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AN
INAUGURAL DISSERTATION

ON

Necrosis.

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St. Paul, H. Cox, M.D.

Professor of Surgery in the
Medical Departments of the
University of Nashville.

This Treatise is respectfully
Inscribed by the

Writer

Necrosis

In offering this Short Treatise, we cannot expect to present anything as the result of our own experience, or observation; nor can we boast of anything more than a mere approach to originality.

But we will endeavor to express intelligibly, the few ideas which we may have gathered from the writings and lectures of others upon the subject of Necrosis, with perhaps a few suggestions of our own.

Necrosis is defined to be, "The death of a bone, either in part or its whole extent, during the life of the rest of the body."

And corresponds with mortification in the soft parts.

"A bone may simply lose its vitality without having previously undergone any alteration except perhaps that which may result from the cessation of the circulation in its blood vessels," which is probably most common in the shafts of long bones. Most generally, however, the structure of a bone so affected, is entirely broken up, and its texture in a great measure destroyed. Its color is also changed, from the natural healthy tints to a yellowish white, and it may become brown or black. The latter appearances, however, are attributed to the action

of the atmosphere upon the dead bone, since only the portion so exposed becomes blackened, unless the bone is very porous, and even then it may be the effect of the same cause, for it is possible that the pores may be filled with atmospheric air; in part at least.

Necrosis is more common in the compact than in the cancellous structure of bone; owing to the superior vital endowments of the latter, which enable it to resist the influence of causes which operate in the production of the disease in the harder parts. And for the same reason we have necrosis more seldom in the articular extremities of bones.

The Tibia is said to be most liable to this disease, which is perhaps owing to its more exposed situation, and consequent liability to external injury. The femur is next in liability; then the humerus; flat cranial bones; lower jaw bones; phalanges of the fingers; Clavicle; ulna; radius; fibula; &c. in proportion to their exposure to external violence, and the relative amount of compact structure which they contain.

The common causes of necrosis are cold, violent injury, rheumatism, scrofula, syphilis, fever, long continued use of mercury, and inflammation, of which it is perhaps more properly a termination. Other causes

are mentioned, as gouts, over pressure, &c, which we think, might be classed under one or another of those above mentioned.

Cold is supposed to be the most common cause of this disease, and perhaps very properly so, when considered as an exciting cause only. We are inclined to the belief that when necrosis suddenly supervenes upon exposure to cold, there must oftentimes, if not invariably, have existed a predisposition to the disease, as a consequence probably of an inherited syphilitic taint, or rheumatic, or scrofulous diathesis, requiring only the intervention of cold, or some other exciting cause to develop the disease under consideration.

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Latterly a prominent cause of necrosis especially of the lower jaw bone, has been discovered in the manufacture of lucifer matches, which has been attributed to the elimination and consequent inhalation by the operators of phosphorous acid in the form of vapor. Why this gas should affect the maxillary bones, and more particularly the inferior maxillary, is a point yet unsettled. The supposition that it acts as an irritant upon the peristomium, producing inflammation in that tissue and consequent necrosis, is not sustained by facts; no such effects being produced upon the bones of the nasal cavity, with which the vapor comes more immediately in contact in the act of inspiration.—

Taking for granted that the persons
 inhaling it, breathed all the time
 with their mouths shut. (1) -

And that it enters the circulation
 and is thus determined to a partic-
 ular part to display its peculiar ef-
 fects, remains also unexplained.

It is laid down as a fact that ex-
 posure to the vapor of phosphorus, does
 produce "necrosis," destroying a portion,
 or probably the whole of the jaw bone
 which is seldom if ever reproduced,
 owing to the absence of the proper
 "inflammatory" (2) action in the sur-
 rounding parts, and the want of a
 healthy condition of the system gener-
 ally.

Necrosis produced by contusion
 as by a blow "e.g." is for the most

part partial, or superficial, being confined to the outer, or compact lamellae of the bone, and to the surface deprived of periosteum by such violence; which after some time may exfoliate, and be replaced by a healthy deposit of ossific matter without giving rise to any serious consequences.

Exfoliation is not, however, a necessary consequence of denudation or stripping off of the periosteum, particularly if the bone be otherwise healthy, and enjoying a vigorous circulation. Granulation may spring up and the breach be gradually repaired.

As a consequence of rheumatism and more especially of scrofula and

syphilis, we have necrosis occurring
 in the internal structure of the bone,
 or it may be the result of inflamm-
 ation of the "internal periosteum, in-
 volving the medullary matter, and
 spreading from within outward, des-
 traying the entire substance of the
 bone in a short time. Or else
 suppurating through the walls of
 the bone, thence extending through
 the soft parts to the surface, thus
 giving exit to the pus or dead ma-
 tter and continuing for many
 months, or perhaps several years.

Necrosis of the phalanges of the
 fingers, or toes, may be properly att-
 ributed to inflammation of the perio-
 steum, as in paronychia, or perhaps
 a burn. While the improper or too

long continued use of mercury may produce the same disease in the jaw bones, more readily than else where; by destroying first the surrounding soft parts, thence involving the periosteum and subsequently the osseous tissue itself.

And we may be excused for believing that this cause seldom if ever "per se" produces the disease in any other part of the body; simply from the fact that the destructive effects of mercury are first manifested in the salivary glands; producing undue excitement and irritation, and perhaps inflammation in that substance, which may result in its destruction and also the destruction of the adjacent parts, as above stated.

That mercury may, and does, after

long continued use, pass into the tissue of bones; is a fact amply verified by observation and experiments.

But that it does so in the form of a chloride, after which the chloride being separated from it and probably elaborated and thrown off, or else retained in the system in some other form. And thus the mercury is left free, in which condition according to our conception it possesses no irritating properties.

Stanly says (if I mistake not) that in fever, necrosis of the shaft of a long bone has occurred without any evidence of previous inflammation either in the periosteum or medullary tissue, and suggests that the inflammation and death of the bone, in such cases,

are analogous phenomena to the local congestions and inflammations occurring under similar circumstances in other organs of the body. From which he concludes that inflammation in the "tissue" of a bone may precede its necrosis. That inflammation may occur primarily in the osseous tissue without affecting the medullary matter is a fact we think, which admits of easy demonstration:- But that such inflammation should be sufficiently extensive as to cause the death of the entire bone, and a consequent separation from its periosteum, without any injury to that membrane, is, we acknowledge a matter ^{to us} involved in some considerable mystery. For it would seem that inflammation

so extensive as to cause the death of the entire bone, must if it continues even a "month;" necessarily produce supuration, and that pus so formed in seeking an exit, as is its tendency, would come in contact with the periosteum, separating a portion of it at least, from the bone, and thus produce disease, and even death in its passage to the surface of the limb.

Instances are mentioned by writers on the subject, where necrosis occurred without being traceable to any distinct cause; But that there was a cause existing somewhere in the economy, no one will pretend to doubt, else the effect would not have been manifested. And we are disposed to think that the subjects of this disease in the

cases referred to, did not, as is stated "enjoy good health" previous to the manifestation of this particular malady. (We mean health in the strictest sense of the term.) It is quite probable that there was, and is, in all such cases, a constitutional liability to disease, (the iniquity of the Fathers visited upon the children) which in our judgements does not admit of a perfect physiological condition of the entire organism.

Necrosis of the internal lamellae of a bone, is in the majority of instances, characterized in the commencement by pain deep in the structure of the bone. The pain, however, may be preceded by fever, which may last for several days, and even weeks, and

then subsiding in the commencement of pain deep in the bone.

The death of the inner lamellae of bone, is generally followed by suppuration in its cancellous structure and the formation of cloacae, or fistulous openings in its walls.

While these changes are going on within the bone, an inflammation is set up in the adjacent soft parts, which is marked by a circumscribed swelling or tumour; "from which when punctured or allowed to burst, matter is discharged," thus forming a canal through the soft structure, and walls of the bone, perhaps to the medullary cavity. Through the apertures thus formed in the integuments and soft parts, the openings

in the walls of the bone, may often be discovered. They may, however, be so small as not to admit the passage of even a small probe, when of course it would be difficult to determine as to their existence.

Mr Key, states, (and Stanley corroborates the statement) that he has been led to suspect the existence of cloacae by observing that more matter was discharged from the wound than its surface ought to have furnished.

The symptoms of necrosis of the outer laminae of bone, are not essentially different from those which characterize other inflammations of the periosteum and bone. Ordinarily there is separation and

inflammation of the periosteum, immediately over the dead bone, and extending through the investing soft parts to the integuments;— followed by suppuration. And the matter thus formed, in making its exit through the skin, leaves an opening which leads to the dead bone, as in case of necrosis of the internal lamellae.

When necrosis occurs in a portion of a bone of small size, or even in its whole extent, it is not so readily distinguished from inflammation of the periosteum; or serofulous affections, especially in children, ^{as} the inflammation being of a mild character, fibrin or serum is effused without suppuration, then the disease

passes through its various stages without any changes except those resulting from the thickening, or enlargement of the parts adjacent to the dead bone.

There does obtain, occasionally, however, a condition of things in the which the existence of necrosis can scarcely be mistaken, or that is pathognomonic of the disease. And this is when small spiculae or splinters of dead bone, protrude through the soft parts to the surface of the limb, or are discoverable on separating the edges of the wound, or may be felt by introducing the finger. Such a condition, we apprehend is now common in necrosis of the external lamellae of bone.

During the progress of this disease there is, at the same time, an effort on the part of nature, (*Vivis medicatrix naturalis*) to repair the breach. This is done by the thickening of the adjacent healthy structures, and the pouring out of coagulable lymph, as is done in case of fracture of a healthy bone, consequent upon the irritation in the surrounding structures, superinduced by the particles of dead bone, which act as an extraneous substance. The coagulable lymph thus poured out, after a time, varying according to the condition of the patient, acquires the properties of cartilage, which, in turn is replaced by ossific deposits, forming a shell in which is enclosed

The dead bone. In this skull, the holes or cloacae are left, which communicate with the surface of the limb, forming a channel through which the sequestrum, or dead bone, may be felt, or possibly extracted.

In the treatment of necrosis particularly of the shaft of a long bone in its incipency, our efforts should be directed to the arrest of the progress of the inflammation in the surrounding soft parts; that it may be confined to the neighborhood of the dead bone, and that it should terminate short of suppuration.

To the accomplishment of which an active-antiphlogistic course should be employed, and continued until the symptoms, both local and general,

of inflammation have abated or disappeared. Fomentations and poultices may be applied to the limb, and perfect quietude should be enjoined.

In cases where suppuration has occurred, and especially in internal or deep-seated necrosis; the indications are to remove the sequestrum; for it has been ascertained that, "any effort to promote its absorption, or removal by any natural process will prove of no avail." Dead bone is not being amenable to the action of the absorbents.

When therefore the newly formed shell has acquired sufficient thickness and strength to support, and preserve the integrity of the limb, and the sequestrum can be felt,

and ascertained to be loose, or even if it be not entirely detached, its removal is to be effected by an operation. An incision is to be made through the soft parts, "having for its centre the cloaca or hole in the wall of the bone, through which the dead bone is to be extracted. If the aperture in the wall of the bone, be not of sufficient size to admit the passage of the sequestrum, which is often the case in extensive necrosis, it is to be enlarged by a trephine or other suitable instrument;

Or else the sequestrum may be divided into smaller pieces with a pair of cutting forceps, and thus taken away a piece at a time.

In partial, or superficial necrosis

The acceleration of exfoliation is first to be considered. This may be done by laying open the superincumbent soft parts to an extent equal to that of the diseased bone, and making soothing applications to the parts immediately around the perished bone. In some instances, stimulants are required to produce excitement in the surrounding structure, thus favoring exfoliation in the same manner that sloughing is produced in the soft textures. The stimulants to be employed should be of a mild character on account of the danger of producing inflammation and consequent necrosis in the adjacent sound bone. Various mineral acids have been applied

to the dead bone with the view of softening, and thus rendering it more easily removed by scraping it off. For which purpose the chloro-hydric and nitric acids have obtained the preference. We are of the impression that such remedies should be used with great caution, on account of their corrosive properties.

The actual cautery has been proposed and employed for the same purpose, but at present we believe it is abandoned, and very properly so. In superficial necrosis where the bone is thinly covered, as in the front of the tibia; the removal of the dead bone, as in deep seated necrosis, by an operation is proper; although the depth of the disease

cannot be determined previous to the commencement of the operation.

For the permanent relief of our patients, we not unfrequently have to resort to amputation, and more especially is it required where the articular extremities of bones are seriously involved, in which case it is perhaps the most effectual means, of which we have any knowledge.

The general health of the patients should be strictly attended to in all cases, since the correction of constitutional disturbances greatly accelerates the recuperative process in any particular tissue or organ.