos (2004:109) sees them as an indicator of occupation,²⁰ while Arriaga ([1621] 1968:29) relates that llama *conopas* are used to assure the increase of herds. His account further suggests that the use of a specific *conopa* was limited to a single lineage. According to Arriaga (*ibid.*), “the worship of *conopa* is secret and private for the members of a household, and the small totems are passed from father to first-born son.” The presence of *conopas* in Chanka mortuary contexts may indicate that individuals collectively buried within *machays* may have not only shared occupational responsibilities (like camelid herding), but may also be kin, specifically patrilineal lineages.

²⁰ Betanzos (2004:109) writes, “Those who raised livestock were to have an insignia of it hanging on their door, such as a sheep’s...jawbone...If the man were a hunter, a fisherman, or a farmer or had any other trade, he should hang on the door of his house some insignia of it.”



Figure 5.8. Llama *conopas*, indicators of male corporate group identity

Mortuary contexts during the LIP seem to follow common tropes, regardless of moiety (site) or cultural affiliation (Chanka vs. Quichua). Grave goods from LIP *machays* always included functional personal items largely associated with gender or lineage-specific activities. Non-functional artifacts like paired miniature ceramics, possibly curated local carnivore skulls,²¹ and camelid *conopas* were also commonly encountered and suggest social collectives, like clans or patrilineages. Ceramic assemblages from the LIP largely consisted of unadorned utilitarian wares (see Kellett 2010; Gomez 2009 for ceramics assemblage descriptions). Intentionally-smashed *chicha* beer vessels and butchered camelid and guinea pig remains at and in front of cave apertures point to feasting within benched-in activity areas.

²¹ Strontium isotope testing on two fox (*culpeo*) skulls revealed local (western Andahuaylas) values (Lofaro et al. 2011).

Radiocarbon Dates from the *Machays*

In order to reconstruct the chronology of cave use in Andahuaylas, samples for radiocarbon dating were collected from *machays* at Cachi, Ranracancha, and Pucullu. At the looted caves of Pucullu and Ranracancha, tooth samples were recovered from human crania on the surface of the cave, but well within the aperture. Remains at Ranracancha (Beta-323933) were AMS dated to AD 1160–1260 (2 σ), while a tooth from a skull in the *machay* at Pucullu (Beta-323932) yielded a date of AD 1170–1270 (2 σ). These dates place the lower moiety Chanka site (Ranracancha) and the Quichua enclave (Pucullu) squarely in the early Late Intermediate Period.

At Cachi, samples were recovered from three sectors: Mina Cachihuancaray, Masumachay, and Sonhuayo. Of two caves excavated at Mina Cachihuancaray (“Mina”), Cave 1 was intact and sealed, and Cave 2 was open and looted. At Cave 1, excavation stratigraphy, floor preparation, and artifactual data suggest the *machay* was first used during Middle Horizon Epoch 2. A piece of charcoal (Beta-323924) and a loose tooth (Beta-323925) embedded in the corner of a cleaned prepared earthen floor at the deepest part of Mina Cave 1 were dated to AD 690–880 (2 σ) and 805–973 (91.1%), respectively.

After the deposition of the charcoal and tooth, a layer of sterile fill and a new stamped earthen floor were laid out. Human remains were then collectively interred. In other words, the cave was systematically cleaned out and repurposed sometime between the terminal MH and early LIP. A tooth from a young adult female with modification (Beta-323926) eroding out of the aperture of the Mina Cave 1 yielded a radiocarbon date of AD 1306–1430 (2 σ), the late LIP. Given the AMS dates and archaeological stratigraphic features, most individuals in Mina Cave 1 were interred after the 11th

century, but before the 14th century AD, in other words, during the early-middle Late Intermediate Period. In addition to AMS radiocarbon data, and evidence of repurposing after MH2, ceramics recovered from Mina Cave 1 conform to early Chanka styles and assemblages recovered from other early LIP *machays*. Thus, skeletal remains from this cave were included with the rest of the early LIP sample.

The second *machay* investigated in the Mina sector was Mina Cachihuancaray Cave 2 (a cave locally known as *Pukamachay*). This large natural cave is located right next to the Cachi salt mine. Although the cave has been looted, an interior dividing wall demarcated “apical” and “aperture” sectors. From the deepest (apical) sector of the cave, under a rock fall, we recovered one unmodified, uninjured young adult female cranium. A tooth extracted from the cranium (Beta-323928) was dated to AD 776–966 to (2 σ), the twilight of the Middle Horizon. Given its isolation, this cranium was not included in the analysis of other Middle Horizon-era remains (all from Turpo). Finally, a tooth (Beta-323927) from one of the last-buried individuals near the aperture of the cave yielded an AMS date 1160–1260 (2 σ). This individual had both cranial modification and trauma. Results indicate that the cave was primarily utilized during the terminal MH and early LIP. The long period of *machay* use in Mina overall is most likely due to the nearby salt mine. At Mina Cachihuancaray, unlike other sectors, using the same cave over several centuries (not decades) may have been a way to maintain ownership claims over salt extraction.

At Masumachay Sector, samples were recovered from two intact caves. At Masumachay Cave 1, a rib fragment from a semi-articulated headless individual (Beta-323931) were AMS dated to AD 1320–1440 (2 σ). Other than 25 minuscule vault

fragments, there were no diagnostic crania. As such, this cave was excluded from analysis in the present study.

At Masumachay Cave 2, excavations yielded a similar pattern to Mina Cachihuancaray Cave 1. In this case, Wari artifacts were embedded in the deepest recesses of a clean prepared floor that had been covered with sterile fill and tamped down to create another earthen floor. Human remains were subsequently entombed over the preexisting floor. This pattern of cleaning out and repurposing caves may have been common at Cachi. AMS dates from the apical individual, buried on top of the repurposed floor in Masumachay Cave 2 (Beta-323929) was dated to 1123–1257 (85%). The individual buried nearest to the mouth of the *machay* (Beta-323930) had an AMS date of 1170–1270 (2 σ).

At Sonhuayo Sector in Cachi, samples were collected from caves located inside the agglutinated fortified hilltop settlement. Remains sampled consisted of well-articulated axial and appendicular skeletal elements that had not been disinterred or shuffled about within cave confines. A molar from a partially articulated individual laid to rest on a prepared earthen floor in the deepest part of Cave 2 was selected for AMS dating (Beta-310951). The date of interment for this apical individual is AD 1123–1257 (85%). The second radiocarbon date (Beta-310874) comes from a partially articulated individual interred in the middle of the *machay*. Charred material associated with this “middle” individual (possibly from his mummy bundle) was AMS dated to AD 1160–1260 (2 σ). Finally, a tooth sample was collected from the last person buried in Cave 2 before the remains were permanently entombed with a large boulder. This “aperture” cranium (Beta-323934) dates to AD 1260–1290 (2 σ).

Results from Sonhuayo Cave 2 demonstrate that there is almost complete temporal overlap between the deepest-buried individual and the last-buried individual. Remains may be contemporaneous, or at most, represent about a century of use; over 5 dozen people were entombed within an area of around 10 cubic meters, between the mid-12th and mid-13th century AD. Rather than centuries of unimpeded use, these dates show that *machay* utilization may have been more tightly circumscribed than previously considered.

At Sonhuayo Sector Cave 1 (Cachi Site), at least 26 people were interred in a *machay* which lies about 4 meters east of Sonhuayo Cave 2. A sample of rib from the deepest-buried, apical individual was collected for AMS radiocarbon analysis (Beta 310950). The sample was dated to cal. AD 1220–1280 (2 σ). This date is somewhat later than neighboring Sonhuayo Cave 2.

Finally, Sonhuayo Cave 4 lies about eight meters east of Cave 1. This *machay* was somewhat unique in that it consisted of only one fully articulated old adult female and the highly fragmentary remains of seven sub-adults. Ceramics from this burial consisted of both Chanka and provincial Inca-style ceramics. Because of the presence of Inca ceramics, these remains were not included in the present study. AMS dates on the metatarsal of the old adult female came out to AD 1450–1640 (2 σ). The absence of Colonial artifacts strongly suggests this *machay* was sealed before ca. AD 1532. While more dates are needed to draw firm conclusions, cave use at Sonhuayo may have been staggered: new *machays* were created when old ones filled up after about five to six generations.

Excavation and radiocarbon results from Cachi demonstrate that: 1) caves were repurposed after Wari collapse, 2) caves were the primary form of inhuman during the early Late Intermediate Period, 3) caves were used only for about a century (five-to-six generation), and 4) cave use appears to be staggered.

Table 5.1. Radiocarbon Dates

Lab code (Beta Ana.)	Burial Code	Site Sector Cave	Location	Material	$\delta^{13}\text{C}$	^{14}C Age (Years BP)	2σ (AD)
318796	Tqr.01.01.01	Turpo, Qatun Rumi Tomb 1	Apical	Wood	-26.0	1110 \pm 30	880–990
310951	Son.02.04.57	Cachi, Sonhuayo Cave 2	Apical	Tooth	-8.3	860 \pm 30	1123–1257
310874	Son.02.02.12	Cachi, Sonhuayo Cave 2	Middle	Charcoal	-24.6	840 \pm 30	1160–1260
323934	Son.02.02.05	Cachi, Sonhuayo Cave 2	Aperture	Tooth	-10.3	730 \pm 30	1260–1290
310950	Son.01.Rinco	Cachi, Sonhuayo Cave 1	Apical	Bone	-10.8	770 \pm 30	1220–1280
323935	Son.04.01.2008	Cachi, Sonhuayo Cave 4	Aperture	Bone	-13.6	340 \pm 30	1450–1640
323924	Mch.01.01.xx	Cachi, Mina CH Cave 1	Apical	Charcoal	-22.9	1230 \pm 30	690–880
323925	Mch.01.01.xy	Cachi, Mina CH Cave 1	Middle	Tooth	-17.0	1150 \pm 30	805–973
323926	Mch.01.03.02	Cachi, Mina CH Cave 1	Aperture	Tooth	-11.8	560 \pm 30	1306–1430
323927	Mpm.01.13.xx	Cachi, Mina CH Cave 2	Aperture	Tooth	-13.5	850 \pm 30	1160–1260
323928	Mpm.01.01.16	Cachi, Mina CH Cave 2	Apical	Tooth	-14.4	1170 \pm 30	776–966
323929	Msm.02.xx.xx	Cachi, Masumachay Cave 2	Aperture	Tooth	-13.4	860 \pm 30	1123–1257
323930	Msm.02.01.xx	Cachi, Masumachay Cave 2	Apical	Bone	-14.7	810 \pm 30	1170–1270
323931	Msm.05.01.01	Cachi, Masumachay Cave 5	Aperture	Bone	-10.8	530 \pm 30	1351–1440
323933	Rcc.01.01.04	Ranracancha Ayamachay, Cave 1	Aperture	Tooth	-13.6	850 \pm 30	1160–1260
323932	Pcu.01.01.26	Pucullu, Manchaybamba, Cave 1	Aperture	Tooth	-12.1	810 \pm 30	1170–1270

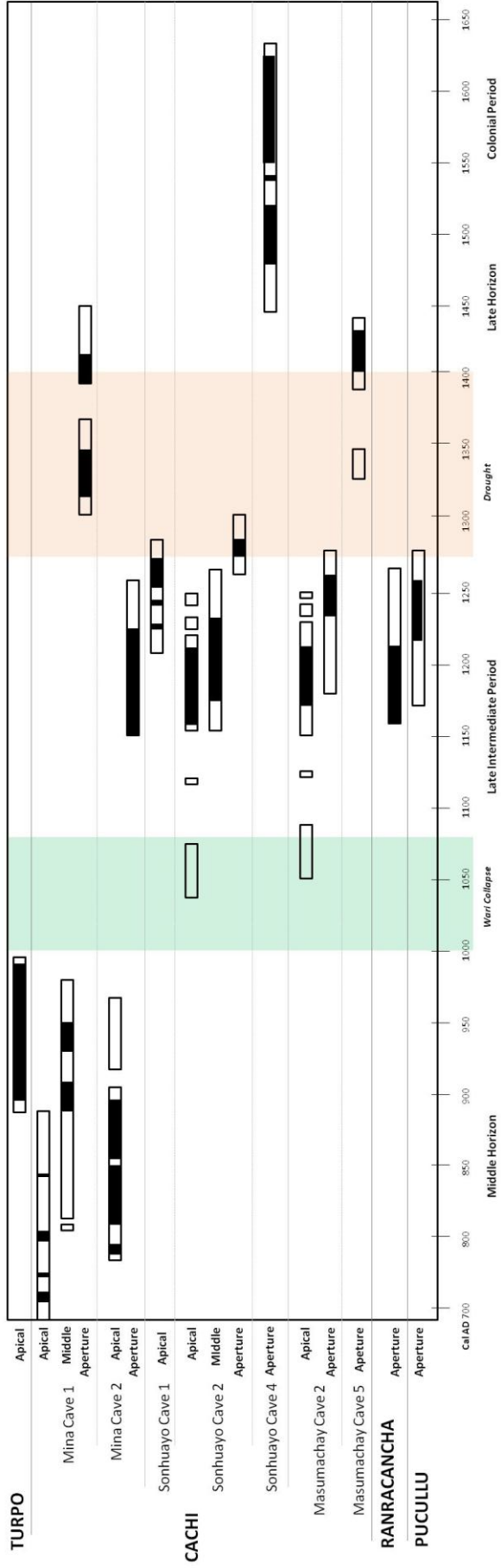


Figure 5..9. Radiocarbon dates from this study (black =1σ, white =2σ)

Table 5.2. Tomb/ *machay* trends by site

Site	No. Mortuary Contexts	Adults & Juveniles	Males & Females	Modification & No Mod	Trauma & No Trauma	Pathological Cranial Lesions & No Lesions
Turpo	1	Yes	Yes	No	Yes	Yes
Cachi	14	Yes	Yes	Yes	Yes	Yes
Ranracancha	1	Yes	Yes	No	Yes	Yes
Natividad	≥1	Yes	Yes	Yes	Yes	Yes
Pucullu	1	Yes	Yes	Yes	Yes	Yes

Trends in *Machay* Mortuary Practices

In Andahuaylas the dead were embalmed before being entombed in *machays*. There are several data sets that support this assertion. First, the interior dimensions of a roughly six-cubic-meter cave would simply not hold the fleshy bodies of some five dozen individuals. Moreover, *machays* were often located near (and sometimes upwind) of houses. Individuals collectively entombed in humid caves, at different stages of decomposition, would have created a potential health crisis. Second, there are dozens of intact mummies on display in various community museums throughout Apurimac. These mummies were eviscerated, and the knees were tucked into the emptied thoracic cavity. Corresponding cutmarks were observed on the visceral side of ribs, likely caused when a practitioner separated the pleura from the ribs (Schneider et al. 2012).

Machays were used for the inhumation of curated, flexed mummy bundles which decompose over time. They were not used for primary inhumation. There are several key taphonomic indicators which suggest that mummification/body curation contributed to

delayed burial and secondary interment. These indicators include the presence of pupal casings in most crania and sedimented mud (distinct from cave soil) in many others. There is also some evidence of animal gnawing by small (rodent-sized) mammals. Most bones with gnaw marks are sub-adults. Poorly preserved remains of mummy bundle material (*ichu* grass and plain-weave body-wrapping textiles) are prevalent within burial caves. The addition, removal, or repositioning of decaying mummy bundles likely contributed to the thorough commingling of *machay* remains.

Overall, Andahuaylan mortuary practices clearly demonstrate the maintenance of old (Wari) and new, post-imperial traditions. Signs of lingering continuity are clear: MH2 and early LIP burials both contain ceramic and lithic assemblages, which included paired miniature objects like *ollas* and bottles (see Tung and Owen 2006). Furthermore, the Middle Horizon tomb and the LIP *machays* all contained articulated, first-buried “apical” individuals and commingled secondary burials. Articulated axial and appendicular skeletal elements of “apical” individuals indicate limited post-depositional alteration (Duday 2009). The apical individuals were always buried either face down, or facing the back of *machays*. That these ancestors gaze into the earth, and not out in the direction of the living, may inform on the nature of power that was imbued in the skeletal remains; the obligation of the ancestor was directed towards productive, fertile soil, ensuring a successful cultivation and harvest (see Harris 1982; Allen 1992), rather than towards devotional progeny gathered outside cave apertures or tomb walls.

However, several key categories of artifacts suggest that LIP people did not retain the majority of Wari mortuary ideology. Importantly, no stone-lined circular tombs from the LIP have been reported in Andahuaylas or the greater Pampas region. *Machays*,

which may have been used during the Middle Horizon, were subsequently cleaned out and repurposed after Wari collapse. The waning influence of Wari is further evinced by the rejection of imperial iconography and ceramic styles in mortuary contexts. In stark contrast to Wari's exquisite polychromes with Viñaque iconography, LIP ceramic assemblages in *machays* are unslipped, unadorned, and brusquely fabricated. All told, these results hint at nuanced transformations in burial traditions, and signal the genesis of a novel mortuary ideology in post-imperial Andahuaylas.

Results: Osteological Indicators of Community Organization in Andahuaylas

Skeletal remains represent the dead, not the living (Wood et al. 1992; Milner et al. 2000; Sattenspiel and Harpending 1996; Paine and Harpending 1983; Wright and Yoder 2003; Bocquet-Appel and Masset 1982; DeWitte and Wood 2008:1436). However, previous scholarship has demonstrated that the demographic profile of skeletal populations can inform on social structure and community organization. Usually, the force of mortality forms a U-shaped curve (also called the “bathtub curve”), with the very young and the very old representing the majority of the dead. When skeletal populations are further separated into age categories, mortality profiles in healthy populations often form a pattern known as the backwards-J curve (Weiss 1973). In this pattern, there is a high percentage of infants and children in the burial sample, proportionally few juveniles and young adults, and a higher percentage of middle and old adults. These normal “attritional” mortality patterns are common in healthy, peaceful populations. However, catastrophes like sustained violence, war, famine, and disease can lead to lowered

fertility, higher infant mortality, excess mortality for adults in their prime, and even mass population die-offs.

In Andahuaylas, Wari state collapse may have altered community organization during the subsequent post-imperial era. By analyzing and comparing other sex and age-at-death profiles of skeletal populations during the Middle Horizon (the Wari era) and Late Intermediate Period, we can reconstruct the demographic profiles of caves and communities. Understanding *who* or *what types* of people were buried together can thus shed insight on the social rules and social perceptions that governed practices of *machay* interment.

A crucial question in this study is whether burials represent the once-living community or rather selective mortuary populations. If caves are indeed reflections of the once-living population, then we may draw tentative conclusions about mortality and fertility in the ancient past. However, there are several conditions that have to be met in order to determine what sort of social or biological organization is reflected by cave collectivity.

First, it appears that the Andahuaylas population, both during the late Wari era, and during the early LIP was relatively stationary. While there are some in-migrants, there was no major population replacement during the post-imperial era (Chapter 9). In other words, much of the population was homeostatic (Wood et.al. 1992:344). Furthermore, diverse population sub-groups (males, females, adults, children, modified individuals, the injured, etc.) were all interred together (see Table 5.2 above). That is, certain categories of people and certain causes of death apparently did not restrict burials in *machays* (see Jackes 2011). Finally, several intact mortuary contexts (Sonhuayo 1,

Sonhuayo 2, Mina 1, Masumachay 1, Masumachay 2 [all from Cachi], and Turpo 1) were all completely excavated, providing a robust skeletal sample amenable to analysis.

Because remains are commingled, it was not possible to use multi-factorial aging methods on single (articulated) skeletal individuals. Age estimates from different skeletal features on the same individual would allow for more precise age-at-death estimations than is possible with the current sample. The nature of the skeletal sample thus necessitated the use of broad age categories and separate MNIs for cranial and post-cranial remains. Consequently, this dissertation does not focus on population dynamics and mathematical modeling on a population scale, but rather on the cultural constraints of mortuary collectivity. Future paleodemographic research might focus on the probability distribution of lifespans (ages-at-death) among this ancient population (Hoppa and Vaupel 2002; Paine and Harpending 1996; Sattenspiel and Harpending 1983; Milner et al. 2008). Nevertheless, there are several initial conclusions we can draw from the demography data in order to evaluate how Andahuaylan community organization was impacted by Wari fragmentation.

Age Distribution within the Andahuaylas Sample

The age-at-death distribution of crania at each site are presented in Table 5.3 below. At Turpo, the Wari-affiliated MH2 site, 27.7% (10/36) of individuals are sub-adults under the age of 15, while at Cachi, 8.4% (15/177) of the cranial MNI consists of infants and children. However, because the cranial bones of the very young tend to disarticulate and fragment, the post-cranial MNI is a more accurate representation of the ratio of juveniles to adults (see below). At the contextually problematic Natividad

Museum, 18.5% (5/27) of the skeletal collection is under 15 years old. At Ranracancha, 11.9% (5/42) of the crania are infants and children. Finally, at Pucullu, the Quichua enclave, 35.3% (12/34) of individuals were under the age of 15 (see Figure 5.8). The change in infant/child to adult cranial representation between MH2 and the early LIP is not significant ($\chi^2=1.510$, $p=0.1096$ (one-tailed), $d.f.=1$, $N=317$).

Table 5.3. Age distribution of crania.

Site	Neonate-Infant (<0-3)	Child (4-14)	Juvenile (15-19)	Young Adult (20-34)	Middle Adult (35-49)	Old Adult (>50)	Adult (20-50+)	Total
Turpo	3 (8.3%)	7 (19.4%)	0 (0%)	11 (30.6%)	6 (16.7%)	3 (8.3%)	6 (16.7%)	36
Cachi	1 (0.6%)	14 (7.9%)	9 (5.1%)	49 (27.7%)	58 (32.8%)	18 (10.2%)	27 (15.3%)	176
Ranracancha	0 (0%)	5 (11.9%)	5 (11.9%)	14 (33.3%)	14 (33.3%)	3 (7.1%)	1 (2.4%)	42
Natividad	1 (3.7%)	4 (14.8%)	1 (3.7%)	8 (29.6%)	12 (44.4%)	1 (3.7%)	0 (0%)	27
Pucullu	0 (0%)	9 (26.4%)	3 (8.8%)	6 (17.6%)	12 (35.3%)	4 (11.8%)	0 (0%)	34
<i>Total</i>	5	39	18	88	102	29	34	315

It is important to note that at Pucullu, Natividad, and Ranracancha, caves were looted, and although all crania were recovered, all post-cranial remains could not be collected. Consequently, because those sites present significant biases, they were excluded from subsequent demographic analysis, and only intact contexts from Turpo (MH) and Cachi (LIP) were used to draw inferences on community organization in Andahuaylas.

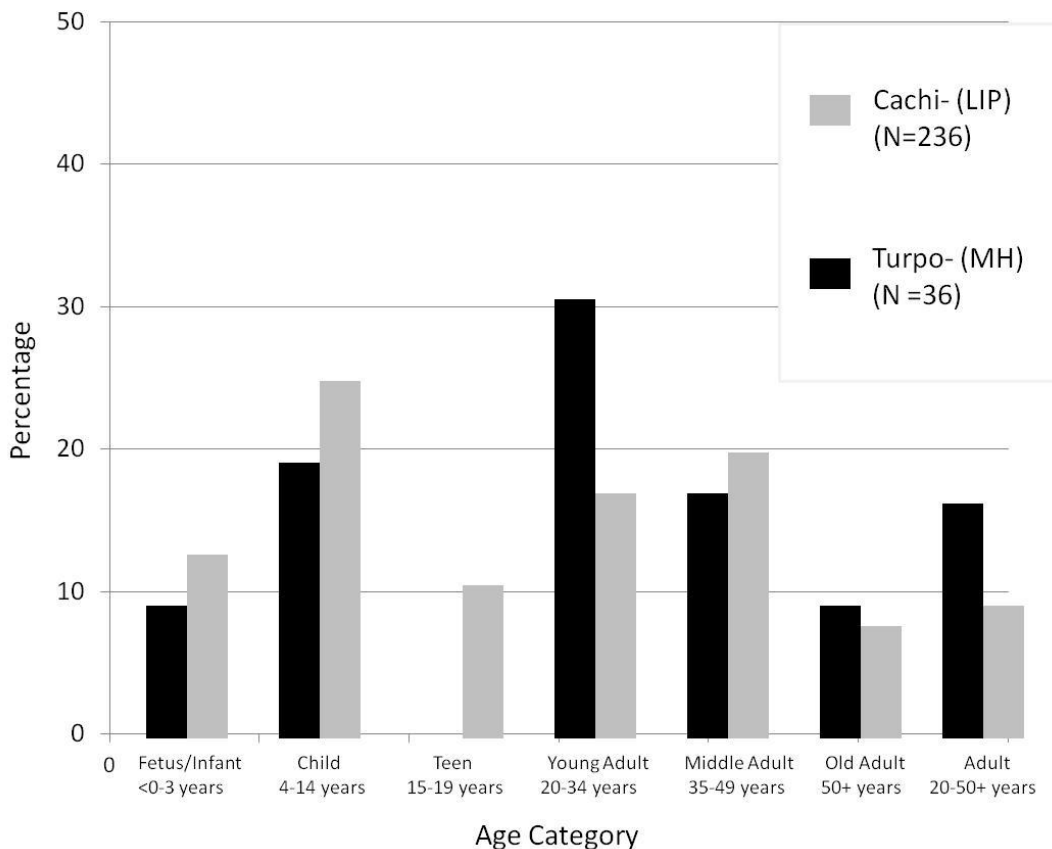


Figure 5.10. Age-at-death distribution for Turpo and Cachi based on cranial and post-cranial skeletal remains

For intact caves at Cachi and the tomb at Turpo, the number of crania was compared with the post-cranial MNIs. Ages-at-death for this population were determined by synthesizing data gleaned (when possible) from pubic symphyses and auricular surfaces, and stages of epiphyseal union on long bones (see Buikstra and Ubelaker 1994; Brooks and Suchey 1990). Skeletal assemblages from intact contexts demonstrate that peri/neonates, infants, and children actually make up 27.7% (10/36) of the skeletal population at Turpo (MH) (from one tomb) and 36.9% (87/236) at Cachi (LIP) (from five *machays*). Notably, the proportion of neonates/infants and children to teens/adults does

not change significantly between the late Wari era and the early LIP (Fisher's exact, $p=0.3522$; d.f.=1; $N=272$).

Sex Distribution within the Andahuaylas Sample

The number of sexed adult males and females for each mortuary sample are presented in Figure 5.10 and Table 5.4. Of 15 sexed adults at Turpo, the MH2 site, there were 10 males (67%) and 5 (33%) females. At Cachi (LIP Chanka), 65/139 (47%) crania were male, and 74/139 (53%) were female. At Ranracancha (LIP Chanka), 19/36 (53%) of the sexed adult population was male and 17/36 (47%) was female. At Pucullu (LIP Quichua), there were 25 adults, composed of 15 (60%) males and 10 (40%) females. Finally, the Natividad Museum consists of 22 adult crania, with 17 (77%) males and five (23%) females. In total, 126/242 (52%) sexed adult crania were male, and 116/242 (48%) were female, a male-to-female ratio of 1.08:1. The ratio of males to females is not significantly different at distinct sites, nor is it significantly variable over time.

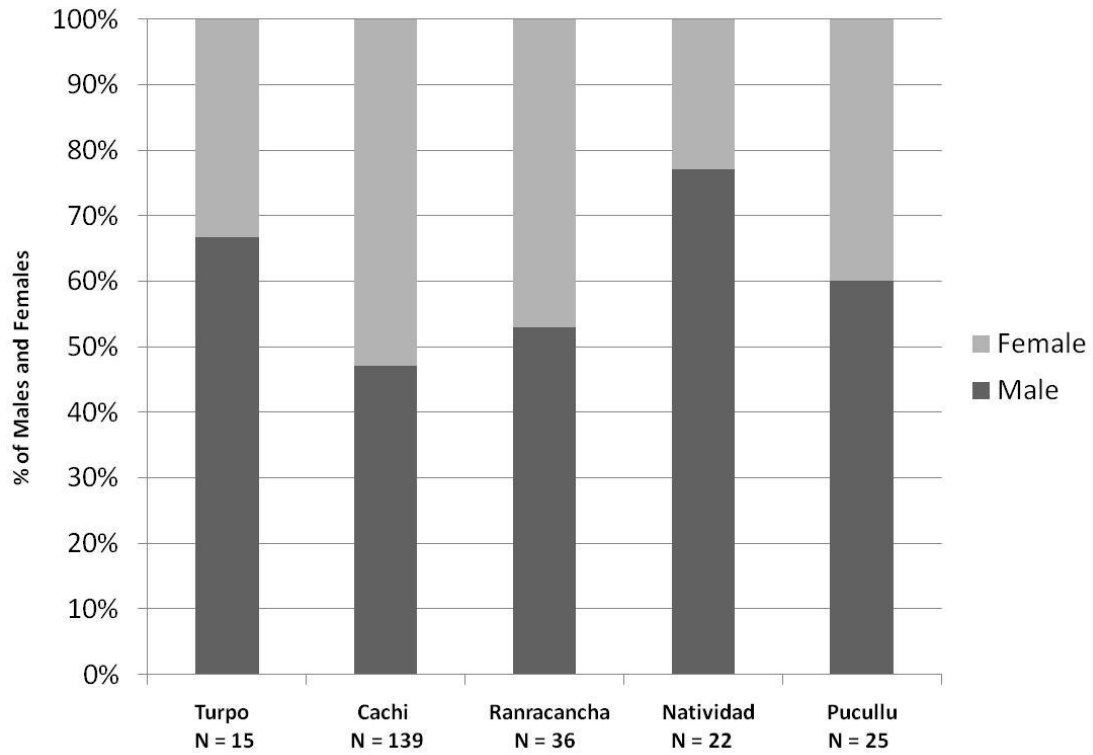


Figure 5.11. Male and Female Sex Distribution

Table 5.4. Sex distribution by site

Site	Era	Affiliation	Males	Females	Male:Female
					Ratio
Turpo	MH	Wari	11	5	2.2:1
Cachi	LIP	Chanka	65	74	.9:1
Ranracancha	LIP	Chanka	19	17	1.1:1
Natividad	LIP	Chanka	17	5	3.4:1
Pucullu	LIP	Quichua	15	10	1.5:1
<i>Total</i>			127	111	1.1:1

Discussion: How Mortuary Practices Structure *Machay* Demographic Composition

Excavations demonstrated that Andahuaylan mortuary practices, in general, shifted between the later Middle Horizon and early Late Intermediate Period. Radiocarbon dates and material culture data indicate that during the Middle Horizon, individuals were interred both in *machays* and in fabricated semi-circular tombs. However, sometime between AD 1000–1050/1100, *machays* were cleaned out and repurposed. Only a few isolated skeletal elements and artifactual fragments evaded extirpation. Subsequently, caves were used exclusively to inhumate the dead: there is no evidence of formal burials under house floors or in other domestic contexts (Gomez 2007, 2009; Kellett 2010). Given these mortuary practices, a crucial question remains: What sort of social or biological collectivity is represented in *machays*?

Age-at-Death Profiles in the Post-Imperial Era

The large percentage of infants and children in the demographic profile from LIP Cachi suggests that *machays* collectively seem to reflect the once-living population. But, in some individual caves, there are relatively few sub-adults. Why might this be? Either juveniles are surviving into adulthood, taphonomic processes are degrading infant bones, or sub-adults are being buried elsewhere due to differential mortuary treatment. In other words, the proportion of sub-adults to adults in the burial sample (Jackes 2011:111) may be the result of social/cultural biases, which restricted interment in *machays* to specific age classes.

The presence of some (but not all) sub-adults in caves may have been structured by birth order or sex (Scaletta 1985). Among late prehispanic communities, first-born

sons were fêted by kin and community and may have had sole rights for *machay* burial among offspring (see Skar 1982; Urton 1999). It is also possible that children afforded burial in *machays* may have completed a rite of passage for entry. Naming ceremonies were an integral rite during childhood in the Andes (see Poma de Ayala ca. 1615), but such rituals would be delayed until practitioners felt that the child would survive past the occasion. Chronicler Arriaga ([1621] 1968) reported that grieving mothers would periodically revisit the mummies of their children buried in caves and take them back home. No other age category had such a specialized mortuary program. These practices of age restricted interment may account for the observed patterns in the tomb and *machays* in Andahuaylas.

Alternatively, instead of age-restricted interment, the age-at-death profile for the more robust LIP sample from Cachi, closely conforms to demographic trends within populations undergoing “catastrophic” (Margerison and Knüsel 2002:141, Fig. 4) natural or social disasters. The relatively low proportion of fetal, infant, and adolescent skeletal remains in LIP Andahuaylas could be a consequence of a turbulent social milieu, which could have significantly impacted fertility and infant mortality rates, as well as spurred out-migrations and displacement among younger mobile sectors of the population (see for example Cook 1981). For instance, in highland Andahuaylan communities today, juveniles (~15–18 years old) tend to leave local communities to get married and/or participate in labor projects that may take them away from their local communities (Kellett 2009). Given that archaeological evidence from the region indicates increasing population sizes during the LIP in Andahuaylas (Kellett 2010), the relatively low proportion of infants and teens in the skeletal population from Andahuaylas could be due

to a combination of lowered fertility (despite increasing population aggregation) coupled with low infant mortality and late adolescent out-migration during the early LIP (see Margerison and Knüsel 2002:139).

Males and Females Interred Together

Data on sex distributions at different sites in Andahuaylas were examined and compared to evaluate whether tomb or caves were reserved for either males or females. Results indicate that burial in a tomb or a *machay* was not confined to members of a certain sex. On a larger scale, mortuary samples from different sites in Andahuaylas do not deviate significantly from the 1:1 expected sex ratio (50% female, 50% male). Fisher's exact testing demonstrates that males are not significantly preferred for interment relative to females (two-tailed p value=0.7161;d.f.=2; N=242). The interment of both males and females in *machays* would be expected if cave collectivity is structured by patterns of either agnatic *or* cognatic descent. These results also suggest that if males or females are dying away from home, their (mummified) bodies are being brought back and buried in the local communities.

Finally, the overrepresentation of males in the Natividad Museum collection is likely due to sampling bias: local collectors seemed to have preferably recovered crania with trepanations, and trepanations are found almost exclusively on males (see Chapter 8). Male-female ratios are more even at the Chanka sites of Cachi and Ranracancha compared to the the MH2 tomb at Turpo, and the LIP Quichua cave at Pucullu, but not significantly so. Currently, sample sizes are too small to draw definitive conclusions on sex-mediated inclusivity in those mortuary contexts.

Community Organization and *Machay* Use

Although there are many issues that prevent us from determining all the constraints that contributed to new forms of community organization during the LIP, there are several important lines of evidence which suggest something “catastrophic” was occurring in the generations after Wari fragmentation. First, there is a relatively low proportion of infants in the LIP burial population at Cachi. Because child burials have not been uncovered in domestic or other contexts, and because infant and perinate bones are well-preserved in *machays*, the underrepresentation of infants may indicate a disruption of fertility patterns: there may be a low fertility rate. The low proportion of late adolescents in the burial sample from Andahuaylas attests to possible “catastrophic” circumstances in the early LIP. Individuals from this age group tend to be the most independent and mobile, and may have evaded the circumstances which led to the premature death of other age classes in society (Margerison and Knüsel 2002). Of course, it is also highly likely that adolescents survived into adulthood, only to be cut down in adulthood. Finally, the peak in age-at-death in the young adult and younger middle adult age group suggests that individuals are dying during prime productive and reproductive years. The loss of young adults in Chanka communities would have had significant consequences: valuable human labor would be lost and the next generation of offspring would cease to exist. In sum, although selective biases were inevitably present, remains from Andahuaylas appear to represent the population from which they were drawn, which allow us to evaluate the social and biological factors that may structure the characteristics and composition of this archaeological population.

Conclusion: Mortuary Practices and Mortality in Post-Imperial Andahuaylas

The AMS radiocarbon dates from mortuary contexts are reliable, uncontaminated, and confirm temporal associations based on ceramic styles. The circular, stone-lined tomb at Turpo was used during Wari's twilight in Andahuaylas, in the 10th century AD. Although *machay* burial caves may have been used for interment during the later Middle Horizon (ca. AD 700–1000), radiocarbon dates and depositional correlates suggest caves were cleaned out and repurposed during the early LIP. *Machays* then became the primary form of inhumation during the Late Intermediate Period. These temporal trends conform to other studies from the area (Kellett 2010; Bauer et al. 2010), and suggest Wari's influence waned drastically in the decades after ca. AD 1000/1050. Overlapping dates from the first- and last-buried individuals in single caves throughout Andahuaylas indicate *machays* had a tightly circumscribed use-life: perhaps up to a century at most, or around five-to-six generations. Neighboring caves, which appear to have been used sequentially, mirror patterns seen in LIP settlements, where larger sites “budded off” into smaller hilltop sites in order to accommodate increasing aggregation and population growth (Kellett 2010).

Artifactual assemblages also attest to the syncretism of new burial traditions with old ones. The inhumation of mostly utilitarian serving wares, small personal objects, and commingled human remains all appear to have antecedents in the pre-collapse era. The introduction of new tropes in burial assemblages including llama *conopas*, paired weapons, and the absence of complex iconography, suggest renewed devotion towards ancestors and corporate groups, rather than a widespread state religion. Evidence of

feasting and offerings, from intentionally smashed *chicha* vessels to butchered camelid remains, attest to the commitment the living maintained with the dead.

Finally, mortuary demographic profiles suggest that *machays* were used to inhume both males and females and members of all age groups, from fetuses to old adults. *Machays* also contained the remains of individuals both with and without cranial modification, and with and without cranial trauma. Furthermore, individuals both with and without cranial and post-cranial lesions indicative of disease were inhumed collectively. Different types of people, and different classes of death apparently did not restrict burial in a *machay*. The next chapter critically examines how violence contributed to altered demographic profiles, and how experiences of violence were restructured in Andahuaylas after Wari collapse.

CHAPTER VI

TRAUMA

*“Me and my brother against my cousin; me and my cousin against my village;
me and my village against a stranger”*

Pashto Proverb

*“Between tribes there can only be war, and through war, the memory of war,
and in the potentiality of war the relations between tribes are defined and expressed.”*

E. E. Evans-Pritchard (1940:161)

Introduction: Cranial Fractures as Proxy for Violence

This chapter investigates how violent confrontations in Andahuaylas were restructured in the aftermath of the Wari state. Results are presented on trauma frequency, distribution, recidivism and lethality among the Andahuaylas sample. Data are presented on the Turpo burial population, dated to the later Middle Horizon, the era of Wari imperial oversight, while subsequent sections detail results and interpretations from the Late Intermediate Period sites of Pucullu, Ranracancha, and Cachi, as well as the collection from the Natividad Museum. Next, patterns of trauma frequency, distribution, and lethality are compared between Quichua and Chanka cultural groups. Finally, the Chanka sites are critically examined; trauma frequencies and patterning are compared between different age categories, sexes, and modified and unmodified groups.

A Bioarchaeological Approach to Evaluate Violence

Skeletal trauma is a reliable proxy for violence (Walker 2001). Through analysis of injury and fracture patterns, bioarchaeologists can determine: 1) whether an injury was accidental or intentional, 2) the mechanism of death, 3) the lethality of a sustained injury, and 4) the extent of any healing. While factors like age, sex, and health and nutritional status (the latter being dependant on diet and infectious disease [Larsen 1997]) affect the biomechanical response of human bone to external force, all bones will eventually break under enough pressure (Galloway 1999). Because bone fracture patterns are finite (Jurmain 1999), diagnostic patterns of intentional trauma from both archaeological and modern forensic cases can be reliably employed to predict and interpret patterns of violent injury on skeletal remains from ancient Andahuaylas. Classes of morbidity data can then be collated with the demographic profile of an individual (i.e., age, sex, ethnicity) as gleaned through morphological analysis of skeletal remains. This allows us to reconstruct patterns of traumatic injury for specific individuals, societal sub-segments, and ultimately entire populations.

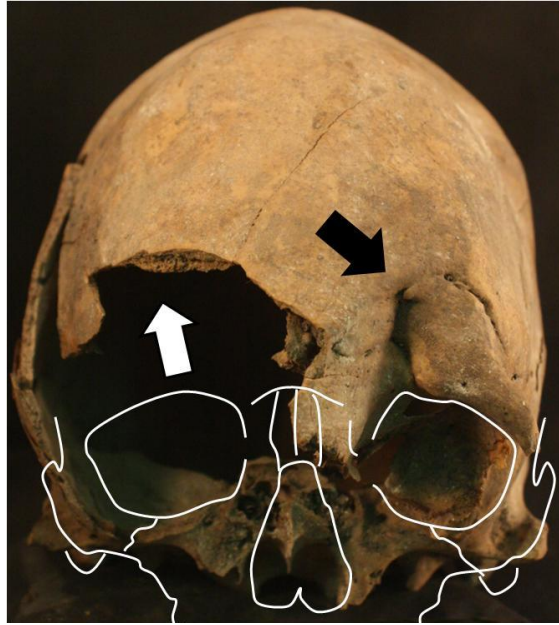


Figure 6.1. Cranium with ante-mortem trauma (black arrow) and peri-mortem trauma (white arrow)

Generally, manifestations of violence in society have been interpreted by scholars as a potent mechanism of subduing, controlling, or even eliminating subordinate populations (Ferguson and Whitehead 1992; Earle 1991; Walker 2001). Yet, populations, or segments therein, may be differentially affected by violence, with distinct, corresponding body parts or regions targeted for trauma. These variations allow bioarchaeologists greater insight into both the motivations of conflict, as well as the biological and cultural responses to force, or the threat of force (Martin and Frayer 1997). Cross-cultural modern and forensic case studies demonstrate that variables like age, sex, and ethnicity can be correlated with specific, standardized patterns of physical trauma (Walker 1997; Horowitz 1985; Lessa and de Souza 2006).

Based on trends documented in historical and modern case studies, the present study hypothesizes that Wari collapse led to increased social tension and violence among

post-imperial populations. Cranial fractures, a proxy for violence, are expected to increase significantly in frequency and lethality between late Middle Horizon and early Late Intermediate Period. Furthermore, although conflict in the post-imperial may have been endemic, it was probably not haphazard. Rather, this study hypothesizes that violence was enacted against specific social groups and mediated by factors such as cultural affiliation, sex, and ethnicity.

Results: Trauma and Violence in Andahuaylas

Trauma by Era and Site

Of 26 late teen/adult diagnostic crania recovered from Turpo, the late Wari tomb, only two (7.7%) had traumatic injuries. Within the early LIP population, 56.7% of late teen and adult crania have at least one traumatic cranial wound (138/243). Thus, violence increases significantly from the Wari era to the post-imperial era (Fisher's exact, $p < 0.0001$; $N = 269$).

Trauma also becomes significantly more lethal after Wari collapse (Fisher's exact, $p = 0.0036$, $N = 269$). There are no late teen/adult individuals with peri-mortem fractures at Turpo (MH) (0/26). However, at the LIP sites Pucullu, Natividad,²² Ranracancha, and Cachi, 53/243 (21.8%) late teens/adults have at least one lethal wound. In other words, lethal trauma contributed to the death of over a fifth of all individuals in LIP Andahuaylas. Given that remains at Turpo were dated to the late 10th century AD,

²² While data from the poorly contextualized Natividad sample may be biased, trauma frequencies and wound distribution patterns conform closely to other contemporaneous sites. Due to this concordance, the sample is still included in the current analysis and discussion.

and the Late Intermediate Period contexts date to the late 11th through early 13th centuries, this dramatic change in trauma frequencies occurred, minimally, within the span of several generations.

Table 6.1. Total teen/adult trauma rates.

Site	Era	Cultural Affiliation	Cranial MNI	(n) Trauma	% Trauma	Total # Wounds
Turpo	MH	Warified	26	2	7.7%	4
Natividad	LIP	Chanka	19	10	52.6	12
Ranracancha	LIP	Chanka	37	23	62.1%	46
Cachi	LIP	Chanka	162	84	51.9%	163
Pucullu	LIP	Quichua	25	17	68.0%	32
<i>Total</i>			269	136	50.6%	257

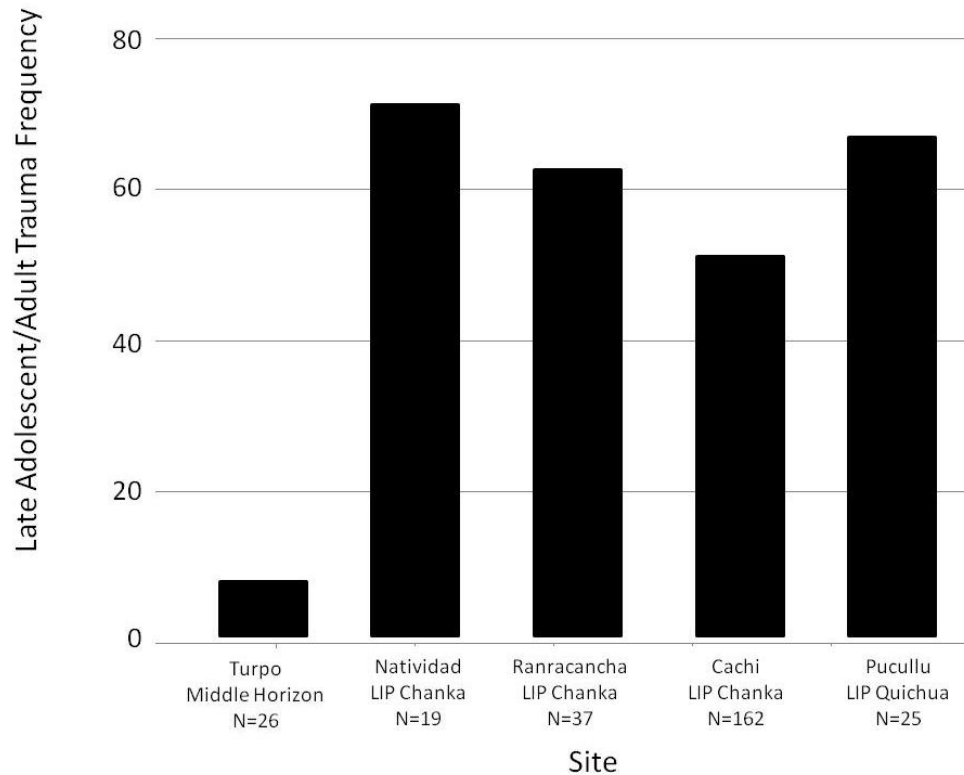


Fig.6.2. Total trauma frequencies by site

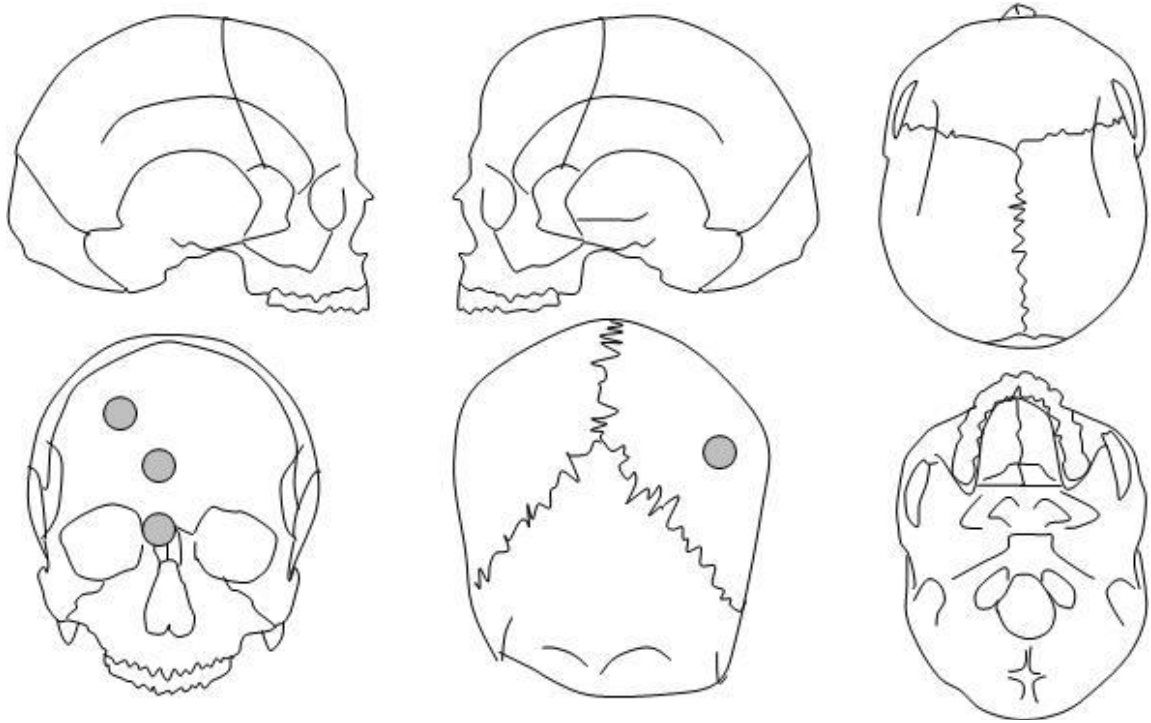


Figure 6.3. Total cranial trauma lethality and distribution during the Middle Horizon (grey = ante-mortem).

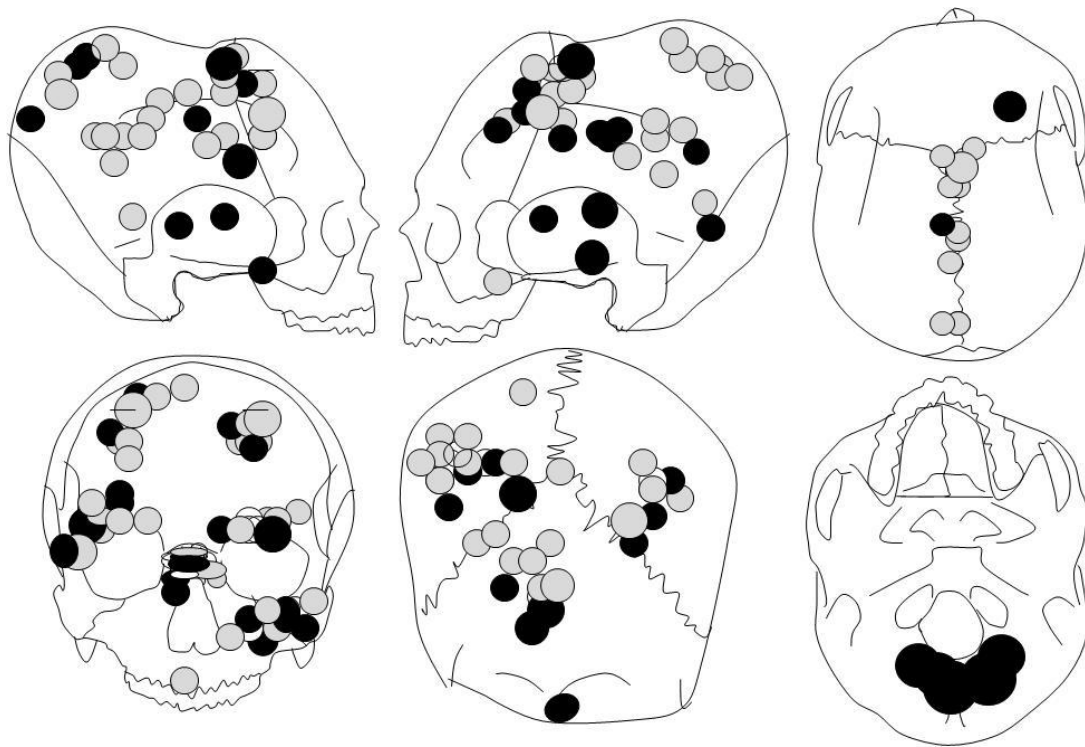


Figure 6.4. Total cranial trauma lethality and distribution during the Late Intermediate Period (grey = ante-mortem; black = peri-mortem).

Defensive Wounds or Accidental Injury: Post-Cranial Trauma Over Time

Head wounds are often the results of intentional violence, while post-cranial injuries are usually the results of accidents (Walker 2001). However, post-cranial injuries that may have been received at the same time as the cranial trauma may be evidence of defensive wounds, and can inform on the motivations for attack (Tung 2012). To confirm that the Chanka were not just an “accident-prone” society, post-cranial fractures are compared between Turpo and Cachi. These two communities—one from the Wari imperial area and the other from the post-imperial era—are located on opposite sides of the same mountain ridge. Conceivably, these communities were both exposed to the same potential risks from accidents arising from walking and working within a difficult topography. In this study, fractures of the distal fibula (the lateral lower leg bone) were compared over time, because the etiology of fibular fractures²³ (“broken ankles”) tend to be accidental among modern rural populations in Andahuaylas (Olga Gomez, RN, Andahuaylas Regional Hospital, personal communication 2011; see Donaldson et al. 1990:244).

In contrast, previous bioarchaeological research has consistently demonstrated that in violent encounters, injuries to the hands, lower arm bones, and ribs are among the best indicators of violence. These post-cranial wounds tend to occur when victims are raising their arms in defense of a blow (“parry fractures” of the radius and ulna), throwing a punch (“boxer’s fractures” of the metacarpals), or receiving a beating (rib

²³ Supination-adduction will cause transverse fractures of the fibula below the syndesmosis and external rotation will cause oblique fractures. Pronation-abduction can cause transverse or laterally comminuted fractures of the fibula (Marsh and Saltzman 2005). These accidental fractures result from falls and are biomechanically and morphologically distinct from the crushing fibular fractures and cutmarks that may result from torturous violence (like hobbling) (Martin and Osterholtz 2012)

fractures) (Lovell 1997; Tung 2012:110). In this study, metacarpal (hand bones), radial and ulnar (lower arm bones), and rib fracture rates are compared between the Wari and post-Wari populations from Andahuaylas.



Figure 6. 5. Healed fractures (white arrows) on A) radius (parry fracture), B) metacarpal (boxer's fracture), C) rib, D) ulna (parry fracture), E) fibula.

Following methods established by Tung (2012), only those bones that were more than 80% complete were included in analysis. Because the present analysis is concerned with general frequencies of violence, left and right bones were combined. The preliminary results, illustrated in Table 6.2, demonstrate significantly more rib and radial trauma on post-imperial populations. While boxer's fractures of the metacarpals, and parry fractures of the ulna also increase after Wari collapse, the difference is not significant. As expected, fractures of the distal fibula, which are usually caused by accidents, do not change significantly over time.

Table 6.2. Post-Cranial wounds indicative of violence and accidents

Bone	Common Etiology																			
	<i>Usually Violence</i>				<i>Usually Violence</i>				<i>Sometimes Violence</i>				<i>Usually Accident</i>							
	Metacarpals (Boxer)		Ulnae (Parry)		Radii (Parry)		Radii (Parry)		Ribs		Ribs		Fibulae							
	# Observed	# Affected	% Affected	p-value	# Observed	# Affected	% Affected	p-value	# Observed	# Affected	% Affected	p-value	# Observed	# Affected	% Affected	p-value				
Turpo (MH)	25	0	0	.6173	33	0	0	.2064	34	0	0	.0362	283	11	3.9	<.0001	22	1	4.5	.4915
Cachi (LIP)	614	26	4.2		131	9	6.9		94	11	11.7		1355	172	12.8		231	18	7.8	

Several different data sets (cultural, environmental, etc.) indicate that the challenging topography of Andahuaylas and the quotidian domestic activities of the provinces’ inhabitants (the underlying cause of many accidents) did not change much in the five-to-six generations that temporally separate people from Turpo and those from Cachi (Gomez 2009; Kellett 2010). This “accidental consistency” is reflected by the concurrence of fibular fracture frequencies over time.

However, the marked increase in ulnar and metacarpal fractures, and the statistically significant increase of radial and rib fractures (“defensive injuries”) further confirms that violent attacks—and not accidents—were more common among Chanka communities in the post-imperial era. The following sections examine cranial trauma across different sites.

Trauma at Turpo (Middle Horizon)

Crania representing at least 36 individuals were recovered from the circular tomb at Qatun Rumi, in Turpo. As noted earlier, of those remains, 26 individuals were at least 15 years old and only 2 (7.7%) demonstrated evidence of cranial trauma. Two of 11 (18%) males exhibited evidence of injury (see Figure 6.6), while none (0/5) of the 5 females or 9 unsexed adults (0/9) demonstrated evidence of trauma. The first injured individual was a middle adult male (35–49 years old), with 2 very well-healed small circular depression fractures on the right frontal bone (above glabella, and on the squamous). The second was a young adult male (20–34 years old) with a well-healed fracture on the right nasal, and a well-healed small circular depression fracture on the posterior right parietal bone.

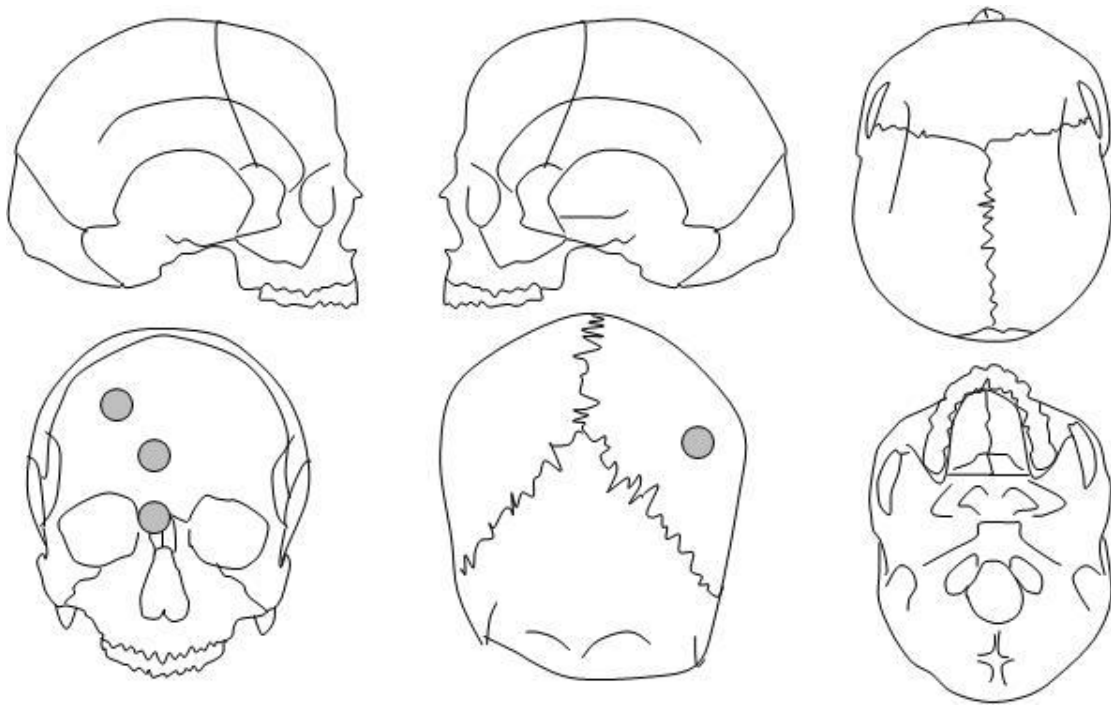
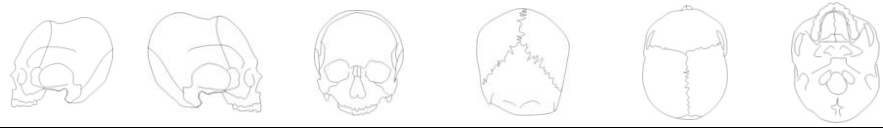


Figure 6.6. Trauma in Turpo (all male) (grey = ante-mortem).

Table. 6.3. Summary table of wound distribution on Turpo males and females



	LEFT	RIGHT	ANTERIOR	POSTERIOR	SUPERIOR	INFERIOR	Total
Ante-mortem	0	0	3	1	0	0	4
Peri-mortem	0	0	0	0	0	0	0
<i>Total Wounded Males</i> (N=2)	0	0	3	0	0	0	4
Ante-mortem	0	0	0	0	0	0	0
Peri-mortem	0	0	0	0	0	0	0
<i>Total Wounded Females</i> (N=0)	0	0	0	0	0	0	0

Interpreting Trauma During the Wari Era in Andahuaylas

Compared to other contemporaneous Andean hinterland communities (Tung 2012), trauma among Wari-era populations in Andahuaylas was low and non-lethal. The location of wounds on the anterior of the males from Turpo suggests both victims were facing their assailants at the moment of impact, while the wound on the right posterior portion of the cranial vault indicates that the victim was turned away, or not directly facing his opponent when that injury was received. Wound sub-lethality in this case suggests assailants may have intended to injure—but not kill—the victim during the assaults. Tung’s (2012:125) research on trauma in the Wari southern hinterlands similarly documented injuries on the frontal bones and facial area of males, indicating that these individuals likely participated in face-to-face physical conflict. Moreover, parry fractures coupled with anterior cranial wounds have been interpreted as evidence of possible raiding (Tung 2012). However, unlike the hinterland Wari-era village of Beringa, there is

no evidence of parry fractures at the contemporaneous hinterland community at Turpo. Thus, raiding does not appear to be the motivation for violence at Turpo.

Previous bioarchaeological scholarship has also demonstrated that sub-lethal anterior cranial injuries in the Andes may sometimes be evidence of ritualized conflict called *tinku* (Tung 2012:139) (also known as *takanakuy* in Andahuaylas). In cases of *takanakuy*, combatants (both men and women) from different *ayllus* or communities meet at a central (“neutral”) location to face off. During these yearly events, community antagonisms and tensions are released as blows are traded. However, fighting styles are quite distinct from western-style bare-knuckle boxing matches. Ethnographic observations by the author documented fighting styles (known as *rumi maki* or “fists of stone”) in several different communities in Apurimac Department. In over three dozen fights, jabs, crosses, and uppercuts were never observed, while hooks and bolo punches were witnessed in a few bouts. In almost all cases, wild, uncontrolled, wide-arc, looping roundhouse (“haymaker”) blows were used to assault an opponent. This type of fighting significantly impacted the lateral eye-orbits, zygomatics, greater wings of the sphenoid, and temporal bones. Medial areas around the frontal bosses and superior coronal suture tended to evade impact. Data gleaned from interviews with fighters and health workers in Andahuaylas further confirmed that combatants also tended to display broken hand (metatarsal) bones (“boxer’s fractures”) (Lovell 1997; Walker 1997). Assuming rural, traditional fighting styles have remained relatively unchanged over the past several centuries, the lack of “lateral face” wounds and broken hand bones (see Table 6.2) at Turpo suggest *tinku/takanakuy* may not have been the cause of injuries either.

Because other forms of violence can be ruled out, wound patterning, lethality, and the lack of defensive wounds at Turpo may instead indicate interpersonal conflict resolution, or perhaps some form of community-sanctioned corporal punishment (see Tung's 2012:144-145 discussion of data from the Wari hinterland site of La Real).

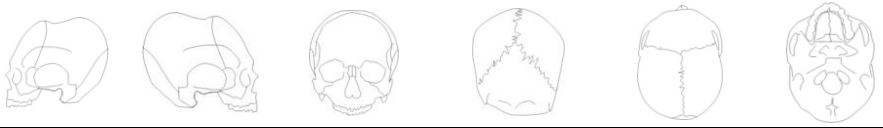
Trauma among Males and Females at the Quichua Enclave of Pucullu

At the early LIP Quichua enclave of Pucullu, 25 crania of individuals over 15 years old could be observed for evidence of trauma. Of these individuals, 60% show at least one head wound (15/25). Among 10 females, 5 (50%) have at least one wound, while 12/15 (80%) males have at least one trauma. Males exhibit significantly more trauma than females (Fisher's exact, $p=0.0344$, $N=25$).

Among the 15 injured males, there are 20 head wounds. Wounds were most common on the anterior (11/20 = 55%), and suggest that in most cases, males were facing opponents at the moment of impact.

Among the 5 injured females, there are a total of 12 wounds. All wounds were sub-lethal. Among females, the majority of wounds were located on the posterior (8/12= 67%). This wound patterning suggests that most injuries among females were received when the victim was not facing an opponent at the moment of impact.

Table. 6.4. Summary table of wound distribution on Pucullu males and females.



	LEFT	RIGHT	ANTERIOR	POSTERIOR	SUPERIOR	INFERIOR	Total
Ante-mortem	3	0	11	1	0	0	15
Peri-mortem	2	2	0	1	0	0	5
<i>Total Wounded Males</i> (N=12)	5	2	11	2	0	0	20
Ante-mortem	0	0	2	8	2	0	12
Peri-mortem	0	0	0	0	0	0	0
<i>Total Wounded Females</i> (N=5)	0	0	2	8	2	0	12

Wounds on the superior and anterior of Quichua females (4/12 =33%) may be the result of intra-community domestic violence at the hands of male partners (Alcalde et al. 2003) or female affines (Van Vleet 2002). Abuse is the most common etiology for facial/head trauma among women (Novak 1999). Unfortunately, because there are no post-cranial elements associated with the Pucullu sample, it was not possible to determine if there were defensive injuries—broken lower arms, hand bones, or ribs—which would further elucidate the type of violence that was occurring in this enclave community.

Nevertheless, the spatial patterning of lethal and sub-lethal trauma observed at Pucullu, where males are facing opponents (and sometimes dying) and females are often turned away (but not dying), is expected in traditional models of raiding and warfare. If males were confronting assailants, and females were escaping capture from assailants, the pattern of injury would conform to the patterns observed at Pucullu (see Tung 2012 for a thorough description of warfare and raiding). Given that Pucullu was an isolated Quichua enclave with little grazing and agricultural lands, surrounded by some of the largest Chanka settlements in the region (Kellett 2010), it is not too far-fetched to propose that

acrimonious confrontations with Chanka neighbors may have taken place. Quichua men may have become the victims of lethal and sub-lethal trauma while defending their small community, or while raiding nearby Chanka settlements in the pursuit of animals or agricultural bounty. Quichua women on the other hand may have had to escape Chanka raiders while also enduring violence at the hands of kin and affines.

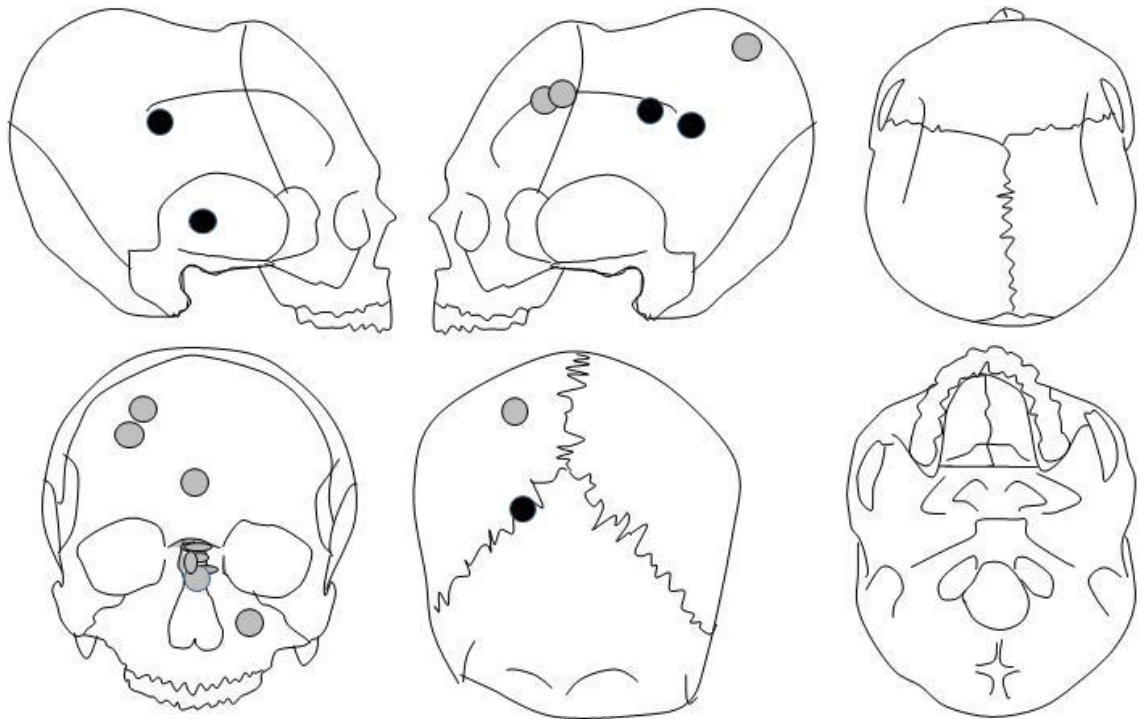


Figure 6.7. Trauma among Pucullu males (grey = ante-mortem, black = peri-mortem).

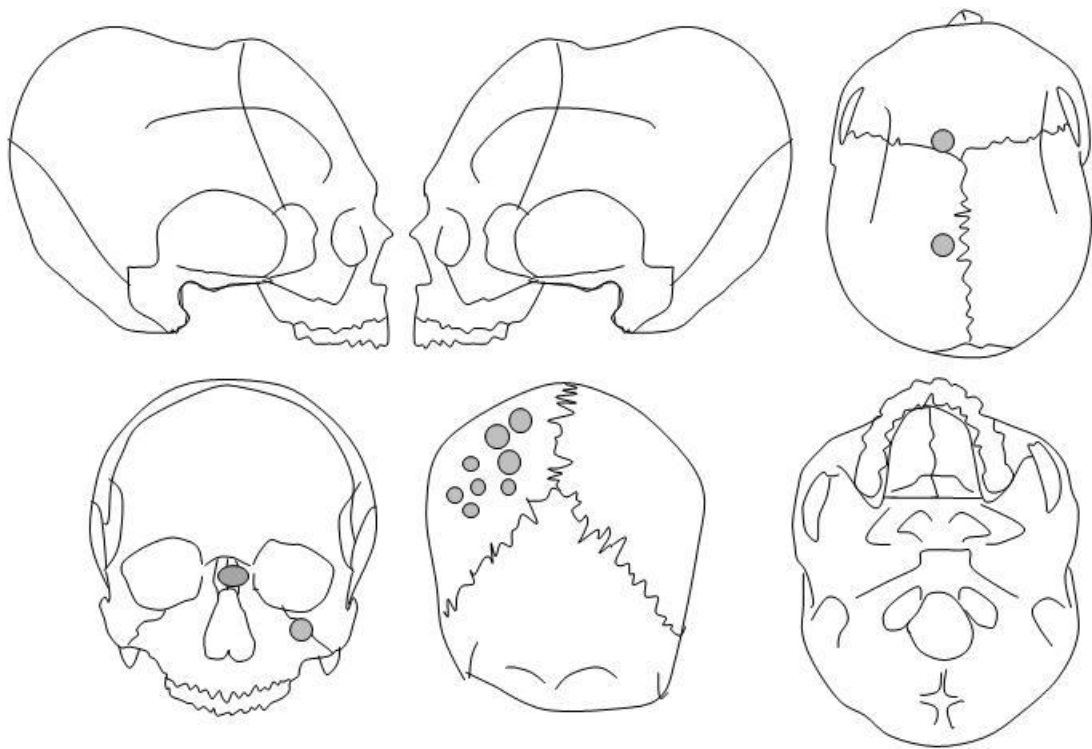


Figure 6.8. Trauma among Pucullu females (grey = ante-mortem)


Trauma among Males and Females at Ranracancha (Lower Moiety LIP Chanka)

Forty-two crania were examined for trauma from Ayamachay Cave in the Llatanacu sector at the site of Ranracancha. Individuals from this site likely formed part of the Anccohuallo *ayllu*, a lower moiety Chanka group. Of those 42 individuals, 37 were at least 15 years old. Of the 37 late adolescent/adult individuals at Ranracancha, 23 (62.2%) demonstrated at least one traumatic injury. When separated by skeletal sex, 11/17 (64.7%) females have at least one wound, while 11/19 total males (57.9%) have at least one trauma; one unsexed adult also evinced two peri-mortem fractures. Unlike Pucullu, the Quichua enclave, the difference in trauma frequency between males and females at Ranracancha is not significant (Fisher's exact, $p=0.7289$, $N=34$).

Among 11 Ranracancha females with trauma, there were 13 total wounds. Although wounds were concentrated on the anterior and posterior (8/12=62%), these areas were not significantly targeted relative to other areas of the skull.

The 11 Ranracancha males with trauma displayed a total of 31 wounds. Similar to the females, over half of all wounds on males were directed to either the anterior or posterior of the cranium (18/31=58%). These results suggest that Ranracancha males and females are experiencing violence in similar social contexts, or that sex is not mediating the location or lethality of attack within this lower moiety Chanka community.

Table. 6.5. Summary table of wound distribution on Ranracancha males and females



	LEFT	RIGHT	ANTERIOR	POSTERIOR	SUPERIOR	INFERIOR	<i>Total</i>
Ante-mortem	4	4	8	5	1	0	22
Peri-mortem	2	1	5	0	0	1	9
<i>Total Wounded Males (N=11)</i>	6	5	13	5	1	1	31
Ante-mortem	3	1	2	3	0	0	9
Peri-mortem	0	0	2	1	0	1	4
<i>Total Wounded Females (N=11)</i>	3	1	4	4	0	1	13
Ante-mortem	0	0	0	0	0	0	0
Per-mortem	0	1	0	1	0	0	2
<i>Total Wounded Unsexed (N=1)</i>	0	1	0	1	0	0	2

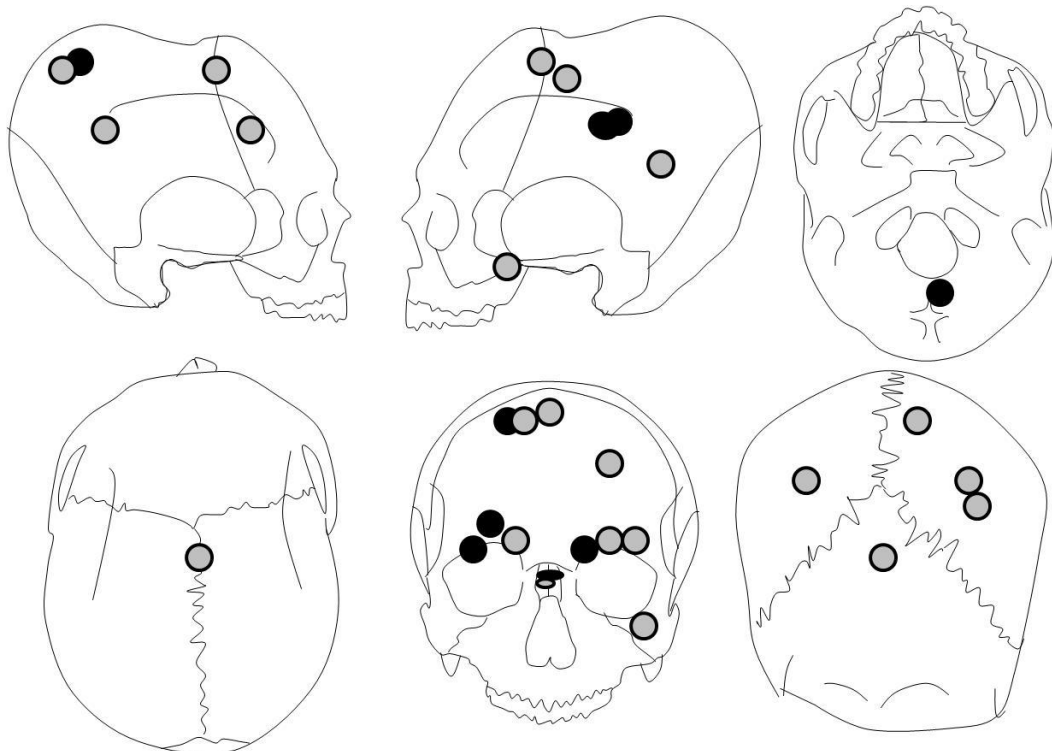


Figure 6.9. Trauma among Ranracancha males (grey = ante-mortem; black = peri-mortem)

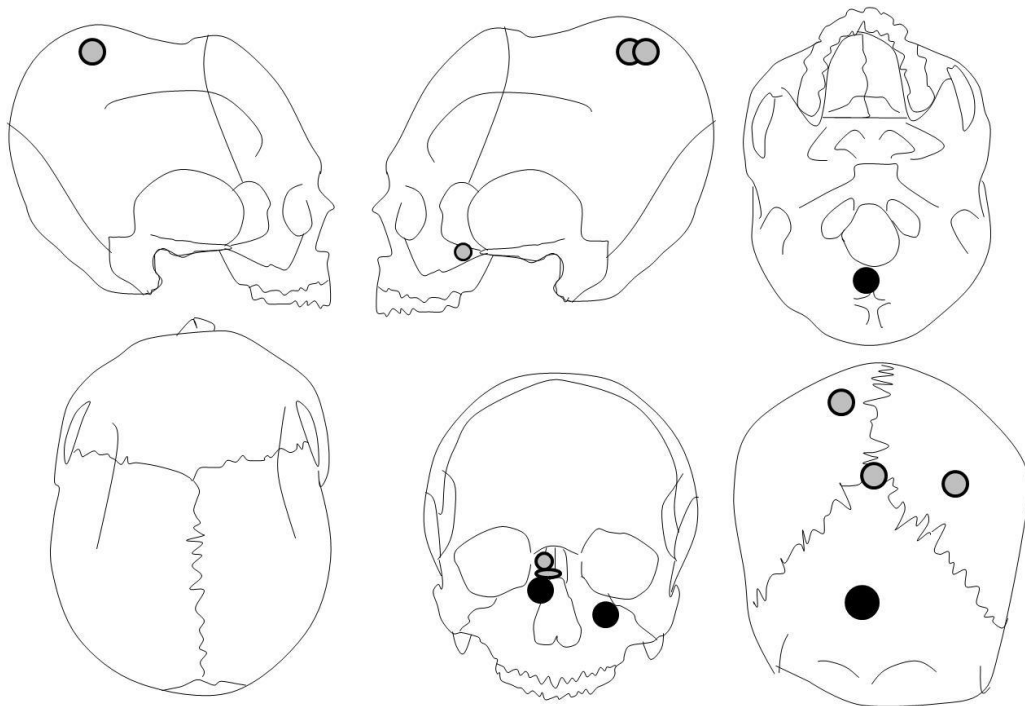



Figure 6.10. Trauma among Ranracancha females (grey = ante-mortem; black = peri-mortem)

The Natividad Museum Collection (LIP Upper Moiety Chanka)

The Natividad Museum collection (located in Hunacaray District, Andahuaylas Province) comes from a series of *machays* from nearby Turpo District. Although the provenience of this collection is somewhat dubious, given that it was collected by local school teachers in the 1980s and 1990s, reconnaissance survey work, loosely associated ceramics, and interviews by the author with the original collectors indicate that this collection most likely derives from the Late Intermediate Period. Our survey work in this region identified several caves with commingled skeletal material still intact, and it is likely that the original collectors sought out skeletons and mummies that were more complete. As such, this collection likely does not reflect the actual burial population, and is likely skewed to include “interesting” crania with modification, trepanation, and trauma. Even so, this collection demonstrates patterns in wound frequency and lethality that are similar to other nearby Chanka sites. For those reasons, this sample was included in the present analysis. The collection includes 24 individuals, 19 of whom were over 15 years of age. Ten out of 19 late teens/adult (52.6%) had at least one traumatic injury.

All three females observed (100%) had at least one traumatic injury, while 11 of the 16 males (68.8%) had at least one wound. At Natividad, male and female trauma frequencies and wounds distribution patterns are not significantly different (Fisher’s exact, $p=0.5304$; $N=19$). Wounds were distributed fairly evenly across the cranium; regions were not significantly targeted for attack, and trauma lethality rates were similar between the sexes.

Table. 6.6. Summary table of wound distribution on Natividad males and females



	LEFT	RIGHT	ANTERIOR	POSTERIOR	SUPERIOR	INFERIOR	Total
Ante-mortem	1	2	1	1	1	0	6
Peri-mortem	0	0	1	2	0	0	3
Total Wounded Males (N=11)	1	2	2	3	1	0	9
Ante-mortem	0	0	0	0	1	0	1
Peri-mortem	1	0	1	0	0	0	2
Total Wounded Females (N=3)	1	0	1	0	1	0	3

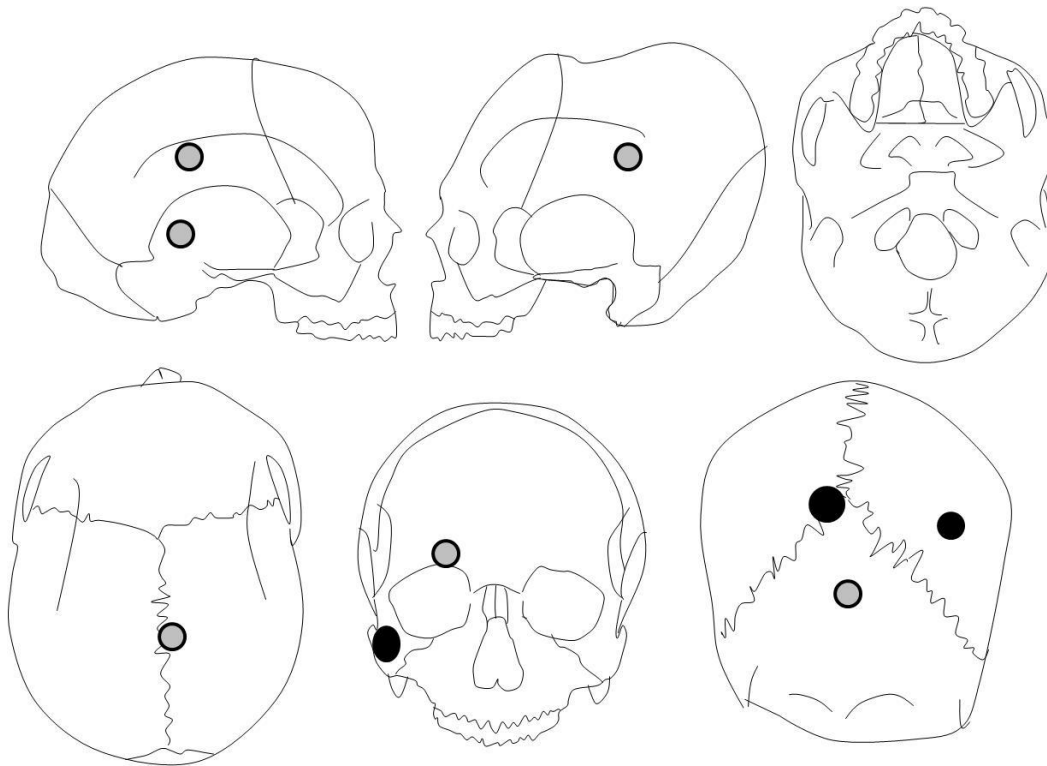


Figure 6.11. Trauma among Natividad males (grey = ante-mortem; black =peri-mortem)

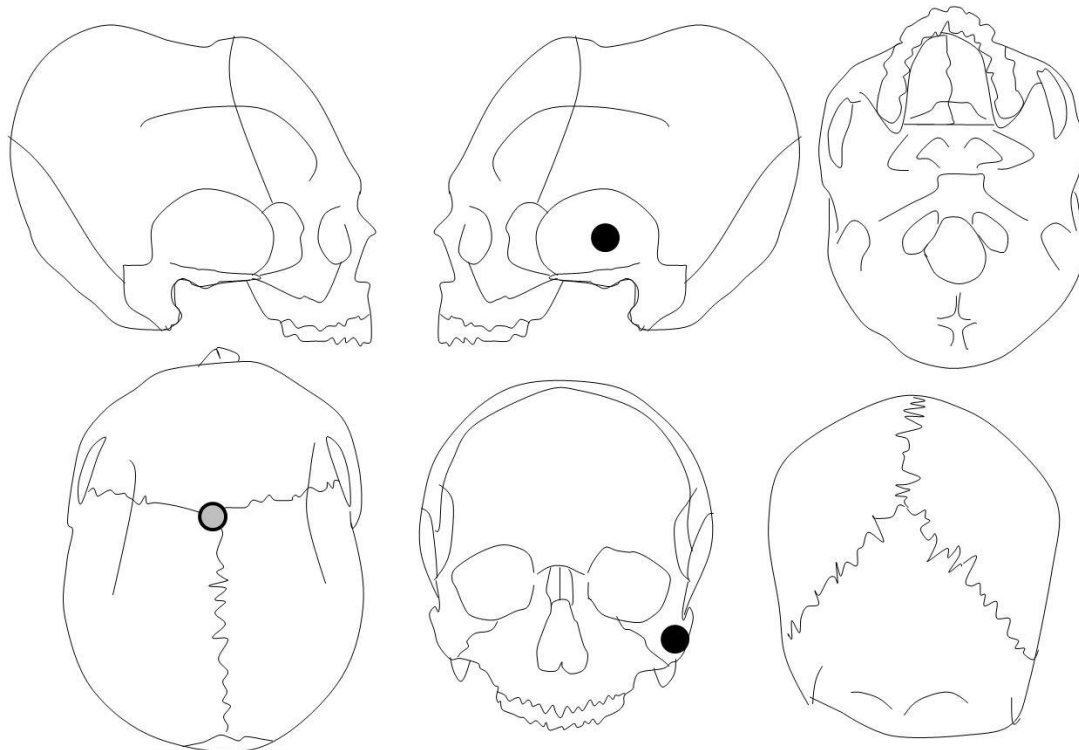


Figure 6.12. Trauma among Natividad females (grey = ante-mortem; black =peri-mortem)


Trauma at Cachi (Upper Moiety LIP Chanka)

The archaeological complex at Cachi consists of three sectors: Sonhuayo, Masumachay, and Mina Cachihuancaray. Crania from these three sectors were combined to create a larger data set for analysis and comparison. In total, 162 individuals over the age of 15 could be observed for evidence of trauma. Of the 162 teens/adults, 84 (51.8%) have at least one traumatic lesion.

Among the 72 total females at Cachi, 45 (62.5%) have at least one trauma. Among 63 total males, 36 (57.1%) have at least one traumatic wound. Among the 27 unsexed individuals, 3 (11.1%) have evidence of at traumatic injury. Like the other Chanka sites, the difference in trauma frequencies between males and females is not significantly different (Fisher's exact, $p=0.5984$; $N=135$).

Similar to the other Chanka sites (Ranracancha and Natividad), trauma distribution patterns are similar between males and females; the ratio of lethal-to-sub-lethal trauma among males and females is not significantly different (Fisher's exact, $p=0.3166$, $N=156$). This suggests that trauma lethality (and the intent of the assailant) was similarly directed towards males and females at Cachi.

Table 6.7. Summary table of wound distribution on Cachi males and females



	LEFT	RIGHT	ANTERIOR	POSTERIOR	SUPERIOR	INFERIOR	Total
Ante-mortem	8	5	17	10	3	0	43
Peri-mortem	5	7	7	0	1	1	21
<i>Total Wounded Males (N=36)</i>	13	12	24	10	4	1	64
Ante-mortem	11	9	15	4	15	0	54
Peri-mortem	6	8	12	7	1	4	38
<i>Total Wounded Females (N=45)</i>	17	17	27	11	16	4	92
Ante-mortem	1	0	1	0	0	0	2
Per-mortem	0	1	3	1	0	0	5
<i>Total Wounded Unsexed (N=3)</i>	1	1	4	1	0	0	7

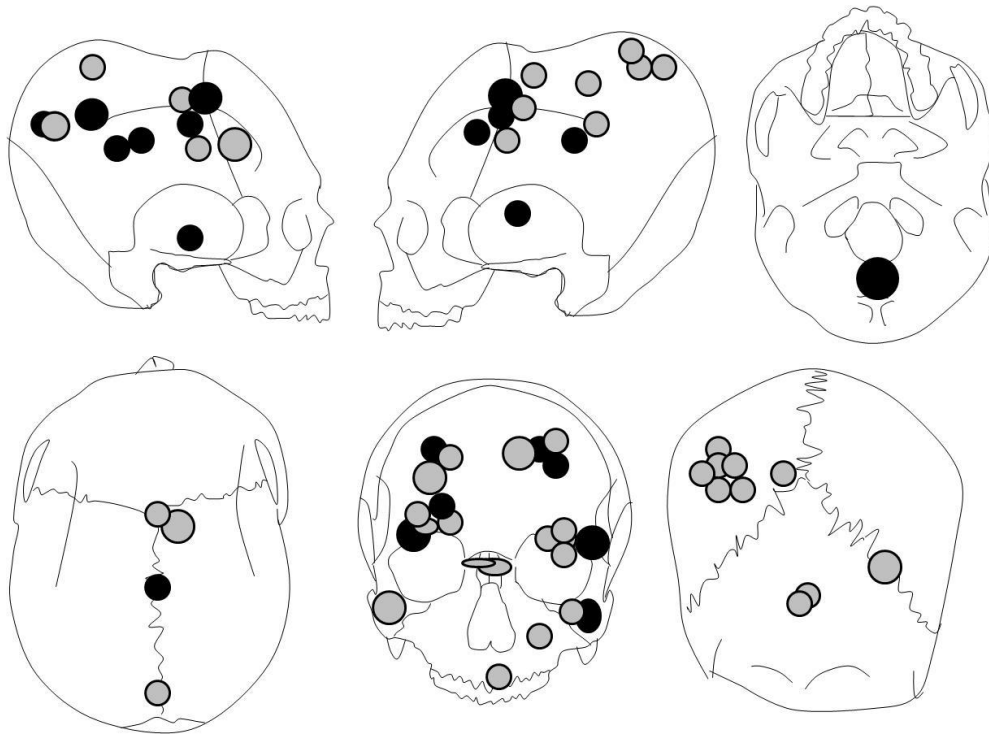


Figure 6.13. Trauma among Cachi males (grey = ante-mortem; black = peri-mortem)

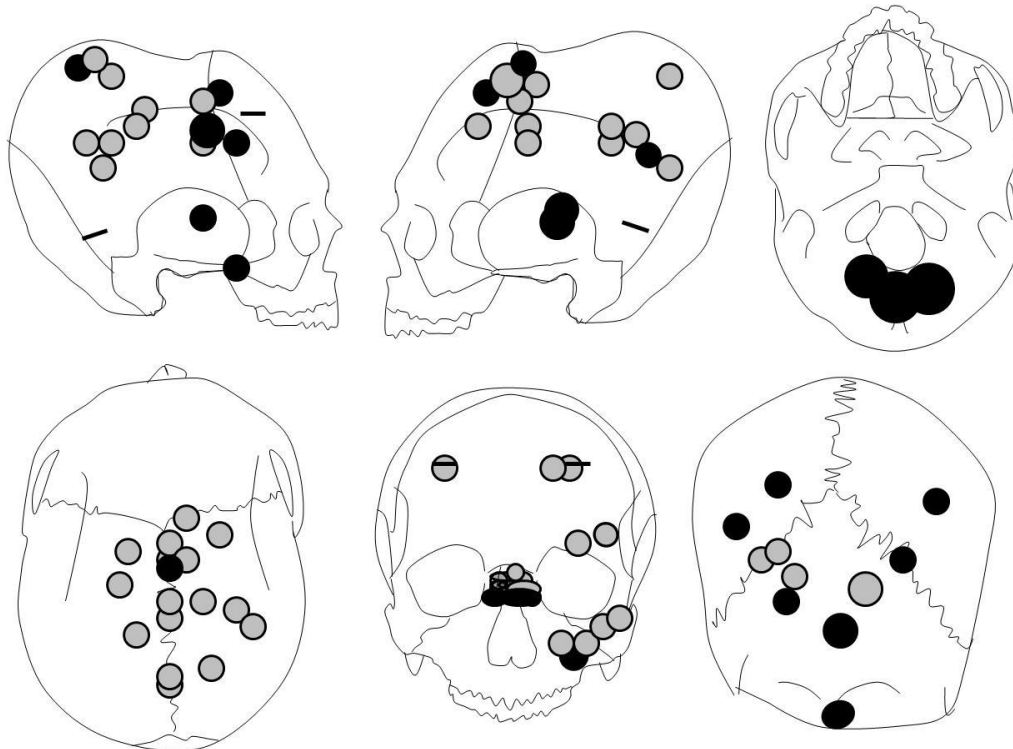


Figure 6.14. Trauma among Cachi females (grey = ante-mortem; black = peri-mortem)

Exploring Motivations of Violence in Chanka Communities During the LIP

Wound patterning in Chanka communities is distinct from patterns observed at the Middle Horizon site of Turpo, and the Late Intermediate Period Quichua enclave at Pucullu. Although trauma frequencies are similarly high at both Chanka and Quichua sites, compared to the earlier Wari imperial era, the following sections will demonstrate that these post-imperial groups (Chanka and Quichua) were experiencing violence in distinct social contexts.

To summarize the evidence thus far, trauma data from the Wari era (Turpo) suggests that violence was relatively rare and may have been experienced in the context of inter-personal conflict resolution with prescribed rules of engagement (Chagnon 1992), and/or community sanctioned physical punishment (Tung 2012). In contrast, at the post-imperial Quichua enclave, cranial trauma frequencies are significantly higher. Moreover, cranial trauma data indicate that males had significantly more wounds than females. Additionally, while Pucullu males tended to demonstrate wounds on the anterior of the skull, female injuries were mostly directed towards the posterior of the skull. This type of wound patterning is commonly seen in cases of raiding and warfare (*ibid.*). However, raiding was probably not the only type of violence occurring within this Quichua community: anterior and superior injuries on female skulls also suggest that intra-community (domestic) violence may have also been experienced.


The pattern of trauma from the Chanka sites of Ranracancha, Natividad, and Cachi are distinct. The data presented thus far has shown that unlike the Quichua enclave, there is no significant difference in trauma frequencies between males and females at the Chanka sites. This evidence suggests that while Quichua males and females were

experiencing violence in somewhat disparate contexts (warfare/raiding and domestic violence), Chanka males and females were experiencing violence in similar contexts. The following sections explore Chanka trauma in more detail in order to discern what type of violence was taking place in these post-imperial communities. Data from Ranracancha, Natividad, and Cachi are combined to facilitate analysis.

Summary: Trauma by Sex in Chanka Communities

Documented trauma frequencies among males and females indicate that Chanka communities across western Andahuaylas were equally impacted by violence. Furthermore, as demonstrated in Table 6.8, wound distribution and lethality between the sexes is congruent across sites; males and females from different Chanka communities all demonstrate consistent patterns of cranial trauma.

Table. 6.8. Summary table of wound distribution on 110 Chanka males and females



	LEFT	RIGHT	ANTERIOR	POSTERIOR	SUPERIOR	INFERIOR	Total
Ante-mortem	11	12	26	17	5	0	71
Peri-mortem	7	7	13	3	1	2	33
<i>Total Wounded Males (N=54)</i>	18	19	39	20	6	2	104
Ante-mortem	14	10	17	14	9	0	64
Peri-mortem	7	8	15	8	0	5	43
<i>Total Wounded Females (N=56)</i>	21	18	32	22	9	5	107

To further confirm that males and females at disparate Chanka sites are experiencing violence in similar contexts, wound counts were compared between all LIP Chanka late adolescent/adult males and females. As demonstrated in Table 6.9 over a third of all injured males and females had more than one wound. Specifically, among males, 32/86 (37.2%) had more than one wound, while 25/59 (42.4%) of injured females had more than one trauma. The difference in multiple wound presence between Chanka males and females is not significant (Fisher’s exact, $p=0.6045$; $N=145$). In other words, both males and females were equally likely to be injured multiple times, either in consecutive or contemporaneous attacks.

Table 6.9. Tally of head wounds per sexed adult in Chanka communities

	1	2	3	4	5	9	Totals
	Wound	Wounds	Wounds	Wounds	Wounds	Wounds	
No. Males	54	18	9	4	0	1	86
No. Females	34	14	2	5	4	0	59
No. of wounds in sample (Total No. Wounds = 250)	88	64	33	36	20	9	

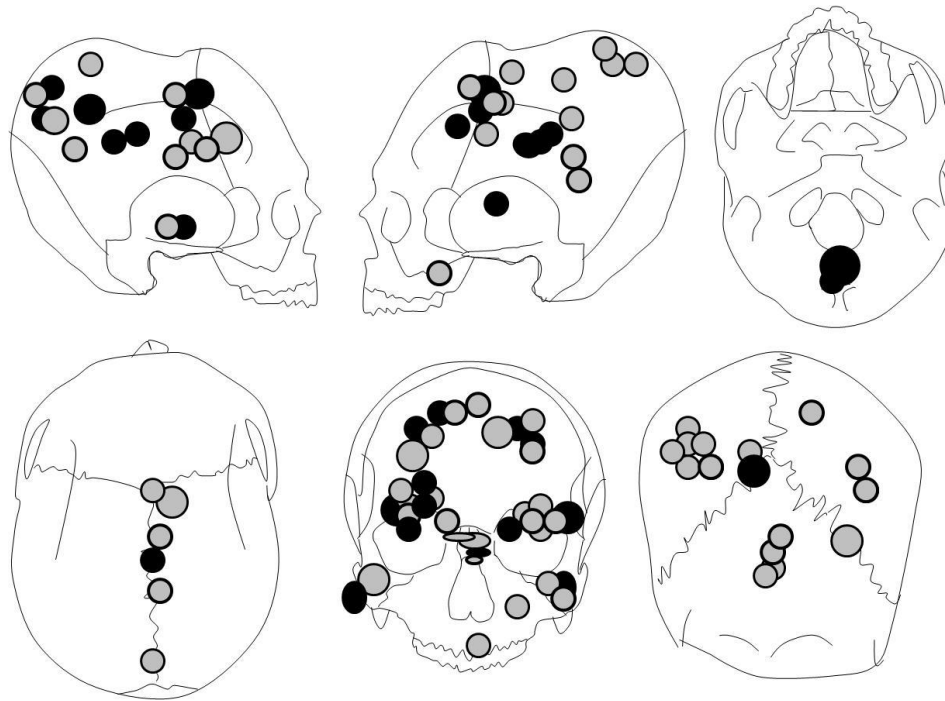


Figure 6.15. Trauma lethality and distribution between Chanka males (grey = ante-mortem; black = peri-mortem)

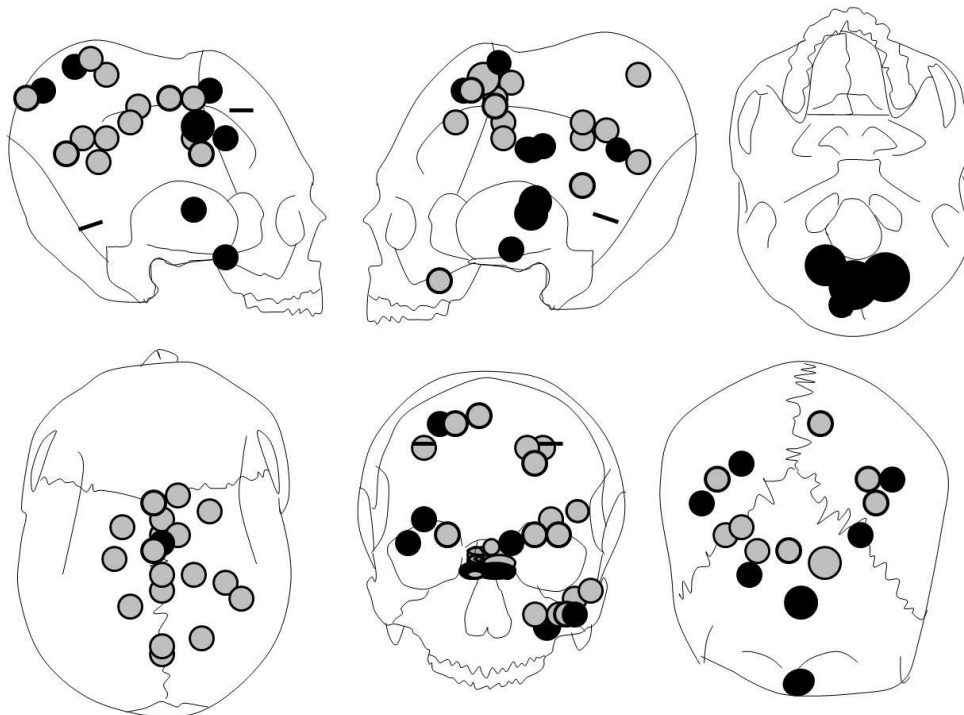


Figure 6.16. Trauma lethality and distribution between Chanka females (grey = ante-mortem; black = peri-mortem)

Age-Graded Trauma in Chanka Communities

As people age, evidence of injury (ante-mortem trauma) accumulates in their bones (Glencross 2011). In contrast, peri-mortem wounds offer us a relatively unambiguous “snapshot” in time because those wounds occurred at or around the time of death. In most societies, the older an individual, the more healed lesions they tend to present. However, in “catastrophic” or extremely violent circumstances, this pattern may deviate from the norm. Because Chanka males and females are having similar experiences, sex categories were collapsed and compared, allowing us to focus exclusively on age-graded patterns of cranial trauma.

Table 6.10. Trauma by age category

	N	# and (%) w/ ante- mortem trauma	# of ante wounds (tally)	Average # of ante wounds per wounded indiv	# and (%) w/ peri- mortem trauma	# of peri wounds (tally)	Average # of peri wounds per wounded indiv	Total # of wounds (tally)
Infant	2	0	0	0	0	0	0	0
Child	22	1 (4.5%)	1	.25	3 (13.6%)	3	.75	4
Teen	14	3 (21.4%)	3	.50	3 (21.4%)	7	1.2	10
Young Adult	69	21(30.4%)	27	.73	19 (27.5%)	33	.89	60
Middle Adult	84	39 (46.4%)	69	1.4	19 (22.6%)	26	.51	95
Old Adult	24	14 (58.3%)	33	2.2	6 (25%)	8	.53	41
Adult	27	4 (14.8%)	5	.63	5 (18.5%)	10	1.3	15
<i>Totals</i>	242	82 (33.9%)	138		55 (22.7%)	87		225

As shown in Table 6.10, while sub-lethal injuries accumulate over the lifetime of the average Chanka individual, lethal wounds overwhelmingly target late adolescents and young and adults relative to other age groups. These data suggest that deadly violence

was cutting short the lives of these productive (and reproductive) members of Chanka society.

Finally, wound tallies were tabulated in order to determine whether late adolescence, and young and middle adulthood was equally dangerous for both males and females (Table 6.11). For both groups, the percentage of all tallied wounds that were lethal decreased from late adolescence to middle adulthood. Although sample sizes are small, the trend is clear: late adolescence is dangerous for females and young adulthood dangerous for males.

Table 6.11. Trauma by sex during prime reproductive years

		MNI	# and (%) w/ any trauma	# and (%) w/ peri- mortem trauma	Total wounds (tally)	# and (%) peri-mortem wounds (tally)
Late Teens (N=14)	Males	1	1 (100%)	0	1	0
	Females	10	5 (50%)	3 (30%)	9	7 (77.8%)
	?	3	0	0	0	0
Young Adults (N=69)	Males	27	12 (44.4%)	4 (14.8%)	21	10 (47.6%)
	Females	38	24 (63.2%)	14 (36.8%)	37	22 (59.5%)
	?	4	1 (25%)	1 (25%)	2	1(50%)
Middle Adults (N=84)	Males	53	31 (58.5%)	9 (17%)	60	13 (21.7%)
	Females	26	18 (69.2%)	8 (30.8%)	31	10 (32.3%)
	?	6	2 (33.3%)	0	6	0

In sum, these results suggests that, like Khmer-era Cambodia, 1990s Rwanda, and early 21st-century Iraq (De Walque 2006; Taylor 1999; Burnham et al. 2006), otherwise healthy adults from the most productive sector of society are overwhelmingly being targeted for violent attack.

High Mortality for Chanka Adults in Their Prime

The pattern of excess mortality becomes even more obvious when the age-at-death profiles are compared between lethally wounded individuals and the combined sub-lethally injured and uninjured post-imperial Chanka populations. Of 215 crania that could be observed for evidence of age, sex and trauma, 49 (22.8%) had least one peri-mortem wound, and 166 (77.2%) had only ante-mortem trauma (survivable injuries) or no wounds at all. The distribution of lethal trauma among different age groups is illustrated below in Table 6.12 and in Figure 6.17.

Table 6.12. Mortality rates by age category and peri-mortem trauma

	MNI	Number lethally wounded	% lethally wounded	Number uninjured and sub- lethally injured	% uninjured and sub- lethally injured
Infants/Children	24	3	12.5%	21	87.5%
Teens	14	3	21.4%	11	78.6%
Young Adults	69	19	27.5%	50	72.5%
Middle Adults	84	19	22.6%	65	77.4%
Old Adults	24	5	20.8%	19	79.2%
<i>Totals</i>	215	49		166	

The healed and uninjured Chanka population from LIP Andahuaylas forms a “bathtub” mortality curve (Jackes 2011), which sees high infant and old age mortality rates and a drop in mortality during later youth and early adulthood, and a rise in old age (in the figure below, the grey “bathtub” is upside-down). Similar demographic patterns have been observed in other healthy, contemporaneous Andean populations (see Andrushko 2007:99; Tung 2003:140; Drusini et al. 2001).

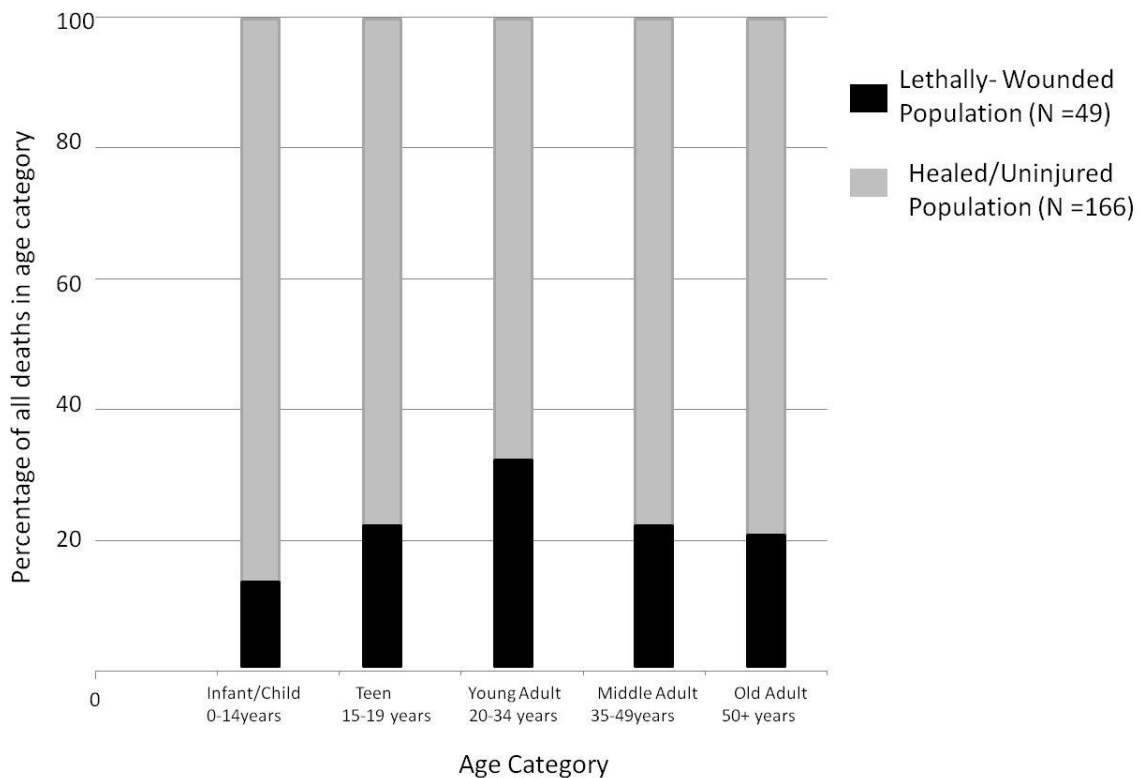


Figure 6.17. Age-at-death curve of injured and uninjured Chanka population

While the mortality profile for the healed and uninjured population follows the “bathtub curve” typical for normal, healthy populations, the lethally wounded sub-population demonstrates an inverted-U pattern; the age-at-death curve for LIP Chanka populations shows that the majority of those with lethal trauma are not the very young, nor the very old, but rather late teens and young and middle adults. In other words, the data indicate that adults in their prime are experiencing excess mortality relative to the other age categories and the sub-lethally-injured/uninjured population. Similar morbidity and mortality profiles have been observed during historical cases of tumultuous social upheaval (i.e., war or genocide), when widespread violence primarily impacted late teens,

young adults, and middle adults (see Fig. 5.12; Burnham et al. 2006; De Walque 2005; De Walque and Verwimp 2009).

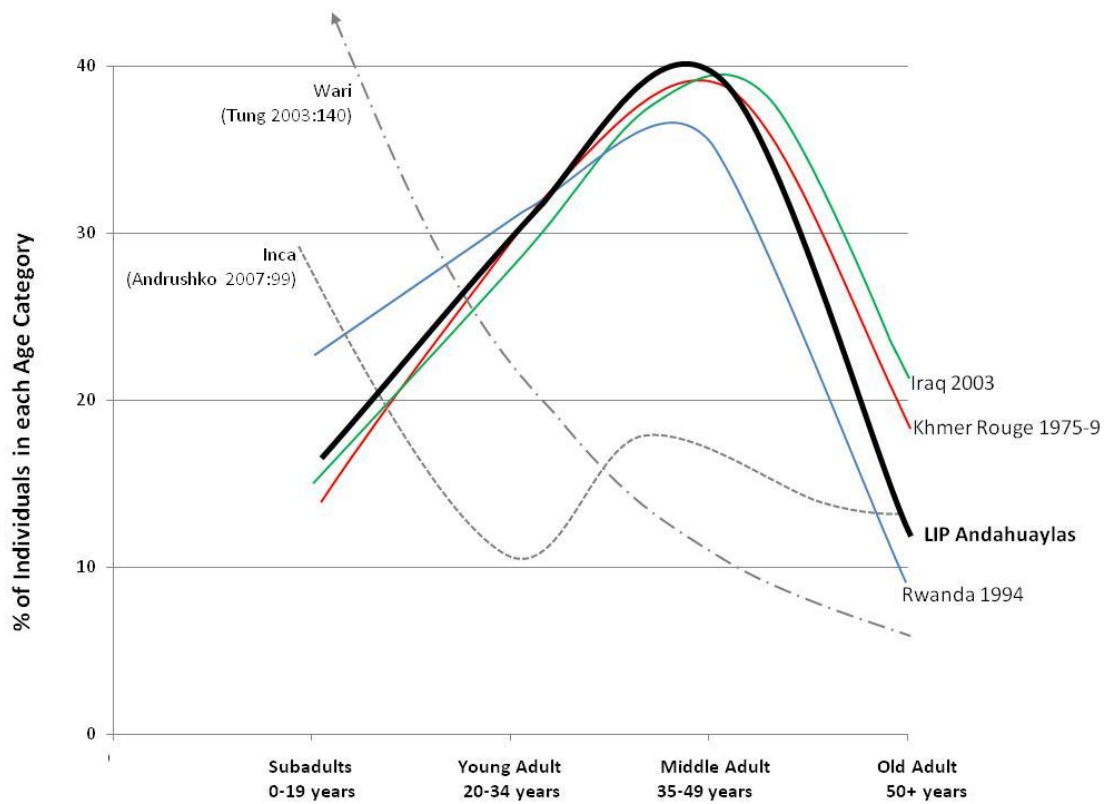


Figure 6.18. Age-at-death distribution during times of state stability in the Andes and post-state instability in Andahuaylas, Rwanda, Cambodia, and Iraq

Overall, the age-graded mortality profile of lethally-wounded Chanka in post-imperial Andahuaylas is somewhat similar to kill tallies for non-combatants during the civil war in late 20th-century Peru (see Fig. 6.18). In that case, violence was most pervasive in regions (like modern Andahuaylas) that lacked any profound or formal state presence. Truth Commission reports (CVR 2003) from Peru demonstrated that women were just as likely to become victims of violence (both physical, but also sexual) as their male counterparts; torture, massacres, and disappearances impacted males and females

equally. Sub-adults were also significantly impacted by violence: over 7% of the ~74,000 killed/disappeared in late 20th-century Peru were children under 18 years old (Mealy and Shaw Austad n.d.:39). In those cases, sub-adults were often abducted by Shining Path terrorists and/or the Peruvian military, and children as young as 12 years old participated in armed conflict.

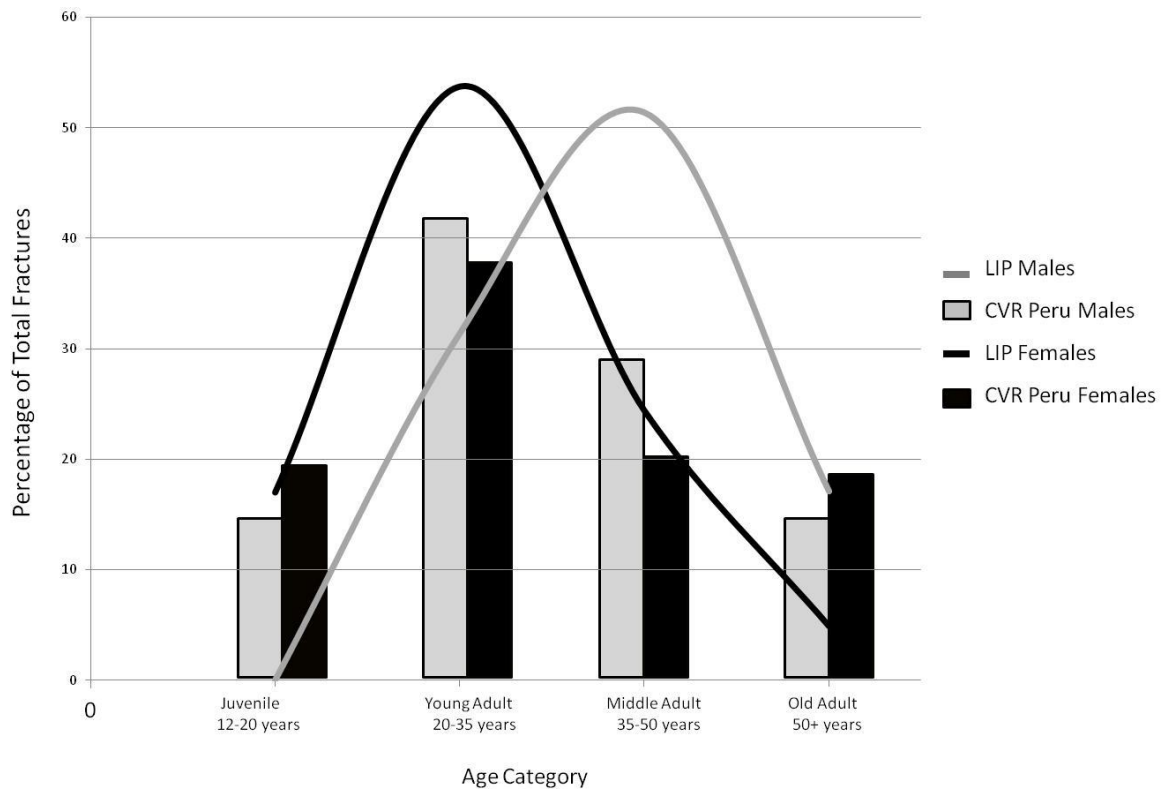


Figure 6.19. Peri-mortem trauma during instability targets men and women in their prime (lines = LIP males and females; bars = dead/disappeared in Peru from 1980–2000)

Patterns of violence witnessed in Andahuaylas and other regions of Peru during that country’s civil war appear to be tragically similar to patterns observed in the same region some eight to ten centuries earlier. Excess mortality in both ancient and

modern Andahuaylas was largely due to violence, apparently more so than any other (non-violent) factor. However, future research with this skeletal collection can further elucidate and clarify paleodemographic trends through the determination of maximum likelihood estimates of excess mortality for non-trauma pathological lesions (like linear enamel hypoplasias, periosteal lesions, and femur length).

Nevertheless, results of peri-mortem trauma analysis correlated with age-at-death appear to clearly demonstrate that violence is contributing to premature death among the Chanka during the post-imperial era. Far from unique, this mortality pattern is commonly observed in cases of war, ethnocide, genocide, and other similar social disasters.

Trauma Recidivism and Lethality in Chanka Society

Analysis of injury recidivism can inform on whether individuals were victims of separate attacks. Although sub-lethal trauma in different stages of healing may be the result of distinct, consecutive attacks, there are several confounding factors that complicate evaluation of short- and long-term healing as an accurate indicator of recidivism. For instance, the force of impact on the cranium, the area of the skull affected, differential healing and vascularization rates, and the age and health of the victim, among other factors, can all hinder the determination of whether injuries were received at the same time or at different times. Given current scholarship, one of the most reliable and unambiguous ways to determine injury recidivism is if an individual has both ante- and peri-mortem fractures. Recall that ante-mortem injuries show signs of healing, and indicate a wound was received well before the time of death, while peri-mortem fractures were received at or around the time of death, and may have contributed to the

cause of death. Table 6.13 below illustrates that injury recidivism rates at the Chanka sites is twice as high as the Quichua site (Pucullu).

Table 6.13. Teen/adult injury recidivism in Andahuaylas

Site	Era	Cultural Affiliation	Cranial MNI	(n)	(n)	% wounded
				Wounded Individuals	Individual with ante- and peri wounds	individuals with ante- and peri wounds
Turpo	MH	Warified	27	2	0	0
Quichua	LIP	Chanka	26	15	1	6.7%
Chanka	LIP	Chanka	218	117	16	13.7%

Although there is not significantly more injury recidivism at the Chanka sites versus the Quichua site (Fisher’s exact, $p=.2158$; $N=244$), the trend suggests that Chanka individuals were twice as likely to become the victims of consecutive—ultimately deadly—attacks.

Trauma and Cranial Modification in Chanka Communities

Overall, trauma data has demonstrated that Chanka individuals were experiencing significantly more violence than their imperial-era ancestors. Furthermore, unlike the Quichua, Chanka males and females in their prime were equally experiencing physical attacks. The demographic and social consequences of this violence would have been significant: generations of new Chanka would cease to exist, and the ability to realize communal labor projects (canal cleaning, defensive wall-building, etc.) would have been greatly hampered; tending to crops and herds in distant fields would have been risky business.

However, not all Chanka late teen/adults were targeted. While some individuals were singled out for violence, others appear to have lived relatively peaceful lives. In this case, the difference between peaceful life and painful death appears to have been primarily based on whether or not an individual had cranial modification.

In this study, possible associations between cranial modification and cranial trauma were evaluated. In total, 210 Chanka crania over the age of 15, and dated to the LIP, could be observed for evidence of both modification and trauma. Of those 210 individuals, 160 (76.2%) had cranial modification and 50 (23.8%) did not. Of 160 modified individuals, 97 (60.6%) had at least one traumatic injury. In contrast, of 50 unmodified crania, only 16 (32%) have evidence of at least one fracture. This difference is extremely significant (Fisher's exact, $p=0.0006$; $N=210$).

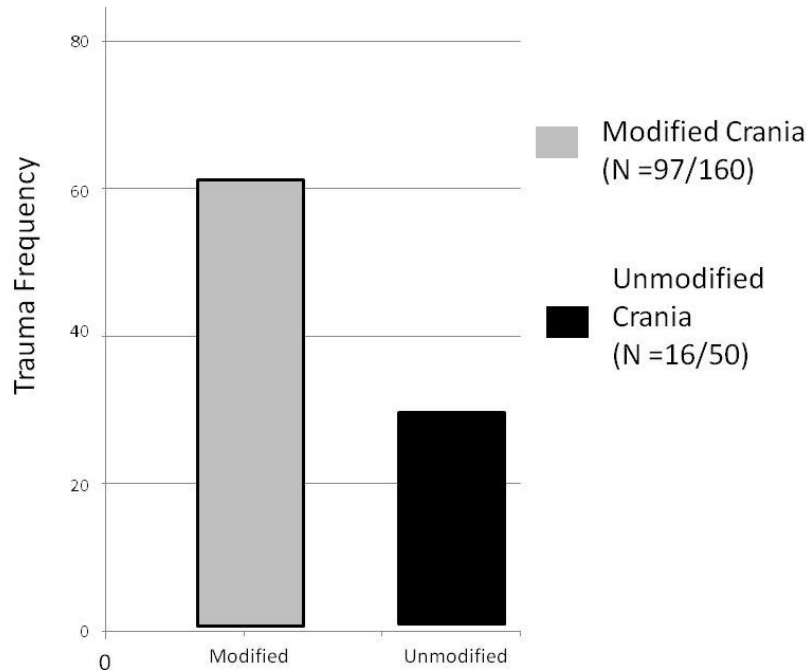


Figure 6.20. Trauma frequencies among modified and unmodified crania

Childhood Trauma in Chanka Communities

Data presented in previous sections have shown that Chanka late teens and adults in their prime have a significantly higher percentage of wounds than their unmodified counterparts. However, there are also noteworthy disparities in childhood trauma frequencies. Intriguingly, wounded children are present only at the post-imperial Chanka sites; none of the 12 sub-adults from the Quichua enclave at Pucullu have evidence of trauma. Among all infant-child crania from Chanka sites (N=21), three (14.3%) have at least one wound. These wounds are all higher impact blunt force wounds which leave depression and radiating fractures on bone, not linear fractures, which are usually caused by lower forces and stem from accidental injury. Moreover, blunt force trauma is not impacting all Chanka sub-adults equally: only modified sub-adults demonstrate cranial wounds (0/1 unmodified children have trauma, 3/20 modified children have trauma). Due to the small sample size, this difference is not statistically significant. However, given the trauma patterning among teens and adults, the trend is clear: regardless of age, those with modification (a practice that must occur in infancy) are apparently being singled out for potentially lethal attacks, both as children and later in life.

Wound Recidivism in Modified and Unmodified Groups

Multiple injuries were common in both sub-groups. Just over 50% (49/97=50.1%) of wounded modified crania have more than one trauma, while 43.8% (7/16) of wounded unmodified crania have multiple trauma (see Table 6.14). This difference is not significant (Fisher's exact, $p=0.7883$; $N=113$).

Table 6.14. Tally of Head wounds per sexed late teen/adult in Chanka communities

	1	2	3	4	5	9	
	Wound	Wounds	Wounds	Wounds	Wounds	Wounds	Totals
No. Modified	48	29	9	7	3	1	97
No. Unmodified	9	4	2	0	1*	0	16
No. of wounds in sample (Total No. Wounds =186)	57	39	33	28	20	9	

* = this individual had five peri-mortem cutmarks, but no blunt force trauma

When Chanka individuals were targeted for violence, those with modification tended to be the victims of repeated attacks. Of 97 wounded modified Chanka individuals, 16 (16.5%) have both ante- and peri-mortem trauma, while none of the wounded unmodified individuals (0/16) were the victims of unambiguous, repeated trauma recidivism. The difference is nearly significant (Fisher’s exact, $p=0.0715$; $N=113$). Given the current trend, with a larger sample size and future research, we may be able to conclusively determine that injury recidivism impacted modified Chanka at a significantly higher rate than their unmodified neighbors.







Table 6.15. Teen/adult injury recidivism among the Chanka

Site	Cranial MNI	(n) Wounded Individuals	%	
			(n) Individual with ante- and peri wounds	Wounded individuals with ante- and peri wounds
Modified	160	97	16	16.5
Unmodified	50	16	0	0

Cranio-spatial Distribution of Trauma in Modified and Unmodified Groups

The cranio-spatial distribution of traumatic wounds was compared between the modified and unmodified groups. For both groups, the highest percentage of total fractures were directed to the anterior of the cranium (see Table 6.16). However, significant differences are clearly present in the locational patterning of trauma: only modified individuals have wounds targeting the superior and inferior portions of the vault relative to all other areas (Fisher's exact, $p=0.0322$; $N=213$).

Table. 6.16. Wound tally and distribution on modified and unmodified individuals

							<i>Totals</i>
	LEFT	RIGHT	ANTERIOR	POSTERIOR	SUPERIOR	INFERIOR	
Ante-mortem	24	18	40	26	14	0	122
Peri-mortem	9	12	23	10	2	7	63
<i>Total Modified (n)</i>	33	30	63	36	16	7	185
<i>Modified (%)</i>	(17.8%)	(16.2%)	(34.1%)	(19.5%)	(8.6%)	(3.8%)	
Ante-mortem	2	4	4	5	0	0	15
Peri-mortem	4	3	5	1	0	0	13
<i>Total Unmodified (n)</i>	6	7	9	6	0	0	28
<i>Unmodified (%)</i>	(21.4%)	(25%)	(32.1%)	(21.4%)	(0%)	(0%)	

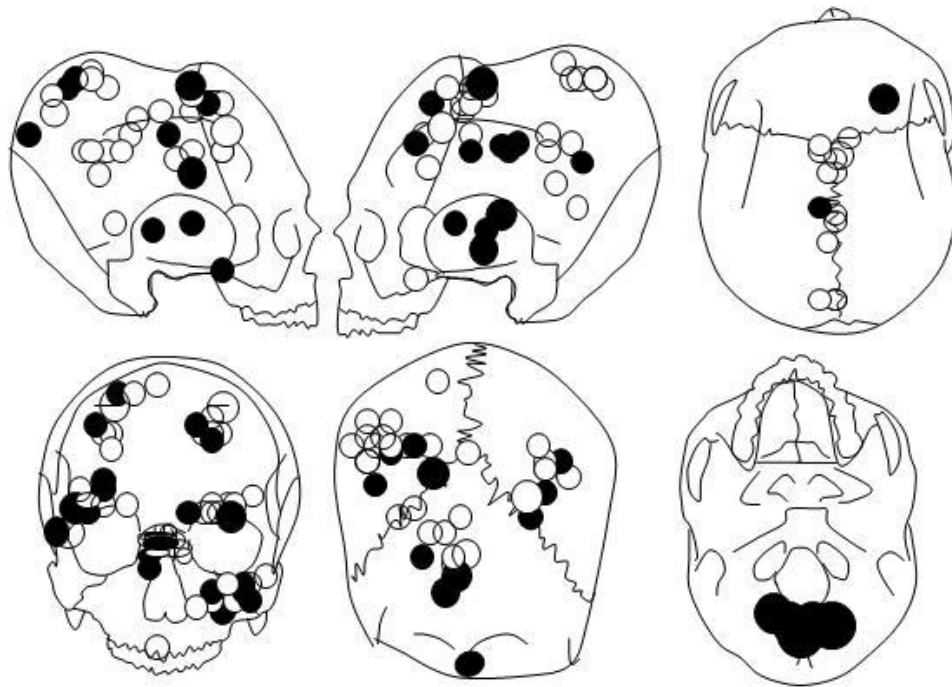


Figure 6.21. Trauma lethality and distribution on LIP modified individuals (white = ante-mortem; black = peri-mortem)

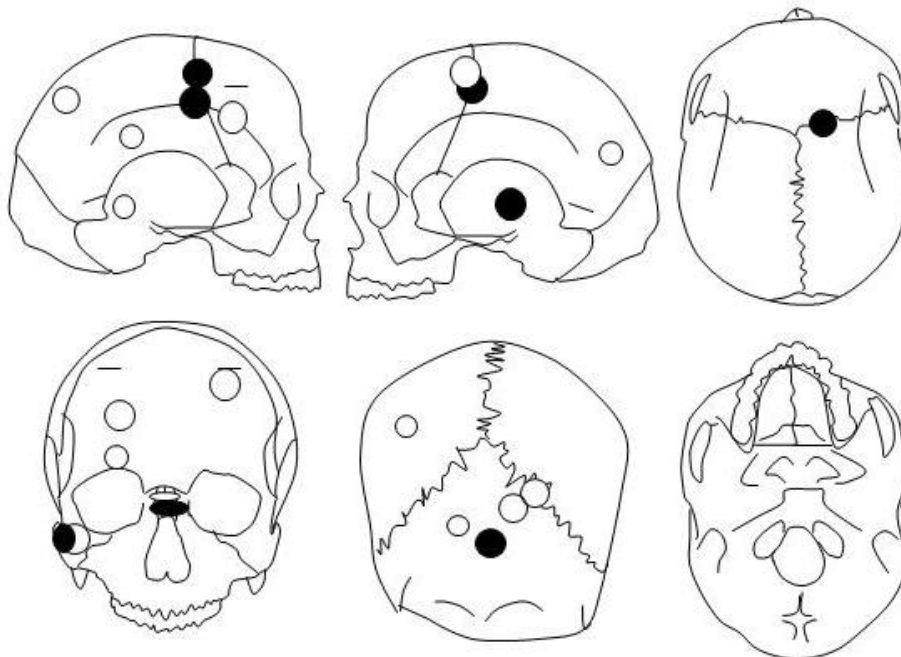


Figure 6.22. Trauma lethality and distribution on LIP unmodified individuals (white = ante-mortem; black = peri-mortem)

Reviewing the Evidence: Correlates of Ethnocide among the Post-Imperial Chanka

The evidence presented so far demonstrates that post-imperial Chanka communities were engaged in different, unique contexts of violence compared to their contemporaneous Quichua neighbors, and earlier Wari-era populations. Given the data at hand, the most likely type of violence that is being experienced in Chanka communities is ethnocide. There are several lines of data that support this hypothesis. Foremost, results indicate that modified and unmodified individuals are having dramatically different violent experiences. Modified individuals present significantly more trauma than unmodified individuals. Furthermore, only modified individuals demonstrated both ante- and peri-mortem wounds, unambiguous evidence of injury recidivism. This pattern suggests that modified individuals' encounters with violence were successive and potentially lethal (Fisher's exact, one-tailed, $p=0.0586$; $N=129$). In the following sections several other intriguing patterns are highlighted, which appear to confirm that violence was ethnocidal in nature and singled out only particular (modified) segments of Chanka society.

Most importantly, in the case of ancient Chanka communities in Andahuaylas, victims of violence were primarily and disproportionately singled out for attack based on recognition of their categorical ethnic affiliation, as identified through cranial modification. In sharp contrast, unmodified individuals led relatively more peaceful lives. This type of asymmetrical violence is a common scenario in cases where states have collapsed or are conspicuously absent. For instance, during the period of internal conflict in Peru, those who spoke Quechua, and concomitantly formed the poorest sector of Peruvian society, were victims of violence at significantly higher rates than their

wealthier, western-dressed, Spanish-speaking neighbors (CVR 2003) (see Fig. 7.6 and 7.7).

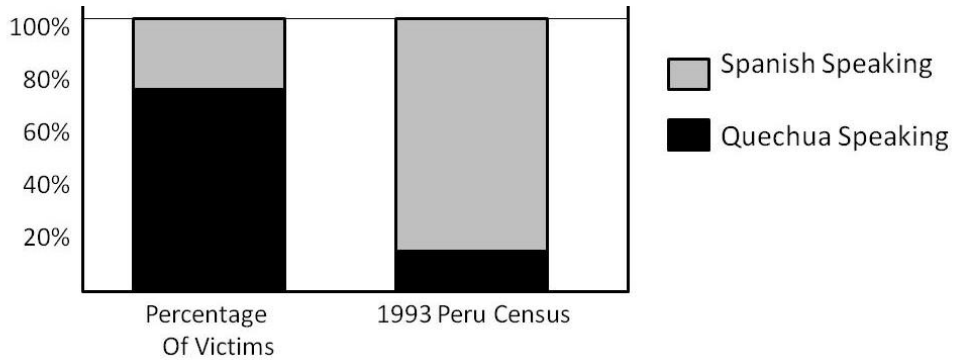


Figure 6.23. Comparison of dead/disappeared Quechua-speaking population relative to the general population (adapted from CVR 2003:154)

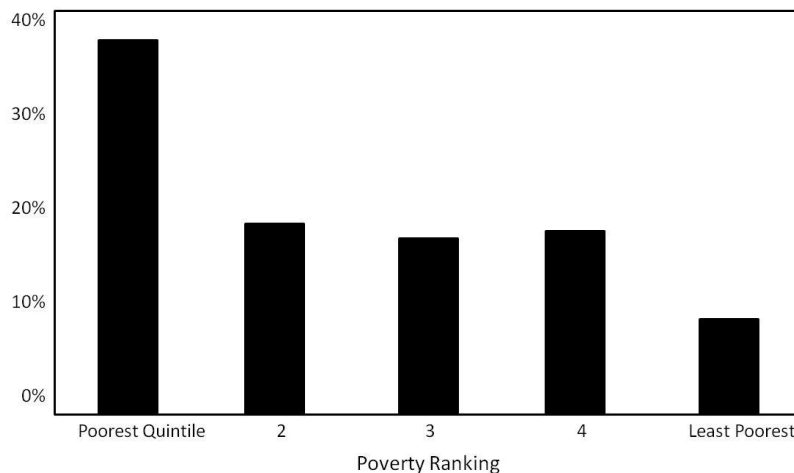


Figure 6.24. Comparison of dead/disappeared relative to poverty ranking in Peru 1980–2000 (adapted from CVR 2003:159)

Excessive Violence

Evidence of redundant violence is also present among Chanka communities in post-imperial Andahuaylas. Here, excessive violence is defined by the presence of multiple peri-mortem blunt force trauma that was physically destructive and more than

necessary to cause the death of a person (see Fig. 6.25 below). Within the entire Andahuaylas sample, these excessive wounds were observed only in Chanka communities. Even more noteworthy, these repeated, high-impact, overkill blows, which were mostly directed towards the face, were present only on modified crania. This type of violence is deeply symbolic. Repeated blunt force injury is meant to increase the suffering of a victim (Gourevitch 1998; Borgdon et al. 2008; Kimmerle and Baraybar 2008; Skinner et al. 2003), and the intentional fragmentation of the skull suggests destruction and dehumanization (Darling 1999; Willey and Emerson 1993). In post-imperial Chanka communities, the physical, peri-mortem destruction of modified crania would have been a potent method of obliterating a victim's identity. This modus operandi may have been common in the Peruvian sierra. For instance, Betanzos (2004:244) mentions that battle axes were used to, "smash heads to pieces," as the final step in a longer process of ethnocidal torture used to exterminate men, women, and children. Osteological evidence from Andahuaylas appears to confirm at least part of the Chroniclers' account.



Figure 6.25. Excessive trauma on modified Chanka crania

In sum, this class of cranial trauma data further supports the hypothesis that modified Chanka individuals are experiencing fundamentally different social contexts of violence than unmodified individuals and from their Quichua neighbors. The pattern of wounds on modified crania suggests that members of this group were singled out for excessive, physically destructive violence.

Modified Children Targeted for Violence

Trauma enacted against children of a specific ethnic group is another key indicator of ethnocide in contemporary communities (CVR 2003). Within Chanka communities, the data presented earlier demonstrated that 14.3% of infants-children have at least one cranial fracture. The frequency of childhood trauma in post-imperial Andahuaylas is high even among contemporary populations (cf. United Nations 2009).

Indeed, the fragmentary (and thus undiagnostic) nature of sub-adult remains in this study sample may mean that rates of trauma in LIP Andahuaylas are actually *underrepresented* within the general population (*ibid.*).

At the former Wari imperial capital (site of Huari), there is also a high percentage of juveniles with cranial trauma: three out of ten juveniles in the Monqachayoq sector (2008a) and four out of six juveniles in the Vegachayoq Moqo sector (Tung 2008b) had peri-mortem cranial fractures. Relative to the preceding Wari era when no juveniles exhibited head trauma (Tung 2012), this is a striking change that further demonstrates that the post-imperial era was a violent and tumultuous time, both for adults and children (Tung 2008a).

But what is causing childhood trauma in post-imperial Andahuaylas? Although abuse is a common etiology of trauma in children (Korbin 2003; Baxter 2005; Scheper-Hughes 1987), only modified children from Chanka communities demonstrate head wounds. The disparate treatment of children is commonly seen in ethnographic examples of genocidal behavior, where torturous violence becomes normative.²⁴ In cases of genocide, unlike in war, children are actually targeted for killing, and this seems to have been the case for Chanka juveniles with modified crania; they, like their adult counterparts, were singled out for violence.

²⁴ For instance, Tyner (2009:2) observed that hundreds of “small, white kernels: teeth,” surrounding the trees which grew within the Choeung Ek (Cambodia) Killing Fields. During that country’s genocide, the Khmer Rouge would smash children against trees because the technique was cheaper than using bullets.

Cranio-spatial Patterning of Ethnocidal Trauma

Both genocide and ethnocide require efficient means of executing large groups of dehumanized people. This need for efficiency usually results in standardized killing methods, and these methods leave indelible, patterned marks on bone. Symbolically, unique locations or mechanisms of injury can also become normative for groups of aggressors. For these reasons, violent acts can sometimes be attributed to a particular segment of society. For instance, in Peru during the 1980–2000 civil war, different causes of death could be associated with either “agents of the state” (military, secret police, etc.) or the Shining Path *Senderista* terrorists. Agents of the state were significantly more likely to employ firearms to cause the deaths of individuals, while the terrorists were significantly more likely to kill using either sharp or blunt force trauma (Fisher’s exact, $p < 0.0001$) (see Table 6.20.). Witness testimony from Andahuaylas relates how the *Senderistas* would almost always smash the faces of victims with large rocks, extirpating their very physical identity (Theidon 2001). As noted earlier, a similar pattern of excessive violence and identity destruction appears to have taken place in Andahuaylas some eight-to-ten centuries earlier.

Table 6.17. Variable methods used by state agents and the Shining Path to cause the death of victims in Peru 1980–2000 (cf. CVR 2003:154)

Method	Responsible Party	
	<i>Shining Path</i>	<i>State Agents</i>
Firearm	55%	82%
Sharp or Blunt Force Trauma	36.2%	11.3%
Other	8.8%	6.7%
<i>Total</i>	100%	100%

Recall that wound patterning indicates the victim's position at the moment of impact and informs on possible motivation for violence. As noted in earlier sections, only modified Chanka crania demonstrate unsurvivable basal skull wounds, called ring fractures. This type of wound is characterized by radiating fractures which split dense features and terminate at the foramen magnum. Impact forces cause the basilar portion of the occipital to separate from the rest of the vault. Often, posterior fracture margins on the occipital squama will display internal beveling. With this type of wound, the brainstem is often lacerated, and death is almost always immediate (DiMaio and DiMaio 2001). Biomechanically, ring fractures can be caused by vertical loading and impact forces transmitted up through the cervical spine and occipital condyles (Lovell 1997), as experienced in high falls. But ring fractures from falls are usually associated with cervical vertebrae compression fractures. In Andahuaylas, not a single cervical vertebra of more than 2,224 observed had this type of fracture. This suggests that falls off cliffs did not cause ring fractures. Rather, ring fractures in Andahuaylas were likely caused by violence. Consider that when humans stand upright, the base of the skull is enmeshed in soft tissue and obstructed by the mandible and vertebral column. However, if individuals are on their knees with their head bowed, the base of the skull is exposed and vulnerable to blunt force trauma. Several strikes to the base of the skull by a standing assailant would lead to a ring fracture. A similar pattern of lethal injury was found on crania from LIP contexts at the former Wari capital city in Ayacucho (Tung 2008b), and at the killing fields of the Khmer Rouge. In Cambodia, incapacitated individuals were the victims of close-range, repeated blunt force trauma (Ta'ala et al. 2006, 2008). In Andahuaylas, ring

fractures were experienced by only one segment of the general population: modified Chanka males and females.



Figure 6.26. Ring fractures from Andahuaylas (left) and the Khmer Rouge Killing Fields (right), from Ta'ala et al. 2006:998)



Figure 6.27. Execution by blunt force trauma to the base of the skull at the Khmer Killing Fields (Painting by Tuol Sleng, reproduced from Ta'ala et al. 2006:997)

Conclusion: Ethnocide in Post-Imperial Andahuaylas

This research acknowledges that an individual may experience violence in different contexts. For example, it is possible that someone may become a victim of abuse within their own community for one reason, and singled out for violence by an outside group for another. Nevertheless, there are several key correlates that strongly suggest that systematic, targeted violence—ethnocide—was a newly emergent form of conflict during the early LIP in Chanka communities. As the next chapter will further elaborate, this iteration of violence singled out individuals whose ethnic identity was inscribed in the shape of their skull.

More generally, this research hypothesized that violence would increase after Wari collapse. Cranial trauma data appear to support this hypothesis. Compared to the late Wari imperial era (MH2), trauma rates increased significantly during the early LIP. Trauma also became significantly more lethal in the post-imperial era, as determined by a dramatic increase in the presence of peri-mortem fractures.

Prolonged conflict, on any scale, can drastically alter the demographic profiles of affected communities. In this study, data from a robust sample of early LIP Chanka males and female skeletal remains show that violence had the potential to contribute to death during crucial productive and reproductive years.

Cultural affiliation also seems to have structured violence during the early LIP. Contemporaneous Quichua and Chanka communities were experiencing different types of violence in the aftermath of Wari collapse. At Pucullu, the Quichua enclave, wound distribution and lethality was mediated by sex: males have significantly more trauma than females. While male wounds are concentrated on the anterior, female injuries are

primarily directed towards the posterior of the skull. This patterning has been observed in cases of raiding and warfare, where men fight and women escape capture (see Tung 2012). Given that the Chanka and the Quichua historically maintained an acrimonious relationship, raids between these cultural groups for agricultural, pastoral, or human bounty was a distinct possibility. Finally, trauma concentrated on the faces and superior areas of Quichua females point to the presence of intra-community (domestic) violence as well (*ibid.*).

In contrast, within Chanka communities, injury frequency, lethality, and cranio-spatial distribution are similar between males and females. This suggests that Chanka men and women are experiencing violence in similar social contexts or encounters. Chanka sites also have a higher ratio of lethal trauma than the Quichua enclave.

Importantly, trauma rates and patterns diverge significantly between modified and unmodified groups at Chanka sites. Males, females, and sub-adults with cranial modification have significantly (or nearly significantly) more trauma than their contemporaneous, unmodified neighbors. The fact that all modified members of society appear to have been equally impacted by attack is an indispensable correlate of ethnocide.

Cranio-spatial wound patterns also point to ethnocidal violence at Chanka communities. Only modified individuals from the Chanka sites have trauma directed at the inferior portions of the vault. These deadly ring fractures on the skull base indicate that those individuals were incapacitated when they became the victims of close-range “execution-style” blunt force trauma. Additionally, repeated, high-impact, peri-mortem “overkill” blows to the face and sides of the cranium obliterated the identity of victims. Excessive and symbolic violence is a final key indicator of ethnocidal violence.

Overall, the trauma data from Andahuaylas indicate that local inter-group relationships were profoundly transformed in the decades following Wari political fragmentation. Modified Chanka individuals were experiencing fundamentally different social contexts of violence than unmodified individuals, and overall, the Chanka were experiencing different types of violence than their Quichua counterparts. Yet despite catastrophic rates of trauma which targeted modified individuals during the early LIP, AMS radiocarbon dates from this research indicate that cranial modification traditions were resilient and continued at least until the Late Horizon (ca. AD 1400–1532). The next chapter investigates cranial modification frequency and variability in Andahuaylas to inform on the creation and maintenance of ethnic identity following Wari collapse.

CHAPTER VII

CRANIAL MODIFICATION

Pedigrees are useful only in so far as they imply the close contact that is a consequence of blood ties [and relations] that eventually leads to mutual help and affection ...For a pedigree is something imaginary and devoid of reality.
Ibn Khaldun (1337 II:8)

Introduction

Trauma patterns on crania from Andahuaylas demonstrate a significant increase in violence immediately following Wari's collapse ca. AD 1000/1050. However, violence was not experienced equally by all segments of the population. Men, women, and children with cranial modification are victims of both sub-lethal and lethal violence at rates that are significantly higher than their unmodified neighbors.

This chapter presents data on cranial modification among the Andahuaylas sample. The first section of this chapter explains why cranial modification is a likely proxy for ethnic identity in the Andes and describes how ethnicity may be approached from a bioarchaeological perspective. Next, results are reported on cranial modification frequency, style, intensity, and homogeneity for males and females from the four LIP sites in this study. The next section discusses how modification and mortuary patterns

figure into Andean notions of ethnicity through *ayllu* identity, and how its use in the aftermath of Wari collapse signals ethnogenesis, the creation and performance of novel, counterposed cultural distinctions.

Cranial Modification as Ethnic Marker in the Andes

Cranial modification is perhaps the most salient corporeal indicator of social identity in the ancient Andes. Indeed Spanish and mestizo chroniclers including Cieza de Leon (1984) [1553], Betanzos (2004) [1557], and Garcilaso de la Vega (1966) [1609–1613], all made mention of cranial modification, noting how it was a practice and sign of group affiliation. The practice involves the permanent deformation of an infant's malleable skull using bindings, boards, ropes, straps, and pads (O'Brien and Stanley 2011). In the Andes, cranial modification has historically been classified into two basic types, *annular*, which involved circumferential binding, and *tabular*, where pressure was placed on the front and back of the skull causing lateral expansion of the parietals (Dembo and Imbelloni 1938).

Today, most anthropologists interpret cranial modification as a marker of a socially ascribed identity. In the Andes, studies have consistently demonstrated that cranial modification was employed to demarcate different sectors of the population, including social or ethnic groups (Torres Rouff 2008), moiety and residential descent groups (Hoshower et al. 1995) and lineage (Blom 2005).

Unintentional modification also occurs, and usually results from choices related more generally to childrearing practices. For instance, over the last several centuries, mothers in highland south-central Peru have tightly swaddled their newborns, often

binding them to *kiraw* (cradles) (Poma de Ayala 1615). This cradleboarding can cause an unintentional flattening in the back of the skull (parietals and occipital).



Figure. 7.1. Drawings by Guaman Poma de Ayala [1616]. Left: (infant bound to *kiraw* cradle); Right: Head-bindings of Chanka leaders Guachaca and Guasco

In Andahuaylas, cranial modification was often obscured by hair, turban-like headbands, and hats. Ethnohistoric accounts (see Figure 7.1), archaeological evidence, and mummies from the region consistently demonstrate how modification was accompanied—and obscured to some extent—by some type of headgear. It is possible that the modification instrument used in infancy and the head bindings used in later childhood and adulthood were isometric in their design.



Figure 7.2. Moldmade ceramic head from Achanchi (LIP, ca. AD 1000–1400). The individual has a fronto-occipital erect head shape and is wearing a tight-fitting red skull cap or turban (permission to photograph granted by Lucas Kellett).



Figure 7.3. Lateral views of mummy; the annular oblique modification style is visible only when headband/wig is removed. Note that this juvenile does not have pierced ears, a mark of adulthood and rank-status (Poma de Ayala 2006 [1616]).

Approaching Ethnicity from a Bioarchaeological Perspective

Although we do not have much information on the possible hairstyles, headbands, wigs, and hats worn by ancient Andahuaylans, modified skulls are a close proxy for the

social information conveyed by head ornamentation. Hats (headgear in general) transmitted a wealth of social information (Wobst 1977), and the shape of the cranium likely conformed to the headgear used to modify the skull. Although cranial modification was prohibited by the Spanish (Cobo 1964 [1653]), for the past five centuries, headgear has continued to be recognized as a distinctive marker of residential origin and social identity in the Andes. Today, “Andeans carefully scrutinize people’s hats to determine regional or ethnic affiliation” (Ackerman 1996:236). In this study, head shape variability is thought to be associated with distinct head gear; this ornamentation was likely used to transmit information on the social identity of the wearer (see Cook 1992; Oakland Rodman 1992). Thus, bioarchaeologically, skull shape serves as an analytic proxy for some type of non-ephemeral, deeply entrenched social identity. The fact that cranial modification is retained prominently and permanently throughout the life of an individual, makes it a powerful marker of social affiliation and a tangible signifier of the production of membership as ascribed by others in the group.

The Emergence of Cranial Modification in Andahuaylas

Cranial modification use in Andahuaylas significantly increases in the post-imperial era. None ($n = 0$) of 36 individuals from Turpo, the MH2 site, have modified crania. However, during the early Late Intermediate Period, modification rates increase significantly to 76% (208/273) (Fisher’s exact, $p=0.0001$; $N=309$).

Table 7.1. Modification use in Andahuaylas

Era	Crania Observed	Number Modified	Modification Rate
Middle Horizon	36	0	0%
Late Intermediate Period	273	208	76%
<i>Total</i>	309		

Following Wari's decline ca. AD 1000/1050, cranial modification was quickly adopted by a majority of individuals in Andahuaylas. At Cachi, the upper moiety Chanka site, 75% (129/171) of observable crania were modified. Rates were similarly high at Ranracancha, the the lower moiety Chanka site (41/41 = 100%), within the Natividad Museum collection (17/27 = 63%), and at Pucullu, the Quichua enclave (21/34 = 62%).

Table 7.2. Modification use during the LIP

Site	Ethnic Affiliation	Crania Observed	Number Modified	Modification Rate
Cachi	Hanan Chanka	171	129	75%
Ranracancha	Hurin Chanka	41	41	100%
Natividad Museum	Chanka	27	17	63%
Pucullu	Quichua	34	21	62%
<i>Total</i>		273	208	75%



Figure 7.4. Cranial modification variability in Andahuaylas

Modification Ratio

A modification ratio was developed to gauge head shape intensity (“elongation”) using a quantitative continuous variable (see Chapter 4). This ratio reflects relative skull oblong or roundness on a Cartesian plane. For unmodified crania that could be measured (N=37) the average modification ratio value was 1.218689 with a standard deviation of 0.126002, and a range between 1.092687 and 1.344691. For 138 modified crania that could be measured, the average modification ratio value was 1.004916 with a standard deviation of 0.105639, and a range of .899277 and 1.110549. An unpaired t-test confirms that the mean difference in values between modified and unmodified individuals was indeed significant (Two-tailed $p < 0.0001$; $t = 7.9051$), and thus a reliable measure of modification presence and intensity in this population. As illustrated in the figure below, modification ratios between modified and unmodified crania produce distinct bell curves with only a slight overlap. It remains to be seen whether this method is applicable in different populations throughout the Andes.

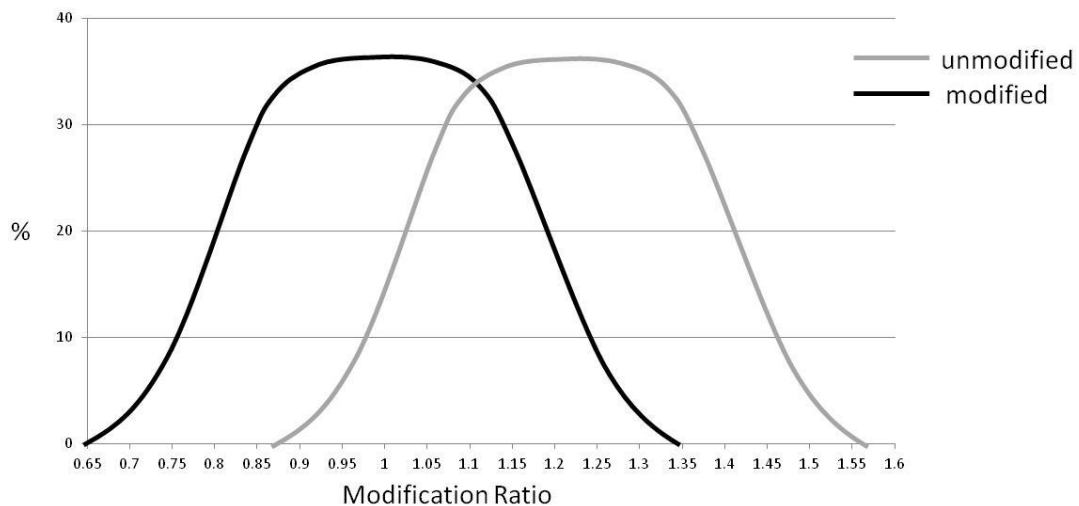


Figure 7.5. Modification Ratio among modified and unmodified groups

Modification intensity (“elongatedness”) was also compared between sites (see Table 7.6; Figure 7.4), where it was found that the distribution of modification intensity, as determined by the modification ratio, is similar. Overall, average modification intensity means tend to be less extreme (less elongated), but with wider variation at Cachi and Ranracancha compared Pucullu. In other words, for the three LIP sites, Pucullu is the least heterogeneous. This cultural homogeneity is expected in enclave communities (Kaufmann 1996).

When the intensity of modification is compared between males and females, results demonstrate that males tend to have slightly more intense (elongated) crania compared to females, and a lower standard deviation (Fig. 7.4).

Table 7.3. Modification intensity by site

Site	Mean Mod Ratio	Std. Dev.
Cachi	1.048397	.137228
Ranracancha	1.009416	.12113
Pucullu	1.015325	.115583

Table 7.4. Modification intensity by sex

Sex	Mean Mod Ratio	Std. Dev.
Females	1.057111	.137151
Males	1.02001	.123147

Modification Variability

A modification code was used to qualify variability in head shape. This code is adapted from Buisktra and Ubelaker’s (1994) cranial modification data collection form. Cranial modification styles in Andahuaylas were produced using circumferential bindings and pads (little pillows), on the frontal bone, and around the area of the occipitomastoid

suture. The annular bindings prevented parietal expansion, and created an “elongated” head. Bands were always placed either above or below the frontal bosses. Pressure was sometimes placed posterior to the coronal suture. On the posterior of the cranium, pressure was centered on lambda, on the squamous portion of the occipital, and/or below inion. Using this method to qualify modification, there were 19 variations. However, these variations may be the results of relatively unstandardized techniques. In Andahuaylas, most of the modified population (84.4%) are employing one of seven major styles. Some of the most common variations in modification style are illustrated below.

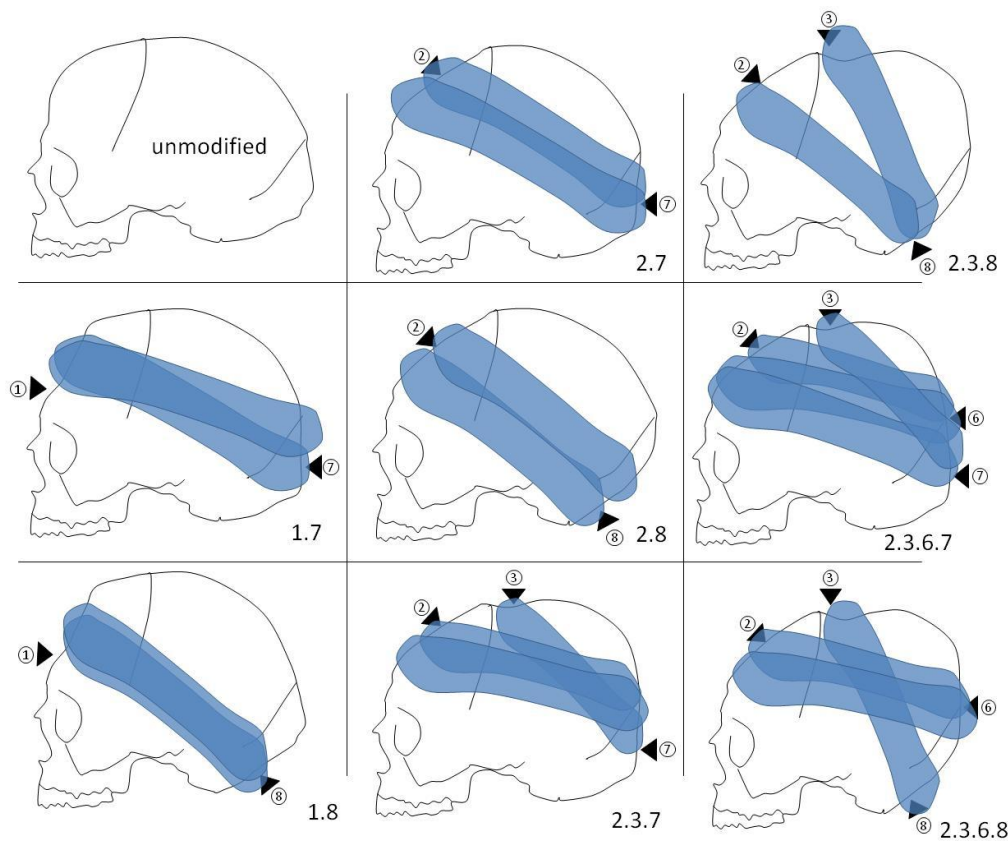


Figure 7.6. Common modification styles in Andahuaylas and corresponding band placement

Table 7.5. Common modification styles in Andahuaylas

Style	N	%
1.7	11	6.9
1.8	8	5
2.0	26	16.3
2.7	33	20.6
2.8	41	25.6
2.3.7	8	5
2.3.8	8	5
12 other styles	25	15.6
<i>Total</i>	160	100

Using standard terminology (Torres Rouff 2003:68-69) commonly employed in the Andes (Torres-Rouff 2003; Blom 2005; Hoshower et al. 2005), cranial modification style in Andahuaylas can be divided into two main sub-types: annular erect and annular oblique.

Table 7.6. Modification style following standard nomenclature

Style	N	%
Annular Erect	106	52.7
Annular Oblique	95	47.3
<i>Total</i>	201	100

Modification Heterogeneity

Modification heterogeneity informs on social grouping and technical standardization. A simple ratio derived from the number of modified individuals divided by the number of variations present at each site illustrates relative degrees of heterogeneity. Despite unequal sample sizes, there is relatively less variation in head shape at the Chanka sites of Cachi and Ranracancha, compared to Pucullu.

Table 7.7. Modification heterogeneity

Site	N Modified	Variations Present	Heterogeneity Ratio
Cachi	128	16	8
Ranracancha	41	13	3.15
Pucullu	21	10	2.1

Overall, males tend to demonstrate more homogeneity in modification styles. At the Chanka sites, where we have a large, robust sample, there is twice as much variation in head shape (band placement) in females as males. This disparity is noteworthy, and would be expected if *machays* reflect patrilocal residence patterns and female exogamy. With patrilocal (mortuary) residence, the out-migration of local females, and the in-migration of non-local wives from distinct settlements/social groups would create the male-to-female modification disparity present among Chanka males and females in Andahuaylas.

Table 7.8. Modification heterogeneity by sex at Chanka sites

Sex	N Modified	Variations Present	Heterogeneity Ratio
Females	59	18	3.28
Males	59	9	6.56

Alternatively it is possible that modification binding practices for males may have followed more standardized prescribed techniques compared to females. Overall, if cranial modification signals identity-specific descent groups, then modification diversity in this instance likely represents corporate cohesion above the descent-group level (Hoshower et al. 1995:160).

Modification Variability and Sex

There are several significant associations between band placement and sex. Among the 68 males observed, 14 (20.6%) have binding impressions below the frontal boss, while only 3 females out of 63 (4.8%) have impressions below the frontal boss. This difference is statistically significant (Fisher's exact, two-tailed, $p=0.00780$; $N=131$). Furthermore, among 63 females, 13 (20.6%) have post-coronal depressions, while only 2.9% (2/68) of males show post-coronal depressions, a difference that is statistically significant (Fisher's exact, two-tailed, $p=0.0018$; $N=131$). This suggests that the placement of bindings on particular regions of the cranium was mediated by sex. This variability tended to occur on the anterior of the skull and would have been very conspicuous. Binding locations and concomitant morphological changes would have been much more noticeable on the face and forehead than on the back of the head, which would have been covered by hair and hats. Although most previous studies of modification have acknowledged major morphological differences on the posterior of the skull (e.g., "erect" vs. "oblique"), highly visible anterior binding locations in Andahuaylas are significantly variable, and in this case at least partially mediated by sex.

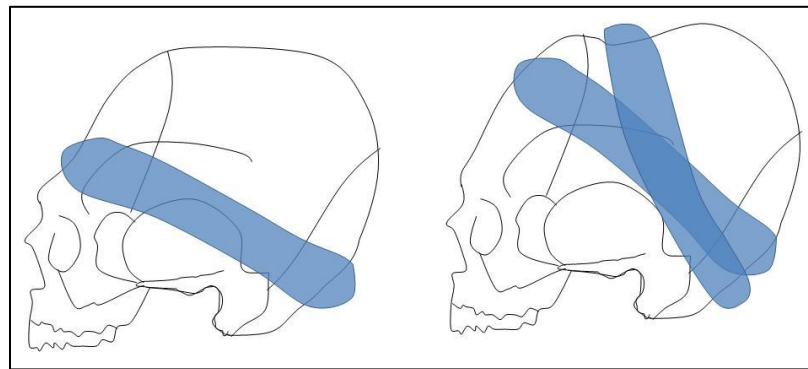


Figure 7.7. Common male modification (left) and female modification (right)

Modification Variability and Cultural Affiliation

This study also documented the variability of modification styles at all LIP sites. Band placement appears to vary slightly between Chanka moieties. There are significantly more skulls with post-bregmatic depressions at Ranracancha (10/41= 24%) than at Cachi (8/112=7.1%) (Fisher's exact one tailed, $p=0.0082$; $N=153$). However, given that remains from Ranracancha all come from the same (patrilineal) cave, these results may be biased. Although the Pucullu sample suffers from similar issues of representative bias, the placement of bindings on the cranium does not appear to be structured by cultural affiliation: there are no significant differences in modification style between Chanka and Quichua sites. These results suggest that aside from sex, cranial binding traditions might have been predicated by lineage, or moiety.

Discussion: The Role of Sex and Modification

Overall, the data on modification presence, style, homogeneity and intensity point most strongly to sex-mediated decisions on binding placement during the modification process in Andahuaylas. However, the disparity in modification intensity between the sexes and the greater heterogeneity in female head shape may actually be an artifact caused by female exogamy. Relative to in-migrating females from various locales, lineages, or *ayllus*, local male head shape may be more homogeneous due to social rules concerning (mortuary) patrilocality.

The fact that variability in head shape homogeneity (and thus head ornamentation variability) would be distinct between males and females is supported in a mortuary model based on patrilocality. Ethnohistoric and previous aDNA research appears to

demonstrate that *machay* collectivity is based on biologically related patrilineage groupings. If modification implementation was also based on male lineages, then *machays* would demonstrate sex-based differences in modification presence. However, this is not the case, because modification frequencies among males and females are similar between caves, sites, and cultural affiliation. So how might we explain the data pattern in Andahuaylas?

One possible explanation is that while cranial modification implementation (the use of bindings in the first place) may have been structured by a biologically-reckoned kinship category (i.e., something akin to a caste, or category of “first-born/successor”), modification style (head shape) was based on matrilineal descent. Accounts of Inca kinship culled from ethnohistory suggest such a scenario. According to Zuidema (1964:15), Inca *panacas*, or social groups, consisted of all the ruler’s descendants, except for the son who succeeded him (Zuidema 1964:15). Sometimes, this favored son was the first-born, but this was not always the case (consider the case of primogenitor Inca Urco who was superseded by his younger brother Pachacutic [Urton 1999]). Perhaps the Chanka used modification to denote this favored descendant.

Importantly, similar to *ayllus*, *panacas*, complementary social collectives, were organized as matrilineal exogamous descent groups, “in which the man belongs to his sister’s group. His children can then not be classed in his group” (Zuidema 1964:185). Conceptually and practically, for the Inca, patrilineality was endogamous and matrilineality was exogamous. Complementary categories of descent may have also been drawn upon in Andahuaylas. Sabine Hyland’s (see Hyland and Amado 2010) ethnohistoric research also highlights the strategic importance of female exogamy in

Andahuaylas. She notes that during the Colonial Era, a *kuraka* would give a big dowry so that his daughters could marry into the creole elite class. When the *kuraka*'s son became the chief, his creole brothers-in-law would actively help maintain power when challenged by other *ayllus*. In other words, the marriage of the future *kuraka*'s sister is crucial to his power.

Thus, although the placement of head-bindings may be mediated by gender, gender-mediated patterns of female exogamy may be accounting for head shape variability between males and females in Chanka communities throughout Andahuaylas.

The Meaning of Cranial Modification in Andahuaylas

The data demonstrate that cranial modification was implemented on male and female children at Chanka and Quichua sites in Andahuaylas only after Wari's decline. Modification implementation and frequency are not correlated with specific artifact assemblages denoting an occupational class, site, sex, cultural affiliation, or residential origin (see Chapter 9). However, sex-mediated descent and exogamy is likely structuring head shape variability and band placement.

Intriguingly, AMS radiocarbon dates indicate that modified and unmodified individuals lived contemporaneously and were often interred collectively in *machays*. Given the "strict organization and distinction" (Doyle 1988:122) of burial caves, members of different *ayllus* were always interred in distinct *machays*. Thus, we can tentatively assume that modified and unmodified individuals collectively buried in Andahuaylan *machays* belong to the same *ayllu*.

However, osteological evidence demonstrates that cranial modification presence in Andahuaylas does not mark *ayllu*. *Ayllus* are nested, scalar entities whose size and character depend on oppositional relationships with an analogous entity (another *ayllu*) (Skar 1982). Because *ayllus* can encompass a single extended family to an entire region, the immutability of cranial modification makes it an impractical marker of such malleable groupings. Moreover, *ayllus*/moieties are dual and complementary, but Ranracancha and Cachi (upper and lower moiety sites) differ significantly in terms of modification frequency (refer back to Table 7.1). This disparity is peculiar, because as two moieties of the same cultural group, we would expect either consistency or complementarity in modification frequencies. Although the disparity between modification rates is probably due to bias (the Ranracancha sample is represented by just one looted cave and future excavations of other caves may reveal more heterogeneity), conceptually, if modification presence is associated with moiety and head shape was correlated to lineage, then how was lineage expressed among unmodified moiety members?

The malleability of particular social grouping makes them inappropriate explanations for modification presence. As a permanent process, modification must indicate a category that remains consistent despite shifts in scale and oppositional complementarity. If we are to reconcile *machay* collectivity, moiety affiliation, and cranial modification variability, cranial modification must denote a supra-*ayllu* (“ethnic”) identity.

Given these considerations, cranial modification may have instead served to highlight specific kinship categories and obligations within *ayllus* and cultural groups. Recall that kin are people who have a blood (cognate) relative in common (Goodenough

1955). Unlike affine relationships that are forged through alliance, kin relationships are fixed from birth. *Kindred* is thus a social category (not a group) that, in Andahuaylas, structures who can form part of the *wasifamilia*.

If modification marks kin categories, then members of the same *ayllu* with differing head shapes (modified and unmodified) would still be interred collectively. Modification in Andahuaylas could have been used to highlight a common social category (based on biological kinship) or scalar level of integration, while still being culturally Chanka (or Quichua) on a macro level. Assuming Andahuaylas mortuary patterns conform to patterns of patrilineality observed in other prehispanic sierra contexts (Baca et al. 2012), modification implementation must be structured by some other complementary rule of descent or social categorization. Cranial modification styles suggest that binding traditions were mediated, to some extent, by gender. However, the sheer range of modification styles points more strongly to the existence of various lineages. Ethnohistoric sources hint that these lineages were based on matrilineal descent. Thus, although in Andahuaylas head shape was based on that of the mother's family (matrilineal descent), and perhaps influenced by the sex of the offspring, the presence of modification itself was structured by a kin category.

Excavation and lab analysis of human remains appear to indicate that: 1) cave collectivity was based on patrilineage and patrilocality, 2) head shape (modification style) was based on matrilineage, and 3) modification presence indicated a kin category. The model below illustrates this complicated relationship: *machay* cave collectivity is based on patrilineal descent, and couples are assumed to be patrilocal at death. However, cranial modification presence is restricted to the kinship category of first-born children (male or

female), while differences in modification style (head shape) is based on that of the mother (matrilineal).

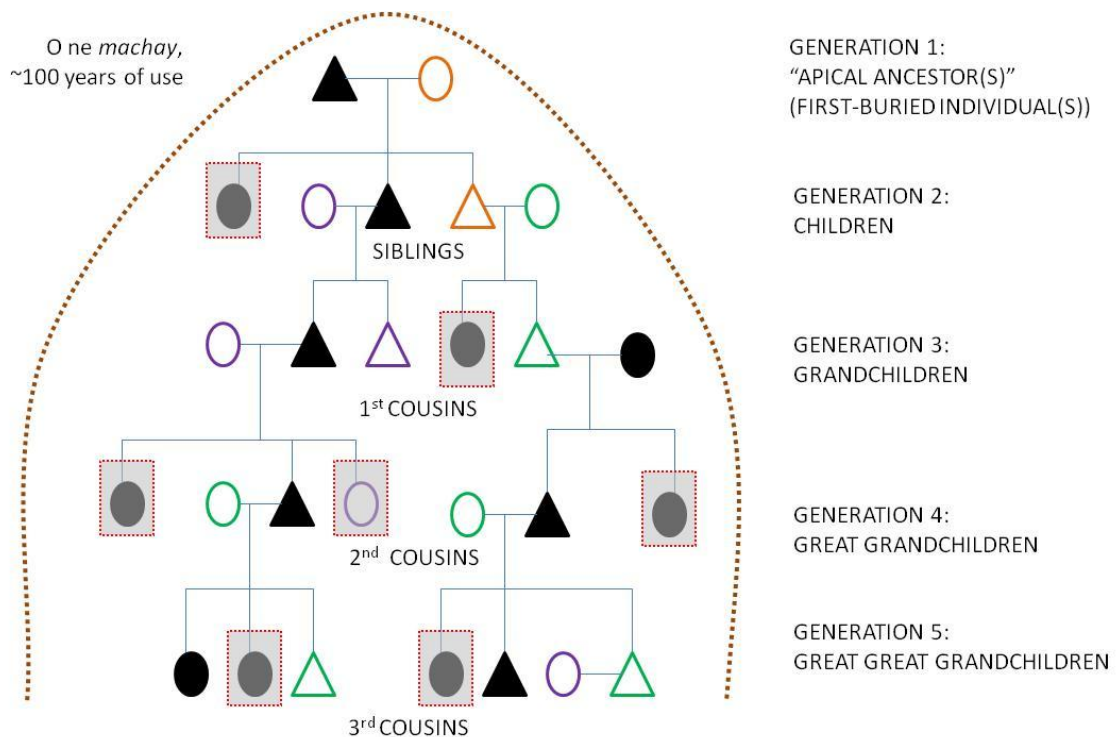


Figure 7.8. Heuristic model #1: how parallel descent and social categorization may structure *machay* collectivity and cranial modification. Key: Triangle = male; Circle = female; Black fill = no modification; White fill = modification; Colored lines = different modification styles; Shaded rectangles = females that moved away (patrilocal)

The schema illustrated above is not the result of computational modeling, but rather serves as a heuristic model that may be tested in similar types of studies. Future genetic analysis of the Andahuaylas skeletal sample may further clarify the biological relationship of collectively inhumed individuals, and be used to help ascertain what role biological affinity plays in the performance of ethnic identity through cranial modification implementation.

The Social Benefits and Risks of Modification

Cranial modification was a tangible means of demonstrating ethnicity. In practical terms, this ethnicity was arguably reckoned through kin categories that were passed on and performed through biological kin ties. A rough analogue may be a group based on *primogenitors*²⁵ or biologically based *compadres*. This shared ethnic identity would have allowed in-group members to access crops, herds, salt, etc. distinct from *laymi* (collective) *ayllu* holdings. Moreover, modification would be a salient affirmation of social solidarity in contexts of supra-household fiestas, labor (settlement building, canal cleaning, etc.), and conflict.

The restricted generational depth of *machay* use in Andahuaylas suggests the identity and memory of those interred together could have been known to living descendants. This social memory could have been key: in a post-imperial era fraught with novel challenges, large social networks would need to be activated on occasion, and solidarity groups would have to be maintained and (re)created in each generation through parallel descent. Although corporate land use and reciprocal labor obligations are a foundational aspect of the *ayllu*, certain practices of affiliation must have been necessary so that certain descendants could make legitimate claims to access those natural and social resources. Modification may have been one strategy which facilitated this process.

²⁵ The special status of first-born and/or “primogeniture” children is well known in the Andes (see Chapter 5). Lower fertility rates and higher infant mortality rates will cause first-born or eldest living children to make up a higher percentage of the population (Biggar et al. 1999).

Post-Imperial Cranial Modification as Proxy of Ethnogenesis

Because modification is a practice whose reproduction speaks to the creation of intentional cultural distinctions, it can be used as a proxy of ethnogenesis. In this case, it appears that Wari's fragmentation helped restructure boundaries that demarcated novel inter-group differences and highlighted novel cultural identities.

Wari state collapse spurred striking changes in how identities were conceived, perceived, and codified; that is, how people regarded and represented themselves and others. As Wari's ideological and economic influence waned, along with its emphasis on status-based differences and rigid hierarchies, communities would have had to renegotiate relationships with neighbors. This renegotiation was the mechanism that drove ethnogenesis in post-imperial Andahuaylas, a process that was reified through cranial modification.

Such processes are common in cases of state collapse, cross culturally (see Sen 2008; Taylor 2010). Multi-valent identities (i.e., sex, age, occupation, etc.) could have been easily suppressed during documented episodes of instability and outright violence after ca. AD 1000/1050. In this turbid milieu, cranial modification may have promptly emerged as a new and highly conspicuous means of denoting a singularized social identity. Cranial modification would have promoted solidarity among in-group members while simultaneously provoking further balkanization of those outside the group (see Torres-Rouff 2003). Antagonisms created by the cultural counter-positioning processes inherent in ethnogenesis may explain why, despite its abrupt genesis and rapid, widespread adoption, those who marked their ethnic identity using cranial modification were overwhelmingly singled out for violence.

Ethnogenesis and Ethnocide as Linked Processes in Post-Imperial Andahuaylas

The ubiquity of modification throughout Andahuaylas indicates that it was a prominent phenotypic signifier which would have legibly transmitted a wealth of social information to both in- and out-group members (Wobst 1977). This salience has its risks. Modified individuals could become drawn into potentially dangerous or violent activities due to the social obligations conferred by head shaping, but consequently singled out for attack or denied resources by rivals.

Given the increased risk of violence, a pressing question remains: Why was cranial modification not wholly adopted (or wholly abandoned) by everyone?

There must have been certain social boundaries marked by modification that were so deeply instantiated that it motivated some caregivers to bind the heads of their offspring, while at the same time preventing other caregivers from doing so. Ascribing ethnicity through modification was thus a privilege dependent on pre-discursive standards that only certain members of the community met. Importantly, during the LIP, refraining from modification would have made just as powerful statement about affiliation as modification itself.

Conclusions: Ethnogenesis and Resilience in the Post-Imperial Era

Analysis of cranial modification presence, style, intensity and homogeneity in Andahuaylas reveals evidence of post-imperial ethnogenesis in the region. Cranial modification is considered a proxy of novel cultural practices whose implementation and performance are used to draw distinctions between groups. Several results support this conclusion.

First, modification only becomes widespread after Wari collapse. During the Middle Horizon, social distinctions were not delimited through modification of the cranial vault. Moreover, groups with different cultural affiliations (Chanka and Quichua) began to utilize modification during the early Late Intermediate Period.

Second, cranial band placement and heterogeneity varies significantly by site and by sex. We may conclude that while cranial modification absence or presence signals a supra-*ayllu* ethnic identity, modification styles likely encode gender or lineage affiliation.

Although a particular modification style (possibly representative of matrilineage) is not associated with high trauma rates, modification presence (possible kinship category) is. This suggests that violence did not single out individuals associated with a specific site (moiety), lineage, or gender. Rather, violence targeted individuals who used cranial modification to denote their biologically and socially reckoned ethnic identity.

Crucially, ethnocide and ethnogenesis may be linked processes in post-imperial eras. As imperial hierarchies disintegrate, old political subjectivities dissolve and novel institutions coalesce: new people and new groups are created. Andahuaylas witnessed the crystallization of the *ayllu* at this time (Pink and Kurin 2011; see Chapter 9), as well as the genesis and performance of a new ethnic identity. However, post-imperial eras are also prone to violence, and novel iterations of conflict. In the post-Wari era, groups in Andahuaylas likely fought with people they saw as unrelated, but also with those who shared common ancestry, or even “groups with which their wives originated and with whom their daughters lived” (Leblanc 1999:19). Yet violence was asymmetric, and was reified through ethnocide, a common manifestation of conflict in cases of state collapse. Consequently, the implementation (or absence) of cranial modification may have been a

type of highly visible “special precaution” used to reduce the likelihood of a blood relative living with aggressors getting injured in “friendly fire” (*ibid.*). Moreover, AMS dates indicate that despite disproportionate violence, modification continued as a resilient practice of affiliation until at least the late 14th century in Andahuaylas.

Cranial modification was an innovative adaptation likely used to mediate interpersonal relationships that were radically restructured in the aftermath of Wari collapse. However, inherent within the genesis of novel cultural distinctions and identities are seeds of antagonism and indeed, violence. LIP communities likely witnessed ethnocidal violence, which emerged as a direct result of the negotiated processes of ethnogenesis. The imbrication of challenge and hardship with invention and resilience is not limited to cranial modification and trauma. The following chapter critically examines the use of trepanation (cranial surgery) in post-imperial Andahuaylas as an innovative medico-culture procedure intended to cope with novel challenges following Wari collapse.

CHAPTER VIII

TREPANATION

Introduction: Cranial Surgery in Ancient Peru

Trepanation is a surgical procedure involving the intentional piercing and removal of a part of the cranial vault. In prehistoric Peru, the earliest evidence of trepanation comes from coastal Paracas sites, dated to around 400 BC. Trepanation use continued unabated for the next 2,000 years, with the most recent surgeries dated to Inca attempts around AD 1500 (Verano 2003). Although the earliest evidence of trepanations in the sierra derives from the Early Intermediate Period (ca. AD 200–600) (Verano 2003), the practice was not universally adopted. For instance, evidence of cranial surgery is absent among later Middle Horizon skeletal populations from Cuzco (Andrushko 2008:166).

Across Peru, children as young as two-to-three years old have evidence of trepanation, although the practice is most commonly observed on adults. Moreover, while males are overwhelmingly the recipients of trepanation overall, women form a substantial portion of trepanned individuals in collections from regions like the Northern Highlands and Titicaca Region (Verano 2003:227). Previous studies adduce that trepanations may have been limited to complex culture groups and cosmopolitan geographic regions, such

as the south-coast, the central coast, and Cuzco, but current findings in Andahuaylas suggest otherwise.

This chapter reports on the assessment of 32 trepanned crania from Andahuaylas to addresses questions about the timing, methods, survivability and possible motivations for trepanation. Case studies also present evidence for surgical experimentation and peri-operative procedures like wound dressing and cranioplasty.

Coping with Maladies through Surgical Intervention

Although trepanation is not mentioned in Colonial texts, nor is it represented iconographically on material culture in the region, ethnohistoric and ethnographic examples from the Andean sierra provide important insights on the conditions that may have structured surgical intervention in the past.

During the late prehispanic era, trepanation may have been known by some iteration of the word *sircca* (see Holguín 1952:160). In its noun form, *sircca* means “a swollen vein or a lancet.” As a verb, *sircca* means “to pulsate or beat, to bleed out, bloodlet, or pierce.”

Previous scholarship has consistently demonstrated that trepanation in the Andes was a medico-cultural practice likely realized to alleviate pain and intracranial swelling due to traumatic injury, neurological disorders, or other psychosomatic illnesses (Verano 2003; Andrushko and Verano 2008; Verano and Andrushko 2010). While serious physical injury to the skull can create an acute medical crisis necessitating urgent surgical intervention, social transgressions (Marsteller et al. 2011) or psychosomatic maladies in the late prehispanic Andes may have also prompted trepanation surgery.

Ethnohistoric accounts (see Bastien 1985; Cobó 1653; Salomon and Uroiste 1991 [ca. 1600]) as well as contemporary Andahuaylans commonly attribute pathological conditions that merit medico-cultural intervention to environmental causes (like excessive cold), supernatural causes (like malevolent telluric *wayra* winds), and witchcraft. For instance, townsfolk from modern Cachi report that interacting with *machays* exposes the living to a host of maladies: the living may be overcome by *antimonio* (toxic vapors), suffer from *qapiccasca* (being grabbed by the earth), or contract the *ayatullu* (corpse bone). *Ayatullu* is an illness caused by touching *gintilikuna* (prehispanic) bones. The *ayatullu* enters the body and never leaves; most tumors, bunions (*hallus valgus*), cysts, calcifications, and other similar deformities are offered as evidence of *ayatullu* infection.

Physical, emotional, or spiritual trauma can lead to fatal conditions like *susto* or *manchariska* (fright sickness/animus loss) (Greenway 1998), which often necessitate medico-cultural intervention. In young children especially, *susto* is often lethal because it causes the animus to escape out of the anterior fontanelle. Fontanelles are thus viewed in Andahuaylas as potentially dangerous, semi-permeable apertures, a class of anatomy known in Quechua as *ñupus* (things that are very soft and sink to the touch). While *ñupus* are orifices which expedite animus loss, they are also visible representations of vitality because they pulsate. Vivacity in both young and old is indicated by different onomatopoeic characterizations of *ñupu* pulsations on the head (from the sickly *piti pipitik* and *tanik tanik* versus the healthy *ttic ticc* [Holguín 1952]).

In Andahuaylas today, *susto* is treated using a treatment known as *qarapayle*. A practitioner forcefully massages the cranium and blows on the anterior fontanelle

(*sopladas*) until the *ñupu* pulsations subside, and the soul is returned. While *ñupu* cranial fontanelles disappear naturally over time, trepanation was a process where artificial *ñupus* would have been permanently incised into the skull.

Finally, surgical interventions like trepanation may have been directed towards individuals who have had auspicious experiences, physical deformities, or neurological disorders. Several scholars have proposed that trepanation may have been used to treat epilepsy (Pomata and Campos 2008; Burneo 2003). Those who suffered from seizure disorders, termed *sonqo nanay* (animus pain), were usually held in high esteem, as they had the ability to communicate with *huacas* (shrines/deities) during periodic ecstatic trance-like outbursts (Villagomez 1919:155; Betanzos 1572; see Eliade 1957; Fadiman 1998).²⁶

Trepanation Results

Crania from the four study sites and one museum collection in Andahuaylas were examined for evidence of trepanation. To facilitate comparison with other studies, only those crania more than 85% complete and over five years old were included in the study. Two-hundred eighty-four (N=284) crania met this criteria. In total, 32/284 (11.3%) crania had at least one attempted (ecto-cranial) or complete (reaching the endo-cranium) perforation. There were 45 “trepanation events,” contemporaneous events where one or more perforations were created in the same cranial location.

²⁶ Not every epileptic was treated with such deference: Inca Capac Yupanqui unceremoniously divorced his wife, Chimbo Mama Cava, because of her frequent epileptic attacks (Poma de Ayala 1615).

Methods and Size

Four methods of trepanation (see Verano 2003) are present in Andahuaylas: 1) scraping; 2) circular grooving and cutting; 3) boring and drilling; and 4) linear cutting.

Scraping involves the repeated abrasion of the ecto-cranial surface, creating an irregular, beveled area of bone; this method usually impacts the largest surface area of the cranium. Circular grooving and cutting involves the creation of a circular furrow, resulting in a bone plug which can be pried out of the cranium. Boring and drilling involves the use of a bit to abrade the cranium over and over again, leaving a series of small circular holes. The high number of perforations in the total Andahuaylas sample is largely a consequence of the boring and drilling trepanation method. Finally, linear cutting uses a back-and-forth sawing motion to create a cross-hatched square of bone, which can be removed. In most cases, it was fairly easy to distinguish between these methods.

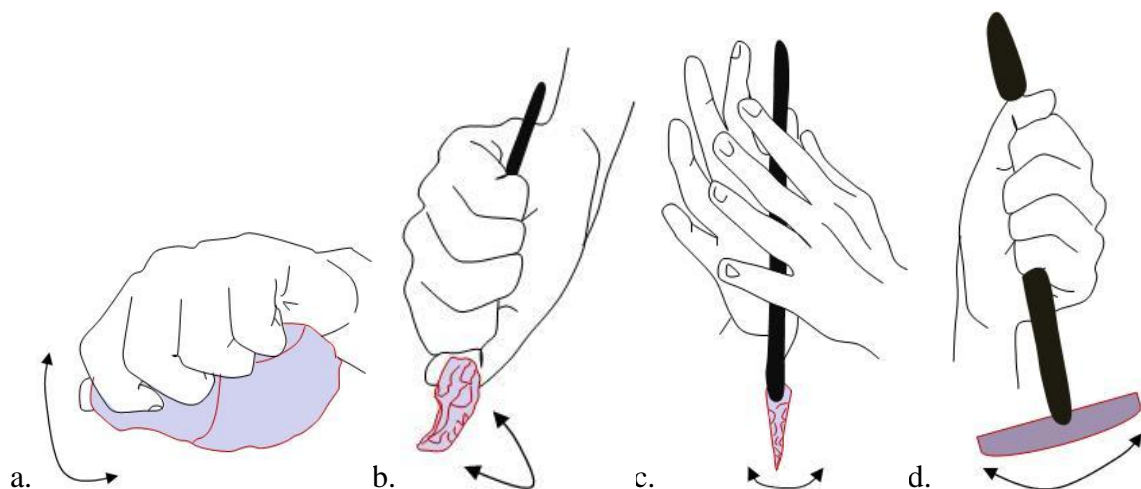


Figure 8.1. Trepanation tools and techniques: a) scraping; b) circular grooving and cutting; c) boring and drilling; d) linear cutting



Figure 8.2. Trepanation methods on the cranium. Clockwise from top left: scraping; circular grooving and cutting; boring and drilling; linear cutting

Trepanation sizes (the area of vault that was impacted by the surgical tool) ranged by method. There are no significant differences between the sizes of scraped or grooved trepanations within or between sites. Nor is there a significant association between trepanation size and degree of healing. However, the size of the drill bit used to make boreholes differs between sites.

To accurately gauge borehole size and depth, a Coltene/Whaldent President Jet Plus microSystem was used to dispense Regular Body President Putty (dental putty) into the boreholes. The resulting mold was measured with a caliper. At the Chanka site of

Cachi, boreholes have an average diameter of 4.335 mm (sd=.449 mm), while boreholes on crania from the nearby Natividad Museum have an average size of 6.105 (sd=.829 mm) Boreholes at Quichua enclave at Pucullu have an average diameter of 5.987 mm (sd =.506 mm). The drilling and boring method, the technique with the lowest survival rate, was not used at Ranracancha.

Table 8.1. Borehole diameter by site (in mm)

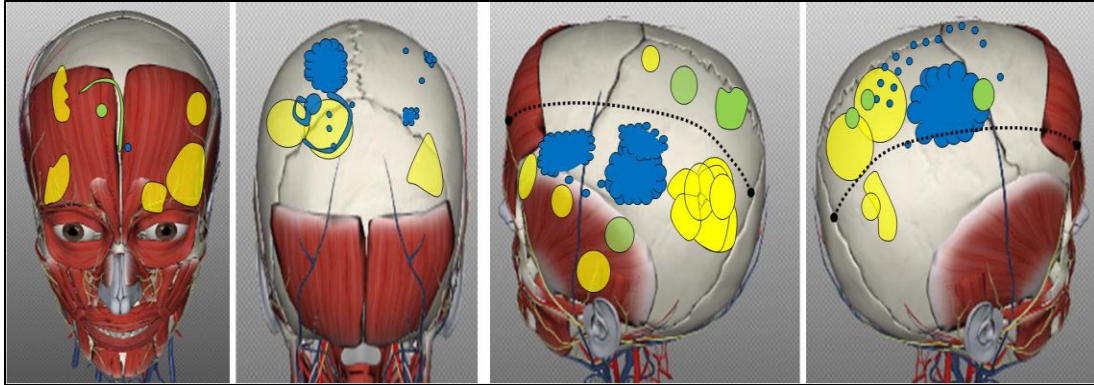
Site	Mean	Std Dev	Min	Max
Cachi	4.335	.449	3.49	5.67
Pucullu	5.987	.506	4.52	6.49
Natividad	6.105	.829	4.55	7.01

Shape and Cranio-spatial Distribution

Certain regions of the vault exhibit more trepanations than other regions and were preferentially selected for intervention. In Andahuaylas, relative to other parts of the cranium, trepanations are significantly directed to the left posterior (Fisher's exact, $p=0.0186$; d.f.=1; N=37) (Table 8.4).

Trepanations also vary by shape. Sixteen out of 45 (35.5%) trepanations were oval, 21/45 (46.6%) were circular, and 8/45 (17.7%) were polygonal (square, triangular, and quadri-circular). The shape of a trepanation was contingent for the most part on the tool used and the method of trepanation realized.

Table 8.2. Trepanation by location



Location	Left	Right	Superior	Anterior	Posterior	Total
#	13	2	9	7	6	37
%	35.1	5.4	24.4	18.9	16.2	100

Despite risks to the patient, 10 (31.3%) of 32 total individuals had trepanations which impacted sutures, while trepanations on 18 (56%) individuals impacted either facial or temporal musculature. In three cases (9.3%), trepanations impacted the frontal sinus cavities.

Temporal and Geographic Distribution

Although only 28 crania from the Middle Horizon site of Turpo were amenable to analysis, none of these Wari-era remains had evidence of trepanation (0/28=0%). At the post-imperial LIP sites, trepanation frequencies are significantly higher (32/256= 12.5%) (Fisher's exact, one-tailed $p = 0.0293$; $N=284$). Trepanation rates are similarly high at all LIP sites. At Cachi (Chanka), 14/162 (8.6%) observed crania had at least one trepanation. At Ranracancha (Chanka), 6/39 (15.4%) of crania had at least one trepanation. At the post-imperial Quichua enclave at Pucullu, 5/31 (16.1%) of crania presented evidence of trepanation. Finally, among the Chanka crania which comprise the Natividad Museum

collection, 7/24 (29.2%) had evidence of trepanation, although this high frequency is likely the result of “cherry-picking” by the original collectors.

Sex and Age-at-Death

Age-at-death and sex data offer deeper insight on who was being targeted for surgical intervention. In Andahuaylas, there were no sub-adult crania with trepanations. In other parts of the Andes, sub-adults make up between 6-8% of trepanned individuals (Andrushko 2007:164, Finger and Fernando 2001:380, Verano 2003:227, Table 2).

Of those individuals in Andahuaylas with trepanations, 25 are males, 3 are females, and 4 are unsexed adults. The overrepresentation of males-to-females (8.3:1) relative to the general population is statistically significant (Fisher’s exact, $p < 0.0001$; $N = 184$). Other studies in the Andes show less of a skew in adult sex ratios. Throughout the Andes, men tend to outnumber females by only about 2:1 (Andrushko 2007:163; Verano 2003:227 Table 2).

Table 8.3. Trepanation by sex

Sex Category	MNI	No. Trepanation	% Total
Male	90	25	27.8%
Female	94	3	3.1%
Unsexed Adult	44	4	9.1%
<i>Total</i>	228	32	

Rough estimates of trauma healing rates indicate that many individuals survived from several months to several years after a trepanation. Based on these rates, individuals underwent trepanation as older young adults and younger middle adults (~30–40 years). Moreover, peri-mortem trepanations are present only in young and middle adults. The

average age-at-death of individuals with trepanation (38.5 ± 8 years) is slightly higher than that of the general (≥ 5 years old) population (33.5 ± 11 years).

Table 8.4. Age-at-death of individuals with trepanations

Age Category	Years	No. Individuals	% Total
Young Adult	18–35	13	40.6
Middle Adult	35–50	12	37.5
Old Adult	50+	4	12.5
Adult	18–50+	3	9.4
<i>Total</i>		32	100

Trepanation, like any serious cranial trauma, leads to higher risks for epilepsy, aneurisms, meningitis, and, minimally, the need for extended convalescence (DiMaio and DiMaio 2001). If the “post-trepanation” lifestyle largely prevented subsequent violent encounters, then this could have contributed to a later age-at-death than the active population.

Trepanation and Cranial Modification:

In this study, modified and unmodified individuals were compared in order to determine if prominently denoting categorical ethnic membership resulted in differences in trepanation patterns. Among 31 trepanned individuals, 26 (83.9%) had modified vaults and 5 (16.1%) did not (Table 8.8). However, relative to the general population, modified individuals are not undergoing trepanation at a significantly higher rate than unmodified individuals (Fisher’s exact, $p=.2748$; d.f.=1; $N=248$).

Table 8.5. Modification and trepanation.

	Cranial MNI	No. Trepanned	% Trepanned
Unmodified	61	5	8.2
Modified	187	26	13.9
<i>Total</i>	248	31	12.5

Healing and Survivability

Among 45 trepanation events observed, 15 (33.3%) have no healing, 10 (22.2%) have short-term healing, and 20 (44.4%) show signs of long-term healing. Generally, survival rates, indicated by short- and long-term healing, are about twice as high in Andahuaylas compared to contemporaneous Cuzco (Andahuaylas survival rate = 65.9%; Cuzco survival rate = 33.3% (Andrushko 2007:167)). Despite the high survival rate in Andahuaylas overall, certain trepanation methods proved more successful than others. Scraping is significantly more successful than both circular grooving (Fisher's exact, $p=0.0031$; $N=45$) and boring/drilling (Fisher's exact, $p<0.0001$; $N=45$), where over 90% (10/11) of patients did not survive the surgery. Moreover, of 223 total discrete boreholes drilled into the crania, only 3 (1.4%) perforations show any signs of healing (and all short-term) (see Table 8.6).

Most individuals ($n=21$) had one trepanation. However, nine individuals underwent two distinct trepanation events, and two individuals underwent three trepanation events each. Furthermore, seven individuals (7/32, 21.9%) had at least one attempted trepanation that abraded the ecto-cranial surface, but did not pierce the endocranium (Table 8.7).

Table 8.6. Healing rates by method

Method	No. Individuals	No. Perforations	Short Term	Long Term	None	% With No Healing
Scraping	23	26	1	25	0	0
Circular Grooving	6	9	5	1	4	44.4
Boring/Drilling*	8	212	3	0	209	98.5
Linear Cutting	1	1	0	0	1	100
<i>Total # perforations</i>		246	8	25	212	30.2

* = boreholes

Intriguingly, individuals with boring/drilling trepanations usually had another method of trepanation present. Of seven individuals with boreholes, 5/7 (71.4%) also have healing scraped trepanations. This pattern tentatively suggests that the boring/drilling method may have been practiced (peri- or even post-mortem) on individuals who had already survived previous surgical intervention.

Table 8.7. Trepanations per individual

Count	No. Individuals	No. Events
1	21	21
2	9	18
3	2	6
<i>Total</i>	32	45

Trepanation healing rates were also assessed between sites (Table 8.1). Trepanation events (one or more concomitant perforations) were largely successful, and many showed signs of at least short-term healing. However, at Cachi, 5/14 (35.7%) events have no signs of healing, while at Ranracancha 1/8 (12.5%) trepanned individuals did not survive the surgery. At the Quichua enclave at Pucullu, 4/10 (40%) individuals died at or around the time of trepanation, and within the Natividad Museum sample, 5/12 (38.5%) crania have trepanation with no signs of healing.

Table 8.8. Trepanation by site and frequency, and morbidity

Site	MNI	No. Individuals with Trepanation	No. Trepanation Events	% Events w/ no Healing (n)
Turpo	28	0	0	0 (0)
Cachi	162	14	14	35.7% (5)
Ranracancha	39	6	8	12.5% (1)
Pucullu	31	5	10	40% (4)
Natividad	24	7	12	41.7% (5)
<i>Total</i>	284	32	44	34.1% (15)

Finally, healing rates were compared between modified and unmodified groups.

Of the six unmodified individuals with one trepanation each, three (50%) showed no signs of healing. Of 30 distinct trepanations distributed over 26 modified individuals, nine (25%) were unhealed (Table 8.9). Despite this difference, modified crania do not have a significantly higher trepanation survival rate (Fisher's exact, $p=0.3292$, $N=42$), and there are no significant differences in trepanation methods, sizes, or locations between groups.

Table 8.9. Trepanation morbidity and modification

	Trepanation Count	% Unhealed (n)
Unmodified	6	50% (3)
Modified	30	25% (9)
<i>Total</i>	36	33.3% (12)

Trepanation Motivations: Trauma and Pathology

Trepanation has been proposed as a surgical innovation intended to cope with cranial fractures (Verano 2003; Andrushko and Verano 2008; Andrushko 2007). In this study, trauma and trepanation are significantly associated in the Natividad Museum

sample (Fisher's exact, $p=0.0207$, $d.f.=1$, $N=24$), but not at any contextualized LIP mortuary site. Among nine individuals where cranial fractures and trepanations were clearly concomitant, all wounds were either linear or depressed radiating fractures. Linear fractures are fissures that occur at the point of impact and follow a path of least resistance as a result of the bones' failure to rebound from generalized force. Depression fractures, on the other hand, occur as a result of direct, localized impact (Lovell 1997). The resulting fracture pattern varies from forming a hinged, shallow "pond" shape, to a lethal, concentrically ringed comminuted fracture (Novak 1999:57). Catastrophic, deadly compound and ring fractures are not associated with trepanations, perhaps because these "lost-cause" wounds were too serious to merit surgical intervention.

Although most trepanations cannot be directly associated with cranial fractures, the cranio-spatial distribution of vault fracture overall is generally similar to the locational patterning of trepanations. For instance, 10/13 (69.9%) individuals had a trepanation located on the same *side* of the skull as a fracture (though not necessarily the same spot).

In at least two cases, unhealed trepanations were placed over areas of healing porotic bone, where no fracture lines were evident (Figure 8.6). Cases of healing/healed infected areas of the vault with unhealed trepanations may be evidence of therapeutic intervention in instances of chronic pathological diseases or conditions.



Figure 8.3. Unhealed trepanations associated with healing pathological cranial porosities (arrow = infected bone; stars = trepanations; circle = cutmarks)

Evidence of Experimentation

If trepanations emerged in Andahuaylas after Wari's decline as part of a new way of intervening on an unwell body, then there should be evidence of technical refinement as practitioners work to ensure that their iatric intervention does not cause the death of the patient. Unfortunately, most methods of trepanation surgery cannot speak directly to technical acumen through experimentation. Both scraping and circular cutting and grooving, for instance, are reductive practices, and with every repetitive abrasion, the previous indenture is erased. However, changes in discrete penetrations caused by boring and drilling are amenable to quantitative analysis. This section will present evidence of Chanka trepanations which show clear, unambiguous signs of experimentation.

In the case of Hry.01 (Fig. 8.4), an adult male from the Natividad Museum collection, a series of at least 63 discrete boreholes were attempted on the right occipital squamous. Only 17/63 (27%) of drill holes breach the endo-cranial surface. Instead, long

sequences of overlapping bit indentations form parabolic and oval shapes. Some of these shapes overlap. Although the individual has a healing scraped trepanation, none of the borehole penetrations show signs of healing, and significant bone polishing suggests considerable handling well after the time of death, when the skull was devoid of soft tissue.



Figure 8.4. Practice trepanations; inset = posterior view of cranium

Differences in borehole diameters on Hry.01 demonstrate that two different drill bits were used. First, a smaller bit was used in three trepanation events: a complete trepanation made from at least 13 holes, with an average diameter of 5.06 mm; an attempted trepanation made from at least 12 drills with an average diameter of 4.55 cm,

and a parabolic attempted trepanation made from at least 28 boreholes, which covers an area of 16.16 cm². Sometime later, a drill bit twice as large (7.01 mm) was used to make three complete boreholes. One of the boreholes was made directly over one of the earlier attempted holes in the parabolic trepanation. These holes are clearly post-mortem; there were no iatric benefits to the patient. In this instance, cranium Hry.01 was abraded by different-sized drills, intentionally corroded into prodigious shapes, and polished by frequent handling. Overall, these data signal attempts to improve drilling techniques through practice.

Similarly, in the case of Hry.11 (Fig. 8.5), a middle adult male also from the Natividad Museum, there is clear evidence for peri-/post-mortem experimentation. Aside from a healed scraped trepanation, this individual has a large, complete, unhealed drilled trepanation made from 74 boreholes, covering an area of 57.17 cm². An additional 19 boreholes were hollowed out in a parabolic fashion that follows the medial and posterior shape of the complete trepanation. The size and color of all boreholes are nearly identical, and suggest that all perforations were received in a single trepanation event. Moreover, the parabolic line of attempted boreholes all display consecutively deeper perforations. The most shallow perforation measures 3.4 mm, and holes increase in depth by about .2 mm as one moves posteriorly. Using trial and error, a practitioner may have been attempting to discern the thickness of the cranial vault as a means of anatomical familiarization.



Figure 8.5. Trial and error experimentation; top inset = healed trepanation on left side of cranium; bottom inset = anterior view of cranium

Finally, the case of Son.02.02.100 (Fig. 8.6) is a 62.8 cm² fragment of an adult left parietal bone. The highly brittle fragment has two clear, sharp v-shaped incisions, which form a right angle, and a square of bone 3.2 cm². Importantly, the incision was made on the *endo-cranial* surface of the parietal; the incisions do not penetrate the ecto-cranial diploë. Due to its location, the only way this trepanation could have been attempted was if an individual was already dead, and their cranium was not intact (i.e., broken or fragmentary). This sole case of linear cutting in the sample suggests attempts at refinement through probative engagement with “praxis material.”



Figure 8.6. Post-mortem endo-cranial trepanation; inset = medial view of left parietal

Peri-operative Procedures

A trepanation incision represents just one step in a lengthier operative process. In Andahuaylas, there are two likely cases of peri-operative interventions that were intended to specifically confront complications brought about through trepanations themselves. One case of peri-operative intervention comes from Hry.23, the mummified head of a young adult male at the Natividad Museum (Fig. 8.7). The head was extremely well-preserved, so much so that delicate features like the eyebrows, eyelashes, and irises were still intact. A healing scraped trepanation was present on the posterior section of the right parietal. The area around this trepanation was conspicuously devoid of long hair. At 60x magnification, the hair around the trepanation appeared sharp and cleanly cut, very similar to microscopic images of modern shaved hair; follicle tips around the trepanation

did not have a “buffed down” appearance of hair which has sloughed off due to decomposition and post-depositional activity. Given the difficulty of realizing a successful surgery, hair around trepanations may have been kept very short in case further iatric intervention was required.

This same individual also has a small borehole on the forehead, over the supratrochlear (frontal) vein. This vein is associated, both medically and colloquially, with trauma-induced migraine pain (Della Cook, personal communication 2011). The lack of healing around the borehole on Hry.²³ suggests that it was drilled around the time of death, and may represent a failed attempt to alleviate venal pressure. Over the wound, there is a smudge of a dark substance, the composition of which may be confirmed through future materials analysis. This smudge may have formed a salve or poultice over the incision.

Poultice use has been seen in a case of trepanation from Cuzco (Andrushko 2007; Verano and Andrushko 2008), and is noted in colonial-era texts. For example, while in Vilcas (across the Pampas River from Cachi), Cieza claims that when one of his subordinates “got sick from some tumors...the Indians brought some herbs made from a yellow flower, which they toasted over a flame to make a powder, and with two or three applications, she was cured” (1554:342).²⁷ Conversations with *mamachas* (older mothers) in Cachi point to two local plants still used as salves and prized for their anageleptic, coagulative, and antiseptic properties: *Oenothera rosea aiton*, a genus from the evening

²⁷ Original: “En los aposentos de Bilcas me adoleció a mi una esclava por ir enferma de ciertas llagas que llevaba e la parte inferior; por un carnero que di a unos indios vi que trajeron unas hierbas que hechaban un a flor amarilla, y las tostaron a la candela para hacerlas polvo, y con dos o tres veces que la untaron quedo sana.”

primrose family, locally known as *Yahuar Choncca* (blood thief); and *Tara* (*Caesalpinia spinosa*). While *Tara* is used for any sort of bodily injury, *Yahuar Sua* is primarily reserved for head and scalp wounds.



Figure 8.7. Peri-operative procedures; left = healing trepanation on right posterior; right = borehole on mid-frontal with black substance smeared over it

Finally, there is a cranium with a probable cranioplasty, a surgical defect (trepanation) that has been repaired with a copper and silver alloy plaque. The cranium, Son.02.02.12 (Fig. 8.8), was excavated from Cave 2 in the Sonhuayo Sector at Cachi. A trepanation spans left frontal and parietal bones. The trepanation was achieved through scraping and shows sign of long-term healing, with smooth, dendritic bone growth forming an undulating, roughly circular margin.

Like all other caves, Cave 2 was commingled, but the cranium was found with the right side facing down and the head facing west, although due to significant post depositional activity this was probably not the original orientation. Nevertheless, when the cranium was excavated, the metal plaque was directly below it, suggesting a close, if not direct association. Most suggestive, the metal plaque is thin (.47 mm) and measures 21.4 cm². It conforms in size and shape with the trepanation aperture on Son.02.02.12 and there is no evidence of a hole or metal process, common attributes of metal *tupu* pins which have also been uncovered at Cachi. Gross and stereoscopic microscopic observation did not yield signs of metal transfer on the bone, indicating that the plaque was not placed directly on the ecto-cranial surface. However, this is not unusual given that the only other confirmed case of cranioplasty in ancient Peru (Verano and Andrushko 2008) involved the use of a poultice to secure the excised bone back in place. Other reported cases of cranioplasty in the Andes—and those which involve the use of metal—are unreliable (Tello 1913; Verano and Andrushko 2008). The metal plaque associated with the trepanation on Son.02.02.12 may have been worn over the scalp and hair, and perhaps even under, or sewed into a *chullu* (hat), all of which would have served to create a barrier between the *dura mater*, the *ñupu*, and the outside world, but would not have left metal stains on the bone itself.



Figure 8.8. Trepanned cranium with cranioplasty; inset = metal plaque

Although trepanations leave impressive scars and swaths of skull devoid of bone, our excavations did not uncover evidence of bone plugs (Verano and Andrushko 2008). So what happened to the excised bone? Although Colonial sources suggest that hair and nail clippings were kept by descendants (Salomon 1995), other sources suggest that dispensable body parts were often destroyed. For instance, modern Cachinos take loose hair and throw it in the fire to prevent it being confiscated by *leiccas* (witches). Artifactual evidence from ancient Cachi shows other “disposable” body parts like locks of braided hair were used as part of LIP offering assemblages. Similarly, Cobó

(1983:167) observed that maladies removed in operations were often destroyed, noting, “The sorcerers pretended to cut his body up the middle with crystal knives [see Fig. 8.9], and out of his abdomen they took snakes, toads, and other filthy things, burning them all in a fire that they had there.”



Figure 8.9. Four views of a retouched quartz crystal lithic from Cachi

Keeping in line with these practices, the bone abraded out of the cranium during a trepanation may have been ritually “dispatched”²⁸ (see Greenway 1998).

²⁸ According to early Colonial documents, proxies would often be used to diagnose and dispel disease. Testimony relates that,

“When someone caught a disease, the healer placed a live, white guinea pig over the sick person’s belly and rubbed it furiously... The healer squeezed the guinea pig blood between his hands with maize flour and chili pepper, and then took the animal to the road and slaughtered it. The healer threw the blood, chanting *nanay puric yaya quisiacpuric yaya caiahuantac ayhuaycuy* [Sickness, take this offering and walk away]... Afterwards... the liver and guts from that guinea pig were observed carefully; if they were tight, it was a sign that the patient would die, but if they were fleshy, then the patient would heal (Duviols 1986:8).” [author’s translation]

Original: “Para curar los enfermos, pedía un cui y lo llevaba a los dichos ídolos... y sobre ellos y sus zeicas lo degollaba con las uñas y con los dedos les espejaba la sangre y les ponía el dicho cui encima y descía así, yaya choqueruntu yaya raupoma micuy caita quisiacinapac allim narpac señor choquerunto y raupoma. Y en agrabandole la enfermedad cogía un cui blanco y así bibo le traía por encima de a bariga del enfermo y le hacía fricaciones y en una kallana quemaba maíz blanco prieto dulce y lo minchaba y estrujaba entre las manos y con ella arina y agi de Chile le hacia la dicha fricación y lleva el dicho cui al camino donde lo degollaba con las unas ty arrojaba la sangre por el decía assi nanay puric yaya quisiacpuric yaya caiahuantac ayhuaycuy y luego bio esta testigo que sacaba los ygados y bofesés del cicho cui y los miraba y si estaba prietos era senal que abia morir y si blancos que abia de sanar. ... estas enfermedades en el tiempo del inca [avian] salido de las guacas.”

In sum, data from trepanned crania from post-imperial Andahuaylas demonstrate clear evidence of trial-and-error surgical experimentation that may have been implemented so that practitioners could both become familiarized with cranial anatomy, as well as improve the success of surgical methods and techniques.

Discussion: Innovation and Intervention in Post-Imperial Andahuaylas

Despite a small Middle Horizon sample size, AMS radiocarbon dating and statistical testing confirms that trepanation only appears in Andahuaylas in the wake of Wari decline, after ca. AD 1000/1050. However, at least four distinct surgical methods were being attempted with varying degrees of success by the early 12th century AD. The relatively late appearance of trepanation in Andahuaylas compared to other regions in the Andes (see Verano 2003) may be a consequence of Wari socio-political fragmentation. Trepanation could have emerged in LIP Andahuaylan society as a result of both novel interactions with practitioners from other regions, as well as by trial-and-error experimentation motivated by a need to cope with high levels of violence, which characterized the era.

In terms of geographic distribution, there were no significant differences in trepanation frequencies, methods, or survival rates between LIP sites. This suggests that people from the region likely shared the same sort of general technical knowledge on the tools and methods involved in cranial surgery. Moreover, given that trepanation patterns are so similar between sites, the social and/or bio-physical factors that motivated individuals to remove a portion of the cranial vault may have been widespread

throughout Andahuaylas. Differences in borehole sizes across contemporaneous sites point to discrete standardized toolkits being utilized by practitioners at different sites.

The results of this study indicate that trepanation may have been employed in diverse contexts of traumata, including physical injury, periostitis, and perhaps psychosomatic malady.

As a surgical technique, trepanations are risky; those incisions that encroach on meningeal arteries or dural sinuses can lead to epidural hematomas and death. Because they are prone to post-operative infection, trepanations directed towards these regions thus reflect a sense of urgency. Additionally, data on cranio-spatial distribution indicate that practitioners were more concerned with trepanning on a predetermined region of the vault rather than at the actual point of physical impact.

Traumatic cranial injuries can cause intracranial hemorrhaging and extradural hematomas; releasing this pressure is often posited as a motivation for trepanation. Yet, this association is hard to prove directly, because trepanation apertures may obliterate signs of fracture. The presence of trepanations over areas of inflamed bone implies that trepanation was not reserved exclusively for the urgent intervention of acute, traumatic injuries, but may have also been used to treat the swelling and pain (among other psychosomatic symptoms) associated with longer-term infections of the scalp, aponeurosis of the epicranium, or the ecto-cranial surface itself.

In several instances, different trepanation methods were attempted on the same individual and/or disparate perforations were attempted around or after the time of death. Clear cases of redundant intervention with no iatric benefit, the variability of trepanation

methods, and concomitant pathology suggest that Andahuaylans were engaging in different experimental techniques.

Socially, results suggest that the trepanation use was not solely mediated by traumatic injury or infection, but rather significantly structured by pre-discursive bio-social attributes like sex. For instance, although LIP males and females are victims of traumatic cranial injuries directed at the same areas of the skull, and at nearly identical rates, trepanations are overwhelmingly practiced on men. These data suggest that surgical intervention was either a process mediated by gender, or highly correlated to sex-specific activities which could predicate the need for surgery (Larme 1998). Similar to females, the absence of trepanned sub-adults implies that they were not viewed as appropriate patients for this type of intervention.



Figure 8.10. *Uncocruna* (the sick people). Regardless of sex or age, the sick/invalid had their own distinct social category during the Late Horizon (Poma de Ayala [ca. 1616]).

Also noteworthy, modified individuals are not undergoing trepanation at a significantly higher rate than unmodified individuals (Fisher's exact, $p=.2748$; $N=248$). This pattern is distinct from trends in cranial fractures, where modified individuals have significantly higher trauma rates. Apparently, although modified individuals are being wounded more often, they are not receiving proportionally more surgeries, as inferred by trepanation presence. These results suggest that trepanation may have been withheld as a viable intervention in cases of trauma towards ethnically marked (modified) members of post-imperial Andahuaylan society. Curtailing "necessary" medical treatments within an ethnic group is a sign of deep social inequality, and fits into the model of ethnocidal interactions that appear to have characterized some populations during the early LIP.

Finally, those who survived trepanation may have been ascribed a new status within the community. Medical histories appear to have been important; individuals who were "fit" enough to survive one intervention, were deemed appropriate patients for subsequent, unsuccessful surgeries. This is evinced by the prevalence of individuals with both well-healed scrapped trepanations as well as unhealed drilling/boring trepanations. Nevertheless, individuals with healed and unhealed trepanations co-resided with the rest of the mortuary population. The mortuary data suggests that whatever ascribed status was conferred on trepanation survivors, it was secondary to the bonds that structured *machay* collectivity.

Conclusion: Surgical Innovation to Cope with Novel Challenges

Trepanation likely emerged in LIP Andahuaylas as a result of both novel interactions with practitioners from other regions, as well as by trial-and-error experimentation following the collapse of the Wari empire ca. AD 1000/1050. Standardization in trepanation techniques suggests that practitioners throughout Andahuaylas shared a common understanding of how to perform cranial surgery, but likely employed distinct standard toolkits. Given that trepanation patterns are similar between sites, the social and/or bio-physical factors that motivated individuals to remove a portion of the cranial vault may have been present throughout the region. While physical trauma seems to be the impetus for intervention in most cases of trepanation, other motivations may have included physiological or psychosomatic factors. Practitioners may have directed trepanations on a predetermined region of the vault, and not on the specific point of cranial fracture. Although the practice itself was not limited to select ethnic or cultural groups, trepanation may have been primarily reserved for men; this suggests that surgical intervention was mediated by gender within society. Finally, while trepanation by scraping was overwhelmingly successful, the boring/drilling method may have been intentionally practiced on peri- or post-mortem individuals as a means of better understanding cranial anatomy and improving techniques. In sum, results clearly point to technical innovations in the aftermath of the Wari empire, as well as distinct (though not intractable), culturally informed understandings of how to heal an unwell body in the post-imperial past.

The final data chapter examines how Wari collapse restructured two fundamental domains of quotidian lifeways in Andahuaylas: geographic mobility and social

inequality. In order to determine how peoples' movement across the landscape was impacted by Wari fragmentation, cranial non-metric and bio-geochemical data are used to evaluate patterns of biological affinity and first-generation migration. In order to gauge social inequality, isotopic analyses are employed to reconstruct ancient diets, and cranial lesions indicative of disease are assessed to create health profiles for individuals and sub-population groups.

CHAPTER IX

GEOGRAPHIC MOBILITY AND SOCIAL INEQUALITY

Introduction: Altered Lifeways in the Aftermath of Collapse

This chapter presents the results of collaborative analytic research completed with colleagues Ellen Lofaro (University of Florida) and Christine Pink (University of Tennessee). Human crania from Andahuaylas were evaluated for non-metric cranial traits, which were then used to reconstruct patterns of biological affinity. Strontium and oxygen isotope results were culled from dental samples to infer patterns of paleo-mobility. Carbon isotope analysis was employed to reconstruct diet, and cranial vault lesions indicative of compromised health were examined to recreate and compare health profiles for sub-population groups. Aside from documented processes of ethnogenesis and ethnocide, this chapter evaluates how Wari collapse variably impacted geographic mobility and social inequality in subsequent populations.

Results I: Bio-affinity and Paleomobility

Cranial Morphometrics and Bio-distance Analysis

State collapse often spurs widespread population displacement. Ethnohistoric accounts regarding the Chanka relate that the cultural group's founders migrated to Andahuaylas after Wari collapse and largely replaced the preexisting Quichua

population. This mytho-historic account, with its claims of post-imperial biological discontinuity, can be evaluated through the use of cranial non-metric traits. These observed shared phenotypic characteristics are used as a proxy for shared genotype and biological affinity. This type of analysis can help clarify migration trends at the population level. For instance, if the Chanka indeed compose a recently arrived population, they will not share the same cluster of inherited non-metric traits as contemporaneous Quichua population or earlier Wari-era populations. Additionally, a decrease in gene flow between the MH and LIP would indicate that populations become more insulated in Andahuaylas after Wari collapse.

In this study, physical anthropologist Christine Pink recorded 35 traits on 300 crania. Following disciplinary standards, in cases of bilateral trait expression, a side was randomly selected and scored. Given that most crania lacked associated mandibles, those traits were removed. Other traits were removed for zero variation within the total population. To correlate which traits were variable within the sample, a Spearman rank order was used, using $p \geq 0.50$ as a cutoff. Sex, age, and cranial modification were also tested for correlation with non-metric traits. This assessment led to the removal of an additional 19 traits. Ultimately within the Andahuaylas sample, 10 traits were used for analysis: infraorbital suture, epicentric bone, bregmatic bone, apical bone, occipito-mastoid suture ossicle, os japonicum, condylar canal patet, pterygo-spinous bridge, and palatine torus. Finally, Mahalanobous D^2 matrix (using Konigsberg's tdist20 FORTRAN program) and Principal Component Analysis were used to assess the relative genetic distance of different burial populations (Pink and Kurin 2011).

Results: Bio-affinity

Results tabulated by Christine Pink (Pink and Kurin 2011) demonstrate that there is limited genetic variation within the total Andahuaylas population; bio-affinity patterning appears to be most strongly related to geographic distance. Gene flow diminished during the LIP, possibly the result of social factors (e.g., violence), which impacted patterns of biological affinity.

Importantly, non-metric data do not indicate a population replacement in Andahuaylas after Wari collapse (see Fig. 9.1). This is a key contrast from the Chanka origin myth, which relates that the Chanka arrived in Andahuaylas from Huancavelica Department only after Wari collapse, where they largely conquered and replaced the Quichua.

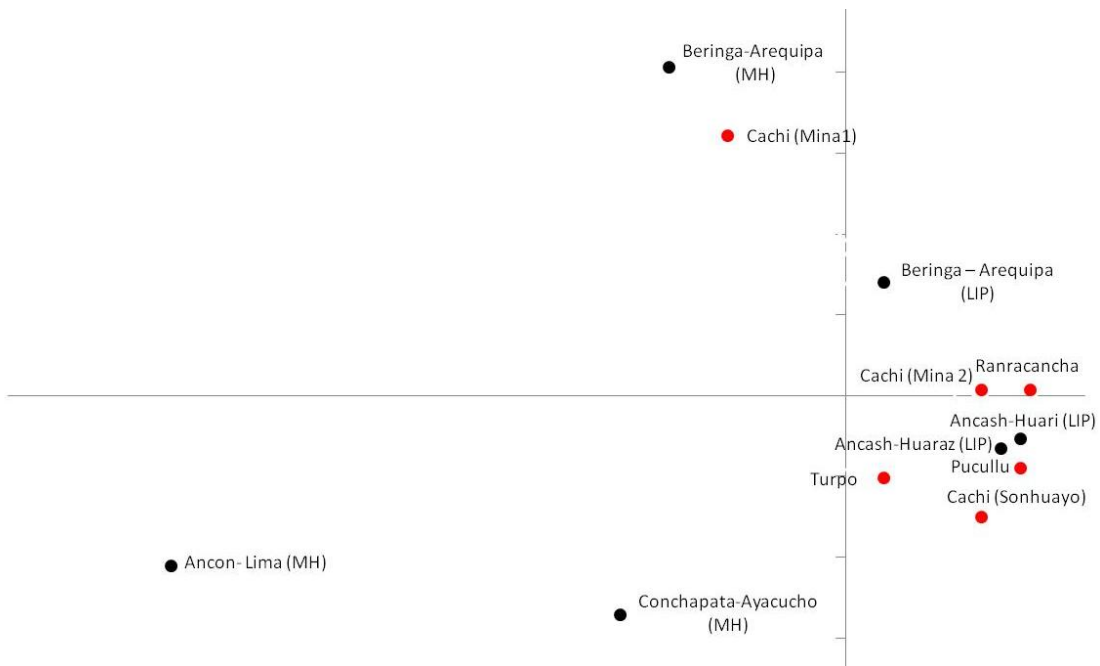


Figure 9.1. Relative biological distance clusters in Peru (Red = sites in Andahuaylas; Black = other sites in Peru) (after Pink and Kurin 2011)

When evaluating the LIP sites, the Chanka data fall into two groups along PC2 (the y-axis). The upper moiety site of Cachi is on one side, and Ranracancha, the lower moiety site, is on the other. This result follows proposed models of a macro bipartite *ayllu* system, where individuals from the same large community were divided into (at least) two major biological groupings. These results are also consistent with ethnohistoric records from early colonial Andahuaylas, which report the resilience of the *ayllu* systems as a means of ordering social relationships after Wari's decline.

There is also epigenetic evidence that Pucullu is biologically distinct from other groups. These results appear to demonstrate that Quichua and Chanka cultural distinctions have a bio-genetic basis.

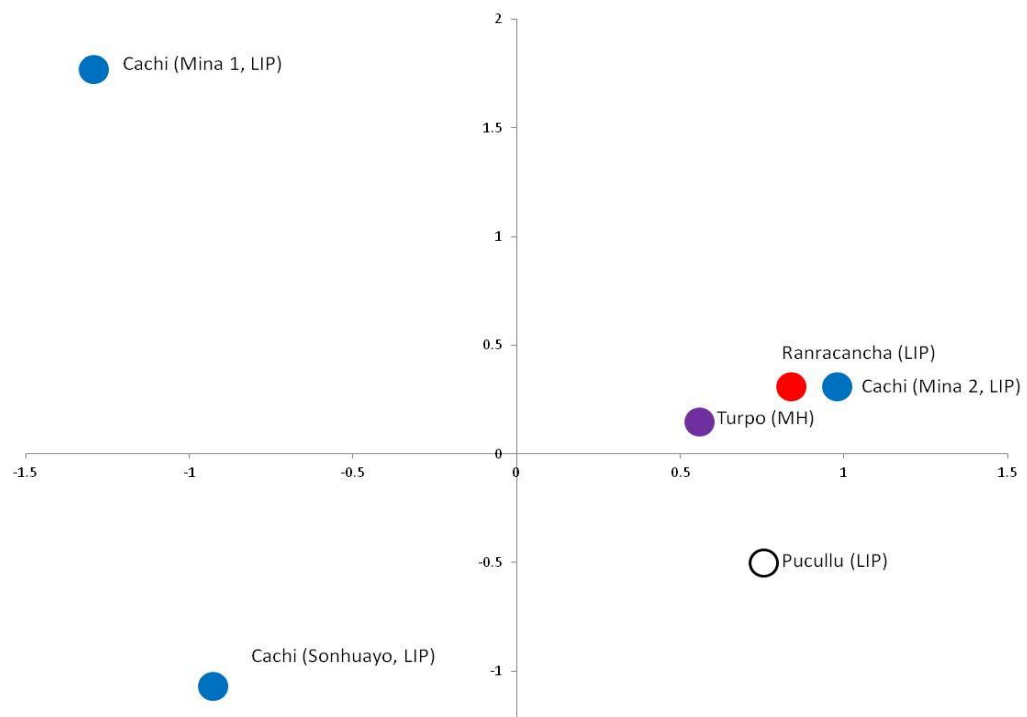


Figure 9.2. Biological distance clusters in Andahuaylas (after Pink and Kurin 2011) (Blue= upper moiety LIP Chanka; Red = lower moiety LIP Chanka; Purple = Wari-era; White = LIP Quichua)

Finally, Pink reports that caves near the ancient salt mine at Cachi, unlike other sectors, appear to be composed of distinct biological groups (Pink and Kurin 2011) with deep historical antecedents in the community. This genetic insularity may be explained by rights of salt extraction. Throughout the historic period, different salt shafts were opened and exploited at the Cachi mine by a different *ayllus*, and later, distinct extended families. The relative genetic isolation of Cave 2 at Mina (see Fig. 9.2), combined with the unusually extended period of cave use (revealed through AMS dating), may be explained by mining rights that trumped other structuring principles of cave collectivity. Given the genetic isolation of the local individuals buried in Mina sector, the basis of cave collectivity may actually be rooted in imperially directed migrant mining labor policies which the Wari might have been implemented in the Cachi during early MH Epoch 2. Future research on human remains from the mine sector at Cachi has the potential to elucidate how extractive resources were managed in imperial and post-imperial eras.

Isotopic Bio-geochemistry:

Enhancing the bio-affinity data, isotopic studies can be used to illuminate patterns of paleomobility on the level of individuals and/or first-generation migrants. They can also be used to reconstruct ancient diets. This study utilizes three isotopes—strontium, oxygen, and carbon—to evaluate how Andahuaylan lifeways were impacted by Wari collapse. Forty-seven dental samples were prepared and processed by Ellen Lofaro at the University of Florida.

Reconstructing Mobility with Strontium and Oxygen Isotopic Analysis²⁹

Strontium isotope analysis of dental enamel analyzed by Ellen Lofaro (et al. 2011) was used in this study to determine the residential origin of individuals from Turpo (the MH site), as well as the LIP sites of Cachi, Ranracancha, and Pucullu. Results are used to determine whether Wari collapse spurred a mass diaspora, or rather the more limited, strategic movement of sub-population groups.

Strontium is a geochemical signature that can be used to “source” human remains to a geologic area. While ^{86}Sr is naturally occurring in bedrock, ^{87}Sr is radiogenic, and formed over time by the decay of rubidium. Thus the ratio of ^{87}Sr to ^{86}Sr measures the relative abundance of rubidium to strontium, a signature that is highly variable over a large geographic region (Carlotto et al 2005; Hawkesworth et al. 1982).

Strontium signatures emerge from eroding geologic material and travel up the trophic chain, eventually becoming permanently sedimented into dental enamel, replacing calcium in the hydroxyapatite (Bentley 2006). While deciduous (“baby”) tooth enamel develops from around 14 weeks in utero until around a year old, and thus largely reflects the mother’s diet, adult tooth enamel forms in childhood (between birth and twelve years) and reflects the diet of those years. Because strontium isotope ratios do not fractionate, the ratio of $^{86}\text{Sr}/^{87}\text{Sr}$ measured in human dental enamel reflects the ratios present in the water and foods an individual consumed during life, and ultimately, the strontium ratio present in the soils and bedrock of a geologic/geographic area (Knudson

²⁹ Following Lofaro et al. (2011), results are presented in the following conventional notation: $\delta \text{‰} = [(R \text{ sample} / R \text{ standard}) - 1] \times 1000$; ‰ = parts per mil; $R = ^{18}\text{O}/^{16}\text{O}, ^{13}\text{C} / ^{12}\text{C}$. Strontium values are reported relative to standard reference material NBS 987. Oxygen and carbon values are reported relative to VPDB (Vienna Pee Dee Belemnite) using NBS-19 as the standard reference material.

and Price 2007). Thus, the “local” area is determined by the regional geology. In this case, the “local” area is Andahuaylas, part of the Western Andean Cordillera, a formation composed of Mesozoic sediments and Cenozoic igneous rock (Marocco 1978). Assuming an individual consumed locally produced foods, signatures in their teeth will reflect the biologically available strontium in the geologic region that individual lived in during the formation of those teeth. Strontium isotope analysis of dental enamel thus allows us to determine the mobility and locality of specific individuals in relationship to the landscape making this analytic method well-suited to test hypotheses on the geographic origin of archaeological populations in the aftermath of Wari collapse.

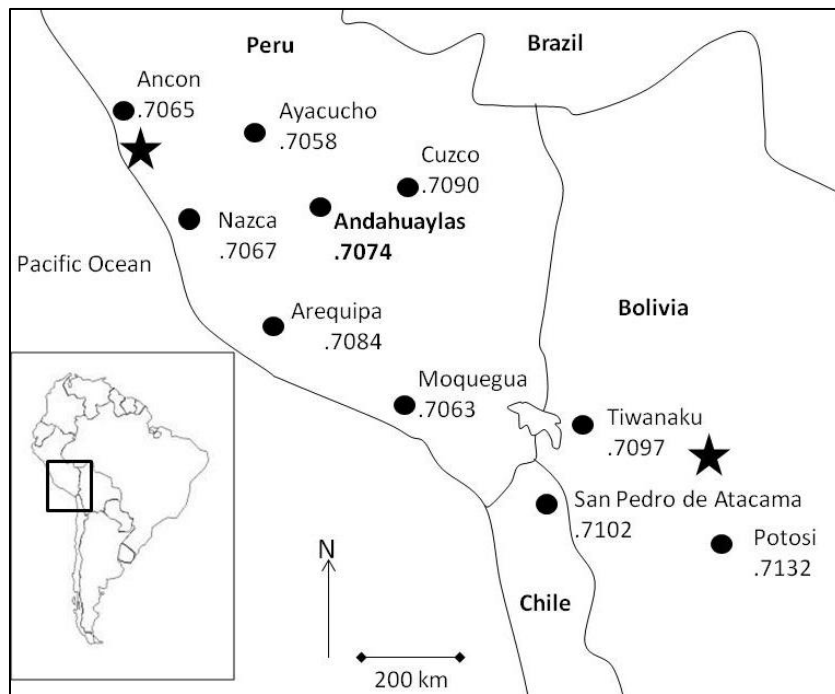


Figure 9.3. Strontium values in the Andes³⁰

³⁰ Values adapted from Tung 2012; Knudson et al. 2004; Andrushko 2007; Knudson et al. 2010; Turner et al. 2009; Slovak 2007; Knudson et al. 2005.

Sampling Methods

Forty-two archaeological human molars and four faunal molars were selected for strontium isotope testing. Previous research in Andahuaylas indicates that during the LIP, individuals consumed locally produced plant and animal sources (Kellett 2010), so it can be reasonably assumed that local and non-local strontium ratios are reflected accurately in human dental enamel. The sample selected for strontium isotope analysis included males, females, and sub-adults with and without modification.

Tooth enamel samples were carefully collected by Ellen Lofaro at the bioarchaeology lab in the Andahuaylas Museum; the right upper second molar was sampled when possible. All individuals were fully documented with photographs and notes before processing.

Laboratory Methods

Samples arrived at the University of Florida's Bone Chemistry Lab, and were processed by Ellen Lofaro (et al. 2011:38-39), who undertook the following steps to prepare and analyze the samples:

Samples were sectioned vertically and cleaned of surface contaminants and dentin using a high speed Brasseler NSK UM50TM dental drill with a diamond tip under 10x magnification. Cleaned samples were finely ground in an agate mortar and then placed in labeled 5mL plastic centrifuge tubes with locking lids. A 50% Clorox (NaOCl) solution to remove organics and humic acids was added to the samples for 16 hours, centrifuged, then decanted. The samples were rinsed three times in distilled water and centrifuged until a neutral pH of 7 was reached. A .2 Molar acetic acid (CH₃COOH) pretreatment solution was added to remove exogenous secondary carbonates and left to react for 15 hours. Afterwards, samples were rinsed to normal pH with distilled water and

until no acetic acid odor was detected. The tooth enamel samples were then freeze-dried and stored until processing began at the Center for Isotope Geoscience's clean lab in the department of Geological Sciences at the University of Florida.

Placed in pre-cleaned Teflon vials, tooth enamel samples were dissolved in 8 M nitric acid (HNO₃) optima for 24 hours and then evaporated in a laminar flow hood. Columns with a resin bed volume of ~100 µl were packed with Sr Spec resin (EI Chrom Part #SR-B100-S). Columns were washed with 2.5mL of quadruple distilled water (4x dH₂O) and then equilibrated with 2ml of 3.5 N HNO₃ optima. Approximately 20mg of cleaned apatite per sample were loaded in 3.5ml of 50% 3.5 N HNO₃ optima. Four washes of 100 µl of 3.5 N HNO₃ optima took place over several hours. A final wash of 1ml of 3.5 N HNO₃ optima occurred, and then 1.5ml of 4xdH₂O was used to collect the strontium. The Sr solution was evaporated overnight to dryness in a laminar flow hood.

Samples were analyzed using a Nu Plasma multi-collector inductively-coupled-plasma mass spectrometer (MC-ICP-MS) housed in the UF Department of Geological Sciences ICP-MS laboratory. Kamenov et. al's (2006) time-resolved analysis (TRA) was used and the long-term reproducibility of the ⁸⁷Sr/⁸⁶Sr NBS 987 was 0.710246 (2 σ = 0.000030).

Strontium Isotope Results

The results of strontium, oxygen, and carbon isotope analysis are presented in the following table.

Table 9.1. Biogeochemistry results

Era	Cultural Affiliation	Site-Cave #	Skull #	Tooth	⁸⁷ / ⁸⁶ Sr	δ ¹⁸ O	δ ¹³ C
MH	Warified	Turpo	05.01	Llama- RMx3	0.707005	-10.37	-4.09
MH	Warified	Turpo-1	01.05	RMx1	0.70707	-10.40	-4.16
MH	Warified	Turpo-1	01.12A	RMx2	0.70708	-10.88	-4.91
MH	Warified	Turpo-1	01.14	RMx1	0.707177	-8.10	-3.56
MH	Warified	Turpo-1	01.11	RMx2	0.707294	-9.43	-3.85
MH	Warified	Turpo-1	01.19	LMx3	0.707311	-10.71	-3.71

MH	Warified	Turpo-1	01.04A	LMd2	0.707332	-12.69	-4.74
MH	Warified	Turpo-1	01.20	RMd3	0.707338	-9.04	-3.72
MH	Warified	Turpo-1	01 .01	LMd2	0.707341	-10.25	-3.77
MH	Warified	Turpo-1	01.12B	RMx2	0.707442	-10.37	-4.70
LIP	Chanka	Cachi- Son 2	03.21	RMx2	0.705731	-9.25	-6.08
LIP	Chanka	Cachi- Son 1	01.01	Llama- LMx1	0.706679	-0.82	-3.5
LIP	Chanka	Cachi- Son 4	04.01	Fox- LMx2	0.7068	-9.94	-2.12
LIP	Chanka	Cachi- Mina 1	01.14	RMx2	0.706865	-10.79	-8.47
LIP	Chanka	Cachi- Mina 1	01.01	LMx2	0.706982	-9.83	-5.04
LIP	Chanka	Cachi- Masu 7	07.01	RMd2	0.707009	-10.46	-5.93
LIP	Chanka	Cachi- Son 4	04.01	Fox- LMx2	0.707023	-9.01	-3.18
LIP	Chanka	Cachi- Mina 1	01.13	RMx1	0.70705	-8.65	-5.90
LIP	Chanka	Cachi- Mina 1	01.02	RMx2	0.707132	-10.07	-4.52
LIP	Chanka	Cachi- Mina 1	01.10	LMx2	0.707163	-9.94	-4.97
LIP	Chanka	Cachi- Son 2	03.18	LMx1	0.707208	-8.62	-3.75
LIP	Chanka	Cachi- Son 1	01.Rincon	LMd1	0.707239	-8.48	-6.25
LIP	Chanka	Cachi- Son 2	03.36	RMd3	0.707241	-10.24	-1.55
LIP	Chanka	Cachi- Son 7	01.02	RMx2	0.707343	-9.10	-4.55
LIP	Chanka	Cachi- Son 4	04.01	LMx2	0.707467	-9.18	-3.63
LIP	Chanka	Cachi- Mina 1	03.05	RMx2	0.707673	-	-
LIP	Chanka	Cachi- Son 1	.04-1.57	RMx2	0.707782	-9.52	-3.46
LIP	Chanka	Ranracancha-1	01.14	LMx2	0.707439	-11.28	-4.69
LIP	Chanka	Ranracancha-1	01.27	LMx1	0.707547	-8.73	-7.40
LIP	Chanka	Ranracancha-1	01.10	LMx1	0.70765	-8.87	-4.61
LIP	Chanka	Ranracancha-1	01.44	RMx1	0.707653	-8.73	-6.88
LIP	Chanka	Ranracancha-1	01.04	LMx2	0.707712	-9.12	-6.18
LIP	Chanka	Ranracancha-1	01.23	LMx1	0.707728	-9.70	-8.05
LIP	Chanka	Ranracancha-1	01.06	RMx2	0.707987	-9.20	-1.54
LIP	Chanka	Ranracancha-1	01.03	LMx1	0.708094	-9.68	-4.88
LIP	Chanka	Ranracancha-1	01.24	RMx1	0.708259	-8.70	-7.53
LIP	Chanka	Ranracancha-1	01.07	RMx2	0.709186	-9.28	-3.52
LIP	Quichua	Pucullu-1	01.13	RMx2	0.707086	-9.73	-5.62
LIP	Quichua	Pucullu-1	01.16	RMx2	0.707372	-	-
LIP	Quichua	Pucullu-1	.01.26	RMx3	0.707488	-9.37	-2.48
LIP	Quichua	Pucullu-1	01.22	RMx1	0.707505	-10.09	-5.94
LIP	Quichua	Pucullu-1	01.20	RMx3	0.707508	-9.92	-6.23
LIP	Quichua	Pucullu-1	01.19	LMx1	0.707523	-9.18	-6.57
LIP	Quichua	Pucullu-1	01.09	LMx2	0.707615	-10.13	-5.60
LIP	Quichua	Pucullu-1	01.03	RMx2	-	-9.83	-6.15

LIP	Quichua	Pucullu-1	01.08	LMx1	0.710039	-8.47	-4.01
LIP	Quichua	Pucullu-1	01.25	LMx2	0.710691	-9.95	-2.84

Previous studies of $^{87}\text{Sr}/^{86}\text{Sr}$ values in the Andes have used archaeological fauna to construct a reliable environmental baseline (Knudson et al. 2005; Knudson et al. 2004). Animals are thought to reveal a more precise range of the biologically available strontium because they are raised locally and feed off herbivorous human by-products such as rotting vegetables, table scraps, and crop waste (Bentley et al. 2004; Price et al. 2002, 1994). Faunal samples are averaged and people who lie outside a range of two standard deviations from the mean baseline are identified as non-local outliers.

In Andahuaylas, fox and camelid dental enamel were used to establish a local baseline, but this proved problematic because the faunal samples cluster tightly in comparison to the rest of the humans. Also, while camelids may have ranges of up to several hundred square kilometers (especially if they serve as pack animals), foxes (*Lycalopex culpaeus*), in contrast, have home ranges which span only about 10 square kilometers over a lifetime (Baiker 2011), a range far more limited than the average ancient Andahuaylan (Kellett 2010). Due to the incongruence of the faunal and human data, descriptive statistics were used instead (Andrushko et al. 2009; Wright 2005). Using this method, the main body of data reflects the “local” individuals; non-local outliers are trimmed, resulting in a normal distribution. The local Andahuaylas $^{87}\text{Sr}/^{86}\text{Sr}$ average is .707434.

Table 9.2. Trimmed $^{87}\text{Sr}/^{86}\text{Sr}$ ranges and averages by site

Site	(N)	$^{87/86}\text{Sr}$ Range	$^{87/86}\text{Sr}$ Average	Standard Deviation
Turpo (no outliers)	9	0.70707 to 0.707442	0.707265	0.000127
Cachi-trimmed	13	0.706865 to 0.707782	0.707242	0.000267
Ranracancha-trimmed	9	0.707439 to 0.708259	0.707785	0.000270
Pucullu-trimmed	7	0.707086 to 0.707615	0.707442	0.000173

The following graph illustrates the strontium isotope values for sampled human dentition from Andahuaylas. Black bars represent outliers, those individuals who spent their formative years away from western Andahuaylas.

$^{87}\text{Sr} / ^{86}\text{Sr}$ Human Tooth Enamel Samples in Andahuaylas

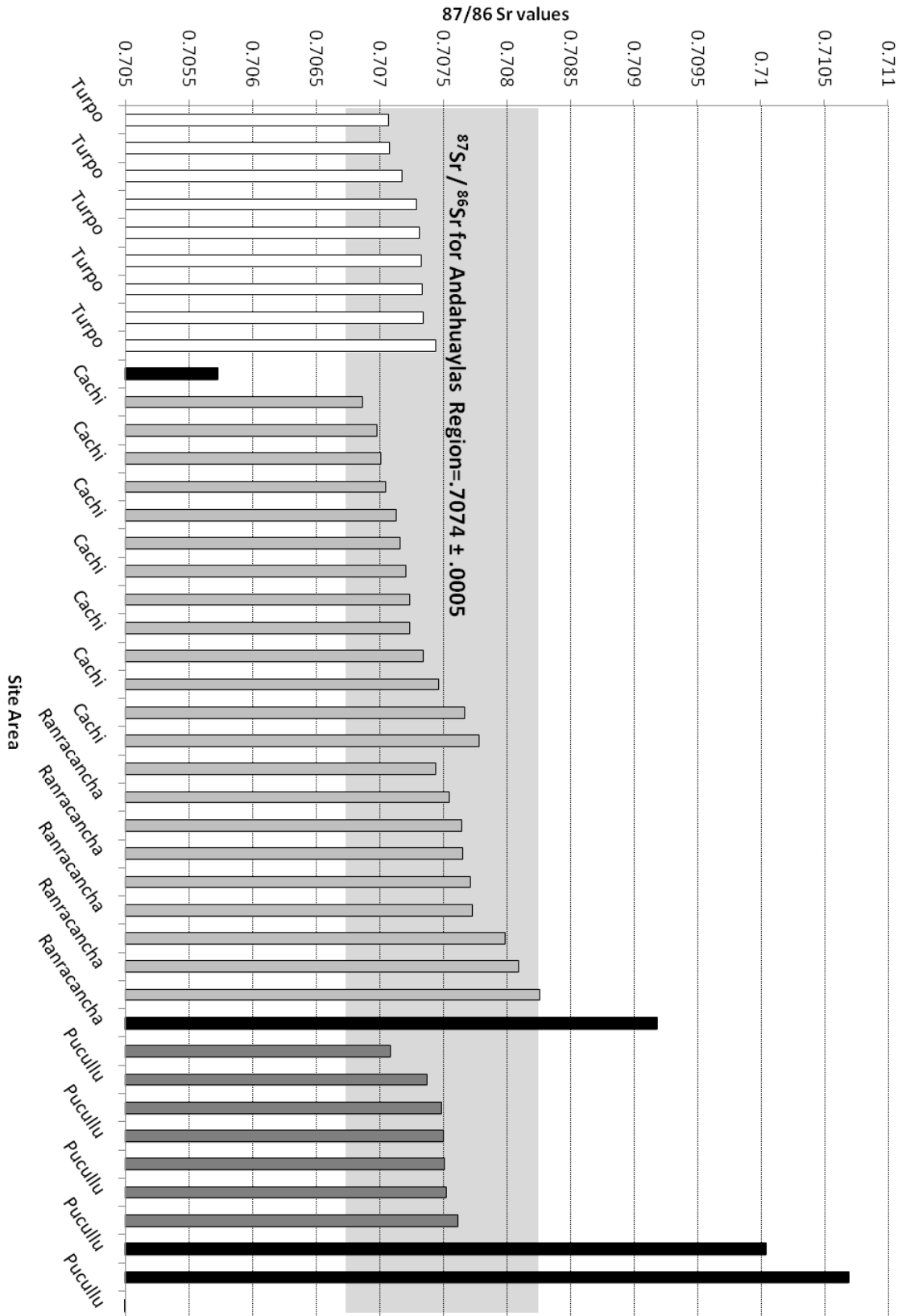


Figure 9.4. $^{87}\text{Sr} / ^{86}\text{Sr}$ results for local human samples from Andahuaylas

Oxygen Isotopic Analysis

Sampled dentition also underwent oxygen isotope analysis. Oxygen imbibed in drinking water becomes permanently bound within the crystalline matrix of enamel apatite (Kingston 2011). As such, oxygen isotopes serve as proxies for climate, water sources, elevation, and by extension, residential origin (Turner et al. 2009). In this study, vertical sections of tooth enamel (20–50 mg) were cleaned and homogenized by Ellen Lofaro to procure an aggregate (rather than seasonal) $\delta^{18}\text{O}$ value for enamel apatite.

The $\delta^{18}\text{O}$ values of humans in Andahuaylas range from -8.10‰ to -12.69‰. The average $\delta^{18}\text{O}$ value for the region is -9.66‰. When first molars are removed (because they form prior to weaning and are thus subject to further enrichment through breast milk (Turner et al. 2009)), then the average $\delta^{18}\text{O}$ for the region increases slightly, to -9.60‰. As Table 9.3 demonstrates, post-weaning mean $\delta^{18}\text{O}$ ranges are larger within LIP sites, than between the MH and LIP. This suggests that $\delta^{18}\text{O}$ values in Andahuaylas likely reflect regional geographic and perhaps altitudinal variability.

Table 9.3. $\delta^{18}\text{O}$ values (‰) arranged by site

Period-Region	Altitude (masl)	(N)	$\delta^{18}\text{O}$ Range	$\delta^{18}\text{O}$ Mean	Post-weaning $\delta^{18}\text{O}$ Range	Post-weaning $\delta^{18}\text{O}$ Mean
LIP-Cachi	3300	13	-8.48 to -10.79	-9.55	-9.10 to -10.79	-8.99
LIP-Pucullu	3090	9	-8.47 to -10.13	-9.63	-9.37 to -10.13	-9.33
LIP-Ranracancha	3690	10	-8.70 to -11.28	-9.33	-9.12 to -11.28	-9.63
MH-Turpo	3260	9	-8.10 to -12.69	-10.13	-9.04 to -12.69	-10.18
<i>Total</i>		42		-9.66		-9.60

Discussion:

Interpreting Bio-geochemistry Results

Unlike strontium isotope analysis, interpreting $\delta^{18}\text{O}$ values remains difficult due to numerous variables including altitude, water sources, wind, physiology, and behavior. For instance, Knudson (2009) has noted that water from a single river in the Andes can have a large range of $\delta^{18}\text{O}$ values due to evaporative pressures, exceeding even interregional variation. Processes like boiling water³¹ may also impact $\delta^{18}\text{O}$ values (Turner et al. 2009). Yet despite these caveats, there are a couple of trends worth noting.

First, $\delta^{18}\text{O}$ isotope values, as a rough proxy for climate, do not appear to show a significant increase in aridity between the later Middle Horizon and early Late Intermediate Period. This is a crucial fact because several archaeologists (Bauer et al. 2010) have argued that the construction of fortified hilltop settlements in Andahuaylas was motivated by increasing aridity (a major drought) during the early LIP. Although $\delta^{18}\text{O}$ values in Andahuaylas do become slightly less negative over time, the difference is more likely due to regional variations and available water sources. For example, Turpo, the Wari-era site with the widest range and most negative $\delta^{18}\text{O}$ values, is located a short (30-minute) walk to several *puquios*, at least four major *quebradas* and streams, and the Huancaray River. In contrast, the LIP Quichua enclave at Pucullu, the site with the tightest range, has direct access only to the Santa Elena River and Laguna Pucullu. It is also possible that the more negative average, larger range, and largest standard deviation

³¹ Changes in $\delta^{18}\text{O}$ due to water boiling probably impacted everyone in Andahuaylas to the same extent because almost all food and drink is boiled. It is rare for people to consume water directly from the source.

at Turpo may actually speak more to the social (not climatic) constraints of water access; populations living during the more peaceful Wari era might have had unrestricted access to a wide range of *puquios*, *huayccos*, and *cochas* located in different ecological zones. The $\delta^{18}\text{O}$ averages and ranges from Cachi and Ranracancha are very similar to individuals at Pucullu and suggest more limited, circumscribed access to water sources during the post-imperial era. Overall, local people in Andahuaylas lived at the same latitude, the same distance away from the coast, and within the same *Kichwa/Suni* ecotone. Given these patterns, social factors appear to be influencing $\delta^{18}\text{O}$ variation more than climatic factors.

Second, as a proxy for geographic origin, when $\delta^{18}\text{O}$ values are correlated with strontium isotope ratios, they clearly highlight outlier (non-local) individuals in Andahuaylas (see Figure 9.5, below).

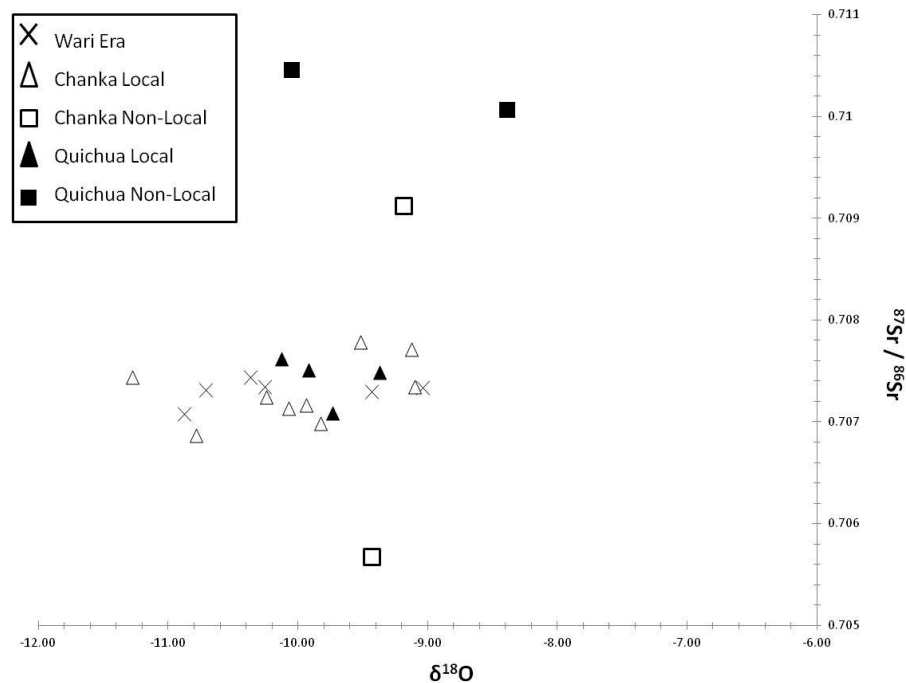


Figure 9.5. Combined strontium and oxygen isotope results demonstrate clear outliers in Andahuaylas.

As illustrated in Figure 9.4, individuals from Turpo, the Wari era site, are all local and homogenous; all individuals sampled spent their formative childhood years in the same region in which they were ultimately buried. There is no direct evidence of Ayacucho-centered Wari colonization at Turpo. This is a significant result given that associated burial artifacts include locally made ceramics emulating late Wari ceramic forms and motifs. These material artifacts suggest that individuals who lived and died in Andahuaylas, were thoroughly “Warified,” and confirms that Wari art (and by extension, ideology) was well-entrenched in this near-hinterland region.

In stark contrast to the Wari era, strontium isotope values from the post-imperial sites of Cachi, Ranracancha and Pucullu all demonstrate the presence of foreign-born individuals ($4/33 = 12.1\%$ of all sampled LIP individuals). At the two Chanka sites, Ranracancha and Cachi, strontium isotope values indicate the presence of non-local females. The female from Ranracancha, a teen with modification, sports a healed wound on the back of her head, while the young adult female from Cachi presents possible perimortem trauma to the nasal region, and a lethal penetrating wound on the occipital. Females with trauma on the posterior of the cranium may indicate attempted flight from captors (Tung 2012). Similarly, the Cachi female (with no modification) has two perimortem wounds. Given that this female’s premature death occurred in an area distinct from her formative years, this female may have been a part of a group of non-local individuals who were at greater risk for violence given their foreign-born status. Often, captive women have increased morbidity and evidence of mistreatment (Martin et al. 2010). Although previous studies have shown that exogamous marriage was used to form

alliances in Andean prehistory, given the traumatic injuries on these females, it is quite likely that they were captured in raids, or the victims of post-migration violent reprisals.

An important question remains: Where did these females come from?

Andahuaylas strontium values don't vary by more than .0001394 over a region that covers some 1200 km²; these non-local females must be from much further away. While the Ranracancha female has a strontium value that falls within the range of the Cuzco-Tiwanaku (*altiplano*) region, we know too little about regional strontium variability to definitively assign a non-local individual to a specific region. Similarly, the Cachi female has a strontium signature which coincides with the Wari heartland in Ayacucho, but is difficult to confirm at this stage given the relative paucity of values for the south-central Andes.

At Pucallu, the Quichua ethnic enclave, the pattern is dramatically different. The two non-local individuals (both modified) are both males. One male has evidence of a mostly healed trepanation, which he received a few years before death. The other male has two healed injuries, one on the anterior, and one on the right side of his head (suggesting that he faced his opponent at the moment of impact). Although these males were born in a foreign area (possibly the southern Andes), they fought, were tended to, and were eventually buried next to their locally born counterparts.

Restructured Mobility in the Post-Imperial Era

The cranial morphometric and bio-distance data similarly suggest that the LIP population was directly descended from earlier Wari-era populations, indicating biological continuity through imperial collapse. The data demonstrate that after Wari's

retraction from Andahuaylas, novel, complementary mobility patterns developed in Chanka and Quichua communities. First, bio-affinity and $^{87}\text{Sr}/^{86}\text{Sr}$ data from the Mine (Mina) sector in Cachi (the Chanka site) indicates that locally born individuals from endogamous *ayllus* were in charge of managing the salt mine during the LIP. However, given their relative genetic distance to other caves in the region, the ancestors of those individuals may not have been autochthonous to Andahuaylas. The salt mine was a highly valued commodity, and the absence of foreign-born males at Chanka sites may have been a strategy to prevent outsiders³² from making claims or attempts at extraction. The presence of non-local young females within Chanka communities may be a result of increasing resource stress and violence during the LIP. Patterned traumatic injuries point to female capture and post-migration violent reprisals. Nevertheless, despite their foreign-born status, these women were buried in communal caves, suggesting that by the time of death, they were afforded similar mortuary rites as local community members. In other words, despite being born in a non-local area, these women were ultimately interred alongside their locally born (possibly fictive) kin, where over several generations, their commingled bones became ultimately indistinguishable from that of their co-occupants.

³² Residential origin doesn't restrict burial in a non-local *machay*, but residence does appear to have formed a fundamental facet of community resource acquisition. As late as the Colonial Period, foreign-born males in Cachi were not afforded the same rights as natural-born individuals. Consider, for instance, the case of Juan Bautista Flores Aroni del Castillo who was born around 1630 in Aymaraes Province (Apurimac), but moved to Cachi around 1690 to serve his uncle, the *kuraka* Geronimo Minaya, as a *pongo*, and "*indio tributario y mitaio*" (knave and tributary corvée laborer). Juan Bautista was petitioning to defend and reclaim lands in ten different areas in western San Antonio de Cachi district, largely inherited from the family of his wife, Christina Choque, "since pre-Christian times." Juan Bautista claims that since 1670, "Neither the lords of Cachi nor anyone else has bothered me, perturbed me, or tried to displace me." But in 1718, he complains of increasing strife and usurpation, testifying that, "The Indians say that because I am a stranger, I can't occupy those lands." By 1729, Juan Bautista had died, but his son, Juan Bautista Flores de Castillo, continued the petition to no avail (See Hostnig et al. 2007).

Importantly, the patterns of Chanka female exogamy documented in this study conform to the proposed model of patrilocal cave collectivity presented in earlier chapters.

The pattern, albeit tentative, is strikingly different at Pucullu, the Quichua enclave. Here, social organizational models of verticality and *ayllu* may help explain the presence of non-local males (versus females). In Andahuaylas, post-marital residence is ambilocal, and both husband and wife come to the partnership with their own plots and livestock and distribute to children as they see fit. Thus, marriage is a family affair and parents may vie for couples for labor reasons. Where couples ultimately decide to reside after marriage is mediated more by birth order, rather than sex. First-born children will often leave the home because they usually have younger siblings in the parents' house that need to be fed. The eldest resident sibling usually becomes a candidate for *ayllu* leadership, while the youngest sibling tends to parents and will inherit the best and most lands, which are allocated at death (see Skar 1982).

Because siblings may forcibly take land from weaker kin (usually unmarried sisters, or sisters with weak husbands), having a strong, able-bodied husband is important for local females with older brothers. This relationship is even more crucial in lower moiety or enclave communities, where clusters of wives (including sisters, consanguineal, and affinal kin) watch over livestock in grazing lands that tend to be located far away from agricultural fields. Because of the increased risk of theft, it is important to have a husband (and his kin) who will tend to and, importantly, defend crops and property. A husband's affines can also be called upon by the wife for labor projects and to take up arms if needed (Skar 1982). As members of an isolated enclave, Pucullans may have had to engage with distant, but related Quichua communities for mates, and as

a means of solidarity to prevent encroachment by rival Chankans, with whom they tangled occasionally. The fact that one non-local male has a well-healed trepanation suggests that he was esteemed enough by the community to merit the surgery. After death, both he and the other non-local male were interred collectively with locally born kin.

Non-local males buried in Pucullu may have served crucial roles within the enclave, but how might they have arrived in the first place? Rather than the victims of raiding and capture, the non-local Pucullu males may have arrived as the result of periodic or internecine events, like *tinku*, which bring different parts of an *ayllu*, and/or different *ayllus* together. The *tinku* (see Bastien 1973) is often accompanied by both violence as well as amorous engagements. For instance, winners of *tinku* fights are extremely popular among women and are held in high esteem among men. *Tinku* is also an event when young, unmarried men and women find their prospective mates. It is possible that these able-bodied individuals were brought into the enclave after such an encounter.

Results II: Inequality in the Aftermath of Collapse

So far, this chapter has focused on the movement of people in the wake of imperial fragmentation. Bio-affinity data culled from cranial non-metric trait analysis showed that populations in Andahuaylas were not replaced after Wari's disappearance. Isotopic data were then marshaled to document complementary patterns of male and female exogamy within post-imperial Quichua and Chanka communities, respectively.

Finally, the data showed that both local and non-local individuals were suffering from violence, albeit in varied contexts.

Previous chapters have demonstrated how violence was not experienced equally in Andahuaylas. But does this inequality extend to the more mundane aspect of quotidian life? In this section, social inequality is evaluated through the analysis of ancient health and diet. Health is gauged through the assessment of osteological lesions indicative of disease, while dietary data, reconstructed using bio-geochemical approaches, are used to inform on nutrition and food accessibility.

Reconstructing Diet Using Carbon Isotope Analysis

Similar to strontium and oxygen isotopes, $\delta^{13}\text{C}$ enamel values reflect diet during the years associated with the mineralization of the tooth crown. Because the composition of enamel apatite directly relates to the isotopic composition of plants (Kellner and Shoeninger 2008; Turner et al. 2009), carbon isotope analysis provides a direct measure of the contributions of C_3 and C_4 plants to diet. The isotopic analysis of carbon relies upon the fact that plants synthesize carbon in several different ways. Andean plants such as tubers and quinoa use the C_3 pathway with resulting $\delta^{13}\text{C}$ levels that fall between -22‰ to -36‰. Plants like maize and kiwicha maintain C_4 pathways with $\delta^{13}\text{C}$ values that vary from -14‰ to -11‰, (Quade et al. 1992; Turner et al. 2010). Due to fractionation, a plant's isotopic composition is offset by about 9.5‰ in humans (Ambrose and Krigbaum 2003). Thus, a diet comprised entirely of C_3 plants has a $\delta^{13}\text{C}$ average of -17‰, while a diet comprised entirely of C_4 plants has a $\delta^{13}\text{C}$ average value of -3‰.

In Andahuaylas, the $\delta^{13}\text{C}$ values of humans range from -1.54‰ to -8.47‰, and average -4.89‰. This indicates that during enamel formation (childhood), most individuals were consuming large amounts of maize and probably kiwicha.

Table 9.4. $\delta^{13}\text{C}$ values (‰) arranged by site

Era-Site	(N)	Mean $\delta^{13}\text{C}$ value	$\delta^{13}\text{C}$ Range
LIP-Cachi	13	-4.93	-1.55 to -8.47
LIP-Ranracancha	10	-5.53	-1.54 to -8.05
LIP-Pucullu	9	-5.05	-2.48 to -6.57
MH-Turpo	9	-4.07	-3.56 to -4.91

Overall, $\delta^{13}\text{C}$ values of individuals buried in Andahuaylas are quite enriched, and suggest that most individuals were consuming large amounts of C_4 plants through quotidian (as opposed to ritual) consumption. Maize-based dishes³³ continue to form a major part of contemporary Andahuaylan diets.

Discussion: Food Access and Consumption in Andahuaylas

Paleoclimatic evidence suggests that during the temperate Middle Horizon, maize was abundant in valleys like Turpo, which remains major producer today. Not surprisingly, individuals from the Wari-era tomb at Turpo have the least negative average $\delta^{13}\text{C}$ values (-4.07‰) indicating they consumed relatively more C_4 plants than other sites. The tight range of $\delta^{13}\text{C}$ values among Turpo males and females point to a homogenous, less-stratified, diet during the Wari era.

³³ These dishes include (but are not limited to): *ulpada*, *chairo*, *sopa*, *saralawa*, *patachi*, *ccarwi*, *cancha*, *mote*, *choclo*, *maiz pelado (tamal)*, *chochoka*, *chicha de jora*, *chicha morada*, and *harina*.

Although the sample size is small, $\delta^{13}\text{C}$ ranges increase overall in the post-imperial era but strontium values remain local. This suggests a more stratified diet within the LIP population (see Kellner and Schoeninger 2008; Hastorf 1993). The data may also reflect novel transhumant or trade patterns in the region with respect to resource acquisition. Different sectors of the community may have had either direct or indirect access to fields and produce from distinct ecological zones. Among LIP populations, other interesting trends emerge.

There is no significant difference in $\delta^{13}\text{C}$ values between the Chanka moieties of Cachi and Ranracancha. The fact that Ranracancha has the lowest average $\delta^{13}\text{C}$ values may be a result of combined maize and quinoa consumption. Although located at a higher altitude, Ranracancha possesses vast tracts of agricultural terraces, tentatively dated to the Middle Horizon and Late Intermediate Period. Work by Frank Meddens and Nicholas Branch (2010) on Wari agricultural terraces in southern Andahuaylas show evidence of large amounts of chenopods in the pollen record, suggesting quinoa cultivation. While paleobotanical samples have yet to be obtained from the Ranracancha terraces, it is quite possible that people were farming C_3 plants such as quinoa alongside maize. Consumption of maize and quinoa together could cause the less negative $\delta^{13}\text{C}$ values seen in the Ranracancha individuals.

Overall, $\delta^{13}\text{C}$ values from the Quichua enclave at Pucullu are more tightly clustered than at the Chanka sites. This pattern would be expected if, as an enclave community, Pucullu individuals were consuming food from a circumscribed region within the narrow Pucullu Laguna valley.

Simple linear regression (R^2) analysis of oxygen and carbon isotope signatures was employed to determine whether there was a predictive correlation between the location of water consumption and diet. This analysis was meant to evaluate whether $\delta^{18}\text{O}$ (water sources) and $\delta^{13}\text{C}$ (consumptive patterns) values are tied to living and accessing food at specific elevations, because maize, a C_4 plant, grows at lower elevations than C_3 plants (like potatoes). Greater maize consumption should directly vary with lower elevation water sources (more negative values). With this type of analysis, an R^2 value closer to 1 means that one variable can be confidently predicted from the other.

However, analysis of the data shows that these variables are not highly correlated. Within the entire Andahuaylas-sampled population, eating food grown at a lower elevation was not predictive of drinking water at a lower elevation.

Next, the covariance of carbon and oxygen isotopes was compared between local modified and unmodified groups. Although R^2 is not significantly predictive for either group, diet is more strongly tied to water source elevation among the unmodified group. (see Figure 9.6). For the modified group, diet appears to be highly stratified, but oxygen values are relatively homogeneous.

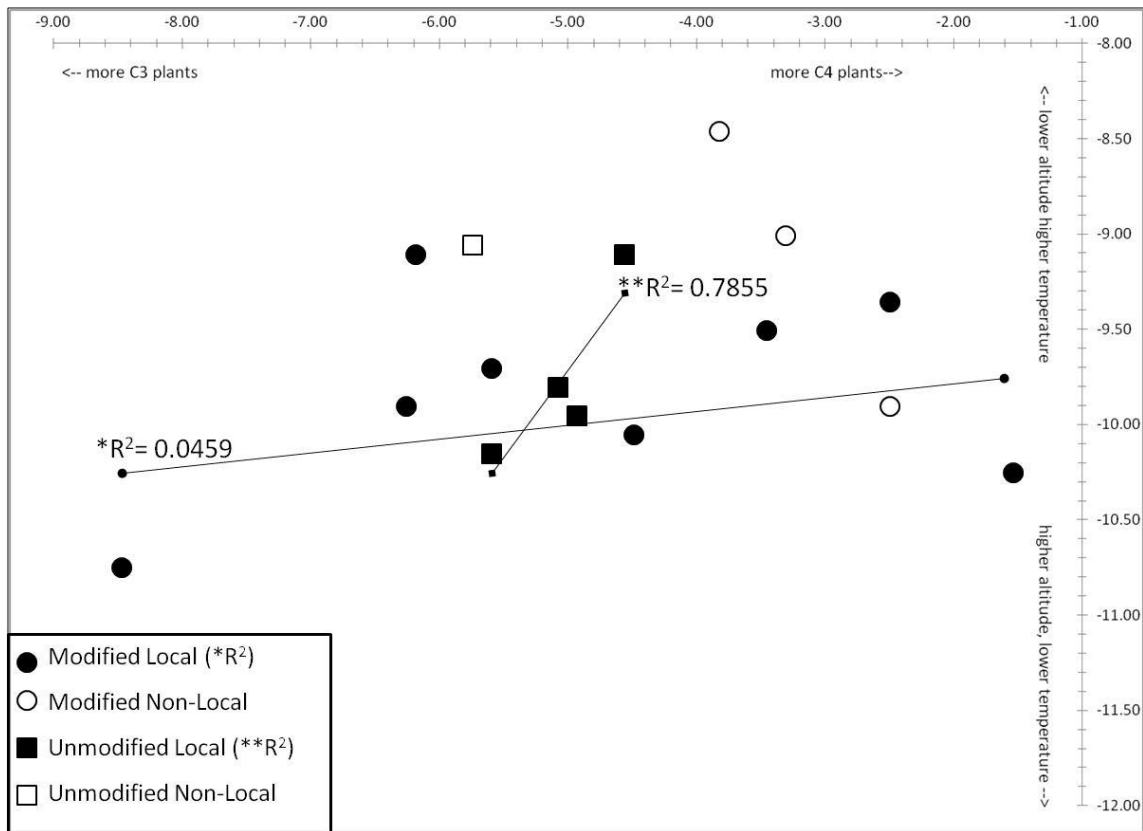


Figure 9.6. Diet and water source covariance reconstructed through carbon and oxygen isotope analysis

The ecological breadth reflected in the carbon and oxygen values may have had significant consequences. As segments of society had to travel away from the safety of their agglutinated settlements to more dispersed and isolated ecological zones (from the *Kichwa* zone up to the *Suni-Puna*), there was a greater risk of crop and herd theft, ambushes and raids, and land disputes between communities. These conflicts could have contributed to excess mortality in the post-imperial era. Stratified or restricted access to certain food and water sources could have also impacted the health profiles of affected groups.

Results: Cranial Lesions as Proxy for Health

Because health indices can be used as a proxy for status inequalities, this study sought to determine if certain sub-population groups had higher morbidity rates during the Late Intermediate Period. In total, 259 cranial vaults were examined for evidence of porotic hyperostosis (PH), sieve-like lesions indicative of anemia (Walker et al. 2009). Thirty-two of 104 of males (30.8%) and 32/90 females (35.6%) exhibit PH. The temporal and geographic distribution of porotic hyperostosis was also assessed but there were no significant differences between Chanka and Quichua sites or over time (Fisher's exact, one-tailed, $p=0.1556$; $N=259$).

Table 9.5. Porotic hyperostosis in Andahuaylas

Site	Era	Crania Observed	# Porotic Hyperostosis	% Porotic Hyperostosis
Turpo	MH	15	2	13.3
Natividad	LIP	23	4	17.3
Cachi	LIP	154	46	29.9
Ranracancha	LIP	40	22	55
Pucullu	LIP	27	8	29.6
<i>Total</i>		259	82	29

Modified and unmodified individuals were compared in order to determine if prominently denoting ethnic membership through the manipulation of head shape during the LIP was correlated with differences in the frequency of cranial porosities. Thirty-nine percent (72/185) of modified men, women, and sub-adults demonstrate evidence of PH, while only 26.5% (13/49) of all unmodified individuals have porotic hyperostosis. This disparity is nearly significant (Fisher's exact, one-tailed, $p<0.0738$; $N=234$).

Table 9.6. Porotic hyperostosis and crania modification in LIP Andahuaylas

	Modified Observed	# and (%) Modified with PH	Unmodified Observed	# and (%) Unmodified with PH
Males	75	27 (36)	29	9 (31)
Females	80	36 (45)	12	3 (25)
Unsexed Adults	5	0 (0)	3	1 (33.3)
Juveniles	25	9 (36)	5	0 (0)
<i>Total</i>	185	72 (38.9)	49	13 (26.5)

Discussion: Diminished Health and Inequality in Post-Imperial Andahuaylas

Porotic hyperostosis, osseous evidence of compromised health during childhood, impacted about a third of the total Andahuaylan population. Males and females were equally likely to exhibit these cranial porosities, and perhaps by extension, equally impacted by physiological stressors that led to pathological changes on the cranial vault. Furthermore, the asymmetry in PH rates between modified and unmodified individuals signals important differences in the well-being of distinct ethnic groups with the population.

Determining the most likely etiology (cause) of anemia can inform on the conditions that helped foster the disease. Three possible etiologies of porotic hyperostosis in Andahuaylas include: 1) a reaction to cranial modification binding pressure (Mendoza de Souza et al. 2008); 2) malnutrition due to maize consumption (Stuart-Macadam 1992); and 3) nutrient malabsorption exacerbated by parasitic or bacterial infection (Walker et al. 2009).

To determine if cranial bindings impact the expression of cranial lesions, the location of porotic hyperostosis was mapped out on the cranial vault. Ninety-two percent (63/68) of individuals with PH have lesions on occipital and posterior parietals. However, areas of the vault on modified individuals that would have been impacted by bindings

(e.g., just posterior to bregma) do not have significantly more evidence of porosity than areas that were free of binding pressure (Fisher's exact, $p=1.000$; $N=142$). These results indicate that cranial binding is probably not the etiology of porotic hypersotosis.

Maize-rich diets (see Stuart-Macadam 1992) are probably not the cause of porotic hyperostosis either. If phytite-rich maize consumption was directly causing anemia and consequently cranial lesions, then the MH population at Turpo should have the highest rates of PH, because a higher proportion of their diet is maize. However, this is not the case, and rates of porotic hyperostosis overall are much higher during the LIP. This suggests an alternative etiology.

Table 9.7. Porotic hyperostosis and Carbon isotope values in Andahuaylas

Site	Era	% Porotic Hyperostosis	Mean $\delta^{13}\text{C}$ value
Turpo	MH	13.3	-4.07
Cachi	LIP	29.9	-4.93
Ranracancha	LIP	55.0	-5.53
Pucullu	LIP	29.6	-5.05

Because other causes can be ruled out, the most likely etiology of porotic hyperostosis in post-imperial Andahuaylas is nutrient malabsorption due to parasitic or bacterial infections. Given the nearly significant increase in porotic hyperostosis from MH to LIP, dramatic changes in settlement patterns and increasing population densities are probable underlying causes of pathological cranial lesions. Survey data demonstrates that the post-imperial era in Andahuaylas was characterized by a major shift to amalgamated, high elevation, defensible ridge- and hilltop settlements (Kellett 2010; Bauer et al. 2010). Agglutinated, defensive habitation sites like Sonhuayo would have been crowded, with the living, the dead, animals, and their waste all located in close

quarters. Because hilltop sites in Andahuaylas have no immediate water sources (Kellett 2010), inhabitants would have had to leave the safety of the settlement for refills (leaving them vulnerable to attack), and water may have been stored for long periods of time. Brackish water, or water contaminated by human and/or animal waste, could have spawned a host of infections (viral, protozoal, bacterial, and parasitic). Vectors like fleas and bats, and zoonotic diseases could have also easily fluoresced in unsanitary and unhygienic living conditions, while crowded settlements could have eased the spread of communicable pathogens from human to human. Despite these risks, comprised health did not affect all members of the population equally. Nearly significant disparities in cranial lesion frequencies between modified and unmodified individuals attest to likely hygienic inequalities during childhood.

Table 9.8. Variations in data patterns between modified and unmodified groups

Class of Data	Proxy for...	Modified Group	Unmodified Group	Conclusions
Cranial Fractures	Violence	Higher trauma rates, more lethal, execution blows	Lower trauma rates, less lethal	Modified are targeted for ethnocide
Oxygen Isotope Analysis	Water source/ Elevation	Formative years spent at similar elevation, not tied to diet	Elevation during formative years variable and more strongly linked to diet	Modified people are getting food from different ecozones, more risk traveling to distant fields. Unmodified eat and drink where they live
Carbon Isotope Analysis	Diet/ Maize Consumption	More stratified, heterogeneous diet	Less stratified, more homogeneous diet	More stratification in unmodified group
Porotic Hyperostosis	Health	Higher PH frequency, more exposure to vectors	Lower PH frequency, less exposure to vectors	Modified spending more time in unhygienic conditions.

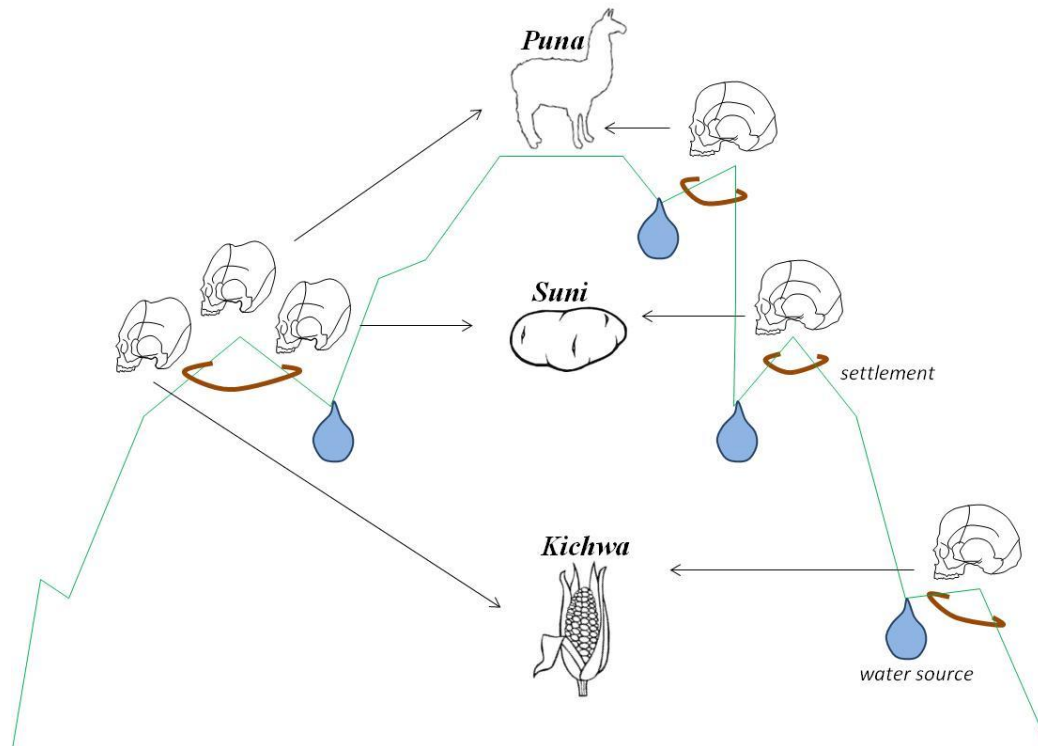


Figure 9.7. Schema of water, food access, and settlement between modified and unmodified groups

When these seemingly disparate results are stitched together and considered comprehensively, what emerges is a tale of two ethnicities. One group, the unmodified minority, is living relatively peaceful, more egalitarian, and somewhat less mobile lives. They may have been more restricted in their movements, accessing food that was located in the same ecotone in which they were living. Conversely, modified individuals may be more confined to crowded hilltop settlements, where diseases could have flourished. Modified individuals alternatively travelled far up or down slope to access food, putting them at risk for ambush or attack (see Fig. 9.7).

These data suggest that Wari collapse did not create worse conditions for everyone in Andahuaylas. Instead, shifts in sanitation and resource availability and access

may have been socially mediated by ethnic divisions, which in turn contributed to compromised health. Because the underlying causes of anemia in this case appear to stem from poor sanitation, nutritional deficiencies, and infectious diseases, it appears that Wari imperial fragmentation may have helped instigate striking social inequalities in food access and living conditions among post-imperial populations.

Conclusions: Lifeways in the Aftermath of Empire

Non-metric cranial data demonstrates that Wari collapse reduced gene flow and prompted the organization of communities along bipartite lines. While there is no evidence of a mass population replacement following Wari collapse, isotopic indicators suggest new migratory patterns during the LIP.

Data from strontium isotope analysis suggest that large extractive resources—like the Cachi salt mine—were managed locally during the LIP. Moreover, marriage strategies were culturally mediated in the post-imperial era. Exogamous migration was variably employed during the LIP as Chanka groups in the region likely participated in the capture of young females, while the Quichua may have relied on an alternate strategy of exogamous male immigration to reify labor obligations and *compadrazgo* bonds with distant, allied communities. This policy would also assure the presence of able-bodied men who could protect the enclave community from surrounding Chanka settlements.

Data from cranial lesions as well as carbon and oxygen isotopes suggest segments of the LIP population were becoming more stratified and less equal. Access to (clean) water, healthy food, and hygienic living conditions varied within and between communities. These water and food sources may have been located up to several hours

away from the safety of home settlements. Consequently theft, capture, or violence were distinct possibilities as new claims for lands and its bounty were contested in the early post-imperial area. All told, data from bio-geochemical, paleopathological, and non-metric analysis reveal dramatically transformed quotidian rhythms in the aftermath of Wari fragmentation, and further confirm that socio-political tumult can significantly restructure emerging post-imperial societies.

CHAPTER X

SUMMARY AND CONCLUSIONS

Introduction

This dissertation aimed to reconstruct the lived experiences of people undergoing dramatic societal restructuring in the wake of Wari imperial collapse. Using a comprehensive social bioarchaeological approach based on both labwork and fieldwork, skeletal, artifactual, bio-geochemical, ethnohistoric and ethnographic data were incorporated within a social and environmental archaeological context. Patterns of migration, health, gender, biological affinity, body modification, and mortuary practices were assessed to better understand how they factor in to the reformulation of ethnic identities and variable experiences of violence. These data were then used to better understand how ancient lifeways and social organizations were renegotiated in eras emerging from tempestuous socio-political transformations. In Andahuaylas, state collapse and societal restructuring variably impacted sub-population groups. Moreover, although post-imperial times may be fraught with want, and deprivation, they are also crucibles for regeneration, innovation, and resilience.

Summarizing the Results and Revisiting the Hypotheses:

The Effusive Nature of Wari Imperial Control in Andahuaylas

This dissertation examined human remains excavated and systematically recovered from Middle Horizon and Late Intermediate Period burials in Andahuaylas. AMS radiocarbon dates and artifactual evidence confirmed that Wari's imperial presence radiated into western Andahuaylas during Epoch 2, after ca. 700–750. During that time, Wari directed the construction of infrastructure including agricultural terraces, imperial highways, and compounds like Patahuasi, a high-altitude outpost used to manage huge camelid herds as well as oversee copper extraction from nearby veins. At nearby sites like Cachi and Turpo, results from this research show that Wari's presence was largely indirect. Salt mining at Cachi and agricultural intensification in Turpo were managed by locally born individuals who were buried with the trappings of the empire. Imported pottery, as well as locally fabricated ceramics, which emulated Viñaque and Wamaga stylistic tropes, attest to the entrenchment of Wari ideology and political economy in the region. Andahuaylas remained an important near-hinterland imperial province for at least 250–300 years, until the empire disintegrated. Wari collapse in Andahuaylas was most likely experienced over several generations, from ca. 1000/1050 until ca. 1100/1150. The cause of Wari collapse remains unclear, but in Andahuaylas, the state's withdrawal from the region was probably not due to local rebellions or uprising because trauma rates remain low in the region throughout the late 10th century; violence escalated in the region only after Wari disappearance.

From Gods to Ancestors: Post-Imperial Shifts in Mortuary Practices

This research hypothesized that Wari collapse instigated changes in burial customs. Furthermore, *machays* were hypothesized to function as collective repositories for social groups in post-imperial Andahuaylas. These hypotheses are partially supported by the data. Evidence from the circular tomb at Turpo, and *machays* at Cachi suggest that aspects of Wari ideology were incorporated into the local mortuary arena. Emblems of Wari elite status found with locally born, “Warified” individuals demonstrate that some locals were co-opted by the state. Excavation results indicate that after Wari’s collapse, certain burial customs were abandoned in favor of new, emergent traditions. At Cachi, *machays* were cleaned out and repurposed at the end of the Middle Horizon sometime after the 11th century AD. The disposal of human remains and artifacts indicate a rejection of Wari ideology as it related to the politics of the dead. While early LIP interments continued the pre-collapse tradition of collective burial rooted to a single articulated “apical” ancestor, artifactual assemblages changed dramatically. Luxurious Wari goods were abandoned in favor of small, paired personal items and miniature totems. Smashed drinking vessels and butchered animal remains, i.e., evidence of feasting, suggest continued post-depositional interaction with the dead. These *machay* traditions continued unabated in Andahuaylas until at least the Late Horizon. Classes of “corporate” heirlooms (like *conopas*), and the collective inclusion of males, females, and sub-adults in caves that were used for only a few generations, strongly suggest that *machays* were used to inhume lineages.

Novel Juxtapositions: Cranial Modification and Ethnogenesis

State collapse can spur novel reformulations of identity; this research evaluated whether cranial modification emerged as a means of social differentiation following the collapse after the Wari Empire. After the demise of long-standing Wari-instituted socio-political hierarchies, new boundary-marking practices, like cranial modification, would have been crucial in the reorganization of communities, and the renegotiation of contested territories and resources over generations.

Cranial modification use, style, intensity, and heterogeneity were compared between groups based on sex, era, cave, site, moiety, and cultural affiliation. Results revealed that modification use became widespread only after Wari collapse. Modification rates increased significantly, from 0% during MH Epoch 2 to 76% during the early LIP (Fisher's exact, $p < 0.0001$; $N = 309$). Because modification is a practice whose reproduction speaks to the creation of intentional cultural distinctions, it is a reliable proxy for ethnogenesis, a process that consists of the imbrication of innovative and vestigial traditions to draw new cultural distinctions between groups of people.

Significant variations in modification styles within distinct sub-population groups in Andahuaylas indicated that head-binding customs were mediated, minimally, by sex, lineage, and perhaps moiety affiliation. Greater homogeneity in head-shape among males within sites support the hypothesis that *machay* interment was structured by patterns of patrilocality and/or patrilineality. Because burial caves contain both modified and unmodified crania, complementary rules of agnatic and cognatic descent likely structured cranial modification and cave collectivity. While people buried within the same *machay* probably belonged to the same lineage or *ayllu*, cranial modification implementation

marked a supra-*ayllu* kinship category—an “ethnic” identity, while head shape may have conformed to matrilineal traditions.

Iterations of Violence: Cranial Trauma and Ethnocide

This research investigated whether violence increased as a direct result of the collapse of the Wari Empire. Groups competing for agricultural fields, pastoral lands (Tung 2008), or sacred sites in the absence of any sort of regional hierarchy (Arkush 2008), coupled with generalized social and economic deprivation (Torres-Rouff 2008) are thought to have spurred violence. Novel hilltop settlement construction and occupation around AD 1000–1100 (Kellett 2010) may have further stoked antagonisms and reified social balkanization and regional hostilities.

Three hundred thirteen crania were examined for evidence of trauma. Patterns in trauma frequency, lethality, and cranio-spatial distribution were calculated for different sub-population groups based on era (MH or LIP), age-at-death, sex, site, cultural affiliation, and cranial modification.

It was hypothesized that trauma rates, a proxy for violence, would increase significantly in the post-imperial era. Violence was more frequent and more deadly in the post-imperial era. Results showed that cranial fractures increased in frequency from 5.4% in the imperial Wari era, to 49.3% in the post-imperial era ($\chi^2 = 16.335$; $p < 0.0001$; $N=295$). The rate of deadly wounds increased significantly as well, from 0% during MH2, to 41.8% during the early LIP. Reconstructed demographic profiles point to violence as a prime cause of excess mortality in the post-imperial era. Lethal cranial fractures are concentrated on juvenile young adult males and females, arguably the most

productive members of society. Age-at-death curves in wounded populations follow an inverted-U mortality curve common in cases of state collapse and genocide

Trauma analysis supports the hypothesis that Wari imperial collapse caused a political vacuum that aggravated and ultimately transformed local inter-group relationships through violence. Results show that violence was not experienced equally in the aftermath of Wari collapse; trauma patterns varied significantly between contemporaneous post-imperial Chanka and Quichua communities. At the Quichua enclave of Pucullu, males were experiencing significantly more trauma than females, a common pattern in traditional cases of warfare. Patterns in wound frequency, lethality, and location indicated that males were probably participating in potentially deadly encounters, while females were likely experiencing a palimpsest of violent encounters, including affinal or domestic abuse, inter-personal conflict resolution, and raids.

Violence in contemporaneous Chanka communities differed significantly. Within Chanka communities, lethal-to-sub-lethal trauma ratios and wound counts demonstrated that violence was significantly more deadly, and that victims were more likely to be the recipients of multiple attacks. Similar injury location, lethality, and distributions between Chanka males and females indicated that violence was being experienced in similar social contexts.

Several lines of evidence culled from this research support the hypothesis that post-imperial violence targeted Chanka ethnic groups. Principally, physical attacks were significantly directed towards people who utilized cranial modification (54.7% modified vs. 31.8% unmodified; Fisher's exact, $p=0.0017$). Among sub-adults, the trauma pattern is similar: violence was directed only towards youths with modified crania. Because

calibrated radiocarbon tests securely demonstrate that modified and unmodified individuals lived contemporaneously during the Late Intermediate Period, the disproportionate number of modified crania with fractures (versus unmodified crania without fractures) revealed that violence was variably experienced by different groups of people; those with modified crania, denoting categorical ethnic affiliation were targeted for violence, while individuals who maintained the natural shape of the cranium lead relatively more peaceful lives. This pattern in asymmetric violence can be described as *ethnocide*, the directed, attempted, and intentional extermination of a group identified on the base of *perceived* socio-cultural difference.

Wound distribution analysis further confirms a unique form of violence. In post-imperial Andahuaylas, only modified individuals from the Chanka sites have deadly ring fractures on the base of the skull. This osseous evidence indicates that those individuals were incapacitated and killed using close-range, repeated blunt force trauma; destructive, high-impact, “overkill” blows to the face were intended to obliterate the victim’s identity. Taken together, these data point to distinct forms of violence enacted against Chanka groups that marked ethnic affiliation through cranial modification.

A Fragile Symbiosis: Ethnic Creativity and Destruction

This dissertation research demonstrated that in the aftermath of Wari collapse, ethnogenesis and ethnocide were linked processes. In Andahuaylas, human heads were permanently modified to demarcate within-group affiliation and between-group boundaries (see Barth 1969), but this practice of affiliation had consequences. Cranial modification fomented intra-group solidarity while simultaneously contributing to inter-

group antagonism and violence. During charged experiences of inter-group counter-positioning and conflict, the attributes that defined ethnic group were brought into greater congruence with each other (Hanlon 2009:14). The seemingly intractable “boundedness” of ethnic groups, wary of others, created an environment conducive to ethnocidal violence. For the post-imperial Chanka, the capacity to perform violent acts both defined and reinforced group identities (Robb 1997).

There were likely several factors at play during the early LIP which precipitated this type of violence, apart from the social and economic deprivation described above. In the aftermath of Wari, there was no longer an imperial army, nor the personnel and infrastructure to support legions of fighters. In the absence of the state, warfare “down-shifted” in scale. Because people could no longer define “friend” and “foe” vis-à-vis the state, the motivation and target of violence changed. Groups united by common bonds of residence and ethnic affiliation became the linchpins of alliance and sowed the seeds of competition and antagonism.

Given these patterns in ethnocidal violence, the resilience of cranial modification as a conspicuous means of social boundary marking is truly profound, and serves as a potent testament to the consummate fortitude and vitality of shared ethnic identity.

Medical Innovation on Social Bodies through Trepanation

Rather than a time of creative and abstruse stagnation, this study hypothesized that the post-imperial era was one of innovation and information exchange. This research investigated 32 individuals with trepanation (ancient cranial surgery). Given the riskiness of the procedure, this unique medico-cultural intervention was considered a proxy for

technical innovation. The complete absence of trepanations during the Middle Horizon suggests that the procedure was unknown or unnecessary during the imperial era.

Emerging in the wake of Wari fragmentation, perhaps as a novel innovation intended to cope with emergent challenges, trepanation use increased significantly during the post-imperial era.

Two-thirds of trepanation patients in Andahuaylas demonstrate evidence of at least short-term healing and survival. Standardization in trepanation techniques indicate that practitioners throughout the region employed normative procedures, directing incisions on predetermined regions of the vault (e.g., the left superior-posterior).

Although trepanations using the scraping method were ultimately most successful, AMS radiocarbon dates demonstrate that different trepanation methods were being attempted contemporaneously. Comparisons of borehole sizes on trepanned individuals indicate that distinct standard toolkits were utilized within different communities. Finally, unambiguous evidence of peri-mortem boreholes, endo-cranial incisions, and praxis marks on Andahuaylan crania are a result of trial-and-error experimentation. Taken together, this evidence signals attempts by practitioners to improve techniques and become more familiar with cranial anatomy.

Given the similarities in trepanation techniques across Andahuaylas, the social and/or bio-physical factors that motivated trepanations must have been similar throughout the region. Analysis of trepanation and concomitant pathologies demonstrated that those factors may have included trauma, disease, and possibly psychosomatic illness. However, the surgical procedures were mediated by sex, and perhaps constrained by ethnicity. Trepanations were almost exclusively practiced on males, even though males and females

equally suffered from violence. Furthermore, despite the fact that modified individuals are suffering from trauma at significantly higher rates, they are not receiving proportionally more surgeries. That is, treatment, in the form of trepanation, is being conspicuously and significantly withheld from specific segments of Chanka and Quichua society. The apparent restriction of trepanation as a medico-cultural intervention towards groups like injured modified individuals and women, suggest shared beliefs about who merited iatric intervention in the post-imperial era. Thus, more than just illustrating technical innovation, trepanation in this case provided a lens to observe how culturally informed therapeutic interventions were transformed and experienced in the aftermath of the empire.

Geographic Mobility and Social Inequality

Finally, this dissertation sought to evaluate how Wari imperial collapse impacted the more quotidian aspects of lifeways in early LIP Andahuaylas. Collaborative research with Christine Pink and Ellen Lofaro employed cranial non-metric trait analysis and biogeochemistry to illuminate patterns of biological affinity, mobility, and diet in ancient Andahuaylas. In addition, cranial vault lesions, a proxy for compromised health, were evaluated to determine if increasing health disparities were characteristic of the post-imperial era.

Population Continuity and Bipartite Divisions

This dissertation reviewed the results of non-metric cranial trait analysis. Because shared phenotypic characteristics are a proxy for biological affinity (see Turner et al. 1991), this analysis was employed to clarify migration trends at a macro level and determine if populations became more insulated in Andahuaylas after Wari collapse.

Three hundred crania were examined, and ten traits were used for subsequent statistical analysis. Multi-variate analysis and cluster analysis of amalgamated nonmetric trait data (employing Mahalanobous D^2 distance testing and Principle Component Analysis) were used to assess the relative genetic distance of different burial populations.

Results revealed reduced gene flow in the aftermath of Wari collapse, but no evidence of population replacement in Andahuaylas. LIP Chanka populations at Cachi and Ranracancha appear to represent two endogamous macro moieties, while the Quichua enclave at Pucullu was genetically distinct from its neighbors. Finally, non-metric analysis revealed that the Mina Cachihuancaray salt mine in Cachi was impregnated by *machays* filled with biologically disparate groups. This result, along with a unique demographic and radiocarbon profile, further support a distinct model of *machay* collectivity at Mina which may have been based on competing rights of salt extraction instead of lineage or *ayllu* affiliation.

Revealing Migration through Strontium Isotope

This dissertation hypothesized that strontium and oxygen isotope analysis would reveal that sections of the post-imperial population would be newly mobile. Isotopic analysis was used in this dissertation to illuminate patterns of paleomobility on the level

of individuals and sub-population groups. Samples of dental enamel were collected for strontium isotope analysis in order to address questions of migration and transhumance in post-imperial Andahuaylas. The $^{87/86}\text{Sr}$ baseline for Andahuaylas was determined to average .707434.

Despite the influx of Wari infrastructure, artifacts, and ideas, there were no foreign-born individuals in Andahuaylas during the Middle Horizon. However, isotopic results support the hypothesis on post-imperial migration due to the presence of non-local individuals in early LIP Andahuaylas. Two non-local females were present at the Chanka sites (one at Cachi and one at Ranracancha). Both females have signs of trauma suggesting that they may have been captured in raids and/or subject to subsequent maltreatment. Strontium signatures also informed on economic organization. Results demonstrated that the salt mine at Cachi was strictly managed by the local community during the LIP: there is no isotopic evidence of non-local (male) migrant mine workers.

At Pucullu, the Quichua enclave, the presence of two non-local able-bodied males (one of whom has a healed trepanation) suggests an alternate strategy of exogamous male immigration to reify labor obligations and social bonds. The in-migration of foreign-born males may have been a tactic used to maintain allegiances with other non-Chanka groups. Quichua community members would have benefitted from the influx of manpower for labor projects and defense.

Gauging Water Accessibility Using Oxygen Isotope Analysis

Similar in principle to strontium isotope analysis, oxygen isotopes in tooth enamel serve as proxies for climate, water sources, and by extension, residential origin (Ambrose

and Krigbaum 2003). The average $\delta^{18}\text{O}$ value (‰) in Andahuaylas is -9.66, and the range is -8.10 to -12.69. Sampled dentition from Andahuaylas revealed that individuals at Turpo during the Middle Horizon likely had access to a greater number of water sources than subsequent post-imperial populations. Increasing homogeneity in oxygen values at LIP sites indicated that access to water may have been more limited in the tumultuous post-imperial era. Importantly, oxygen isotope data do not reveal evidence of striking climate changes between MH2 and the early LIP in Andahuaylas. These results conform to geological and paleo-ecological studies in the area. As expected, individuals with outlier $^{87/86}\text{Sr}$ values also have disparate $\delta^{18}\text{O}$ values.

Diet and Inequality Using Carbon Isotope Analysis

Individuals consuming local foods grown at distinct elevations inform on access to different foodstuffs during childhood (Turner et al. 2009). Carbon isotope analysis of dentition was conducted to help reconstruct ancient diets and test the hypothesis that health would be negatively impacted by Wari collapse. The $\delta^{13}\text{C}$ average value (‰) in Andahuaylas is -4.89, and the range is -1.55 to -8.47. Results revealed that the quotidian consumption of environmentally sensitive staples like maize (and kiwicha) did not significantly diminish between Wari and post-imperial times. These results further indicate relative climatic stasis between the later Middle Horizon and early Late Intermediate Period. However, the post-imperial era did witness increasing stratification with respect to food access, reflected through wide ranges of $\delta^{13}\text{C}$ at Chanka and Quichua sites. Moreover, the covariance of $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ values suggest that after Wari's

retraction from Andahuaylas, ethnic groups maintained differential access to water and plant food sources from different ecological zones. Harvesting food from far-flung ecological zones was probably risky business during the violent post-imperial era. Moreover, increasingly stratified and restricted access to certain foodstuffs or clean water sources also appears to have impacted the health profiles of particular sub-population groups.

Compromised Health Revealed by Porotic Hyperostosis

Finally, cranial vault lesions called porotic hyperostosis (PH) were evaluated to determine how Wari collapse may have impacted health profiles in the post-imperial era. Analysis of 259 crania demonstrated that rates of PH increased overall in the post-imperial era. Results revealed that the physical compression from cranial modification bindings did not cause vault porosities. Dietary shifts in maize consumptive patterns, as informed through carbon isotopic data, do not account for PH rates either. Rather, the most likely etiology of PH in Andahuaylas was megaloblastic anemia caused by nutrient malabsorption which was ultimately due to bacterial infections and or communicable diseases contracted from unhygienic living conditions. Modified individuals had much higher rates of PH than unmodified individuals. Because dietary and health inequalities cannot be attributed to macro environmental changes, it appears that the social repercussion of Wari collapse instigated fundamental disparities in the lifeways of emerging ethnic groups.

Future Directions

The aim of this dissertation was to investigate how state collapse restructured LIP Andahuaylan society, both biologically, and socio-corporally. Far from unique, collapse is a recurring phenomenon that often causes people to redefine who they are, and how they interact with others (see Schwartz and Nichols 2006; McAnany and Yoffee 2010). Sometimes, in the midst of political instability, resource stress, and/or worsening environmental conditions, these interactions can become violent. Yet violence may not be experienced equally by everyone in society; indeed some groups may be more vulnerable than others. While scholars are beginning to examine how violence and novel identities emerge in the wake of “failed” states in contemporary societies, this study contributes to debates about how these processes may work in ancient, non-western, non-state societies. Future research of this sort has the potential to further elucidate mechanisms for violence and identity formation in both modern and ancient contexts of state disintegration. By clarifying the nature of violence in Andahuaylas over time, it may be possible one day to address broader issues of polity emergence, transformation, and demise in general. My hope is that results of these analyses will generate new hypotheses for studies of violence and identity formation in non-state societies, cross culturally.

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