AN INAUGURAL DISSERTATION

on

Anatomy and Physiology of the Kidneys

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Anatomy and Physiology of the Kidneys

The Kidneys belong to the order of glands, and are of a peculiar structure, and perform a very important office in the animal economy.

Their office is to separate, from the blood, certain solids and watery portions holding saline substances in solution. These glands are two in number, situated upon each side of the Spinal column; between the eleventh dorsal, and third lumbar vertebra.

Their length is about four and a half inches, their breadth two inches, and their thickness, one inch. They are of a compressed ovoid form. Their anterior surface is convex, and the
posterior, flat. The convex border is placed towards the abdominal parietes, the concave border towards the spine, and it has an excavation (hilum renalis) in which, are situated the blood vessels, nerves, and pelvis of the kidney. They are held in situ by cellular tissue and blood vessels.

When we divide the kidney longitudinally, we observe that it is made up of two portions: an external, or vascular portion; and an internal, or tubular portion. The external or cortical part is made up of blood vessels, and Tubuli uriniferi. These tubules are very much convoluted, and the capillaries, and Tubuli uriniferi, descend near the termination of the cones of
The medullary portion. In the vascular portion, we discover a vast number of very minute, red bodies.

These are made up of small capillary vessels, and a coil of uriniferous tubes, which receive the name of Corpora Malspighiana. These vascular tufts are invested by a membranous sac, the diameter of these corpuscles of Malspighii are about the 1/10th of an inch. The capsule of these little bodies, is supposed to be the origin of the Tubuli uriniferi; and thus, tubuli spread out to join the vascular tufts.

A small vein comes out, from the inside, of the Malspighian tufts, and unites with the efferent vessels of the other bodies; so as to form a
venous plexus. The tubular, or medullary portion of the kidney consists of ten or twelve, reddish looking bodies, to which, anatomists give the name of the pyramids of Malpighi. This base is towards the bascular portion, and their apex towards the hilus of the organ. The pyramids are made up of tubuli uriniferi, the diameters of which, are about the size of a hair. The tubuli have their origin at the termination of the pyramids of Malpighi, and in passing from these, towards the cortical portion, they divide, and run in a parallel direction; and have small blood vessels lying between them. In approaching the base of the
Cones, they become very tortuous, and are extremely small, in order to insinuate with the Malpighian corpuscles. The diameter of these tubuli uriniferi is about \( \frac{1}{4} \) of an inch.

These mammillary processes, that are contained in the interior, are invested by mucous membranes, and this continues with the tubuli, and is reflected from them, so as to form a membranous sack.

The Kidneys are very abundant, supplied with blood, by the renal artery, which is given off from the aorta. If we inject the Kidney, and then macerate it in diluted muriatic acid, we discover that the vessels resemble
The form of the gland, in a very beautiful manner. We have two distinct systems of capillary vessels, in the Kidney. The blood passes through both, in order to pass from the arteriae to the veins. The first is that, which is formed by the vascular tuft, in the Malpighian bodies; and the second, is that which envelops the convolutions of the uriniferous tubes, and has direct communication with the veins.

The veins of the Kidney, are formed by commencing at the substance of the organ, and by communicating with the veins, from other portions of the organ; thus making up the renal vein, which terminates in the
vena cava. The nerves of the Kidney, are derived from the renal plexus, which is said to be formed, partly by the solar plexus and partly by the lesser splanchnic nerves.

Physiological functions of the Kidneys. It is the office of the Kidneys to separate from the blood certain effete substances, which serve no nutritive function in the economy. This is a wise provision of nature, to adapt these organs to the performance of the important task of depurating the blood. The subject of the secretions of the Kidney, has engaged the attention of Physiologists, from time
Innumerable, and many of the noble heads of our profession, have spent a great portion of their lives, in the investigation of this subject.

The urine is composed of water, holding certain solids in solution. The solid portions of urine are found in a state of solution in the blood. And they are formed from an excess of nitrogenous aliment, introduced into the system. The Malpighian tubs secrete the watery portions, or they are permitted to pass through by transudation. The solid portions are separated by the cells of the Tubuli urinifere.

It is also stated, that it passes from the blood, without further elaboration, and the Sulphates and Phosphates,
are formed by the agency of the gland cells. The secretions of the kidneys are very rapid when compared with other secretions. When there is an undue proportion of watery fluid in the blood, it is eliminated by the kidneys, in the form of urine.

The urine is conveyed by the tubuli, into the pelvis of the kidney, and from thence through the ureters to the bladder. These excretory ducts are about eighteen inches in length.

The urine is of a pale yellow color. When first voided, it emits a peculiar aromatic odor, and is of an acid reaction. In order to test the acid properties of urine, we immerse blue litmus paper into it, when first
order, and it will change its
color to red. Let the urine remain
until decomposition has taken place,
and then immerse the red atmus
paper in it and it will restore the
blue color. The urine varies in
quantity, owing to the condition of
the skin, or the temperature of the
atmosphere. The proportion is
greater in winter than in summer.
In summer the secretions of the
skin are increased, and those of
the kidney diminished. The amount
secreted in summer is estimated
at about 30 oz. per day, and in
winter 10 oz. The average amount
is about 35 oz. The chemical composi-
tion of urine is given differently by
different authors upon the subject.

In one thousand parts of urine,

there are 967 parts of water, urea

14.23, uric acid .168, coloring

matter, and uric acid combined

10,102, Salts 8, 135. The proportions
may vary at different times. The
water depends upon the fluid drants,
and disease may increase or

diminish it. In certain ner-

vous affections it is increased,
while in others it is diminished.

The urea is first of the solid
constituents of the urine, and
it forms nearly one half of
the solid portions of the urine.

Urea is formed in the bloody
by the disintegration of the animal
Tissues, or an excess of nitrogenous food in the system. It is said to be increased by great muscular exertion. Urea has been detected in the blood in health, but when in excess, it produces very injurious consequences. It acts very violently upon the nervous system, producing a narcotic effect, and sometimes spasms resembling epilepsy.

Uric acid is formed from the nitrogenous elements of the food. In healthy urine, uric acid is contained in small quantities. It is increased by animal food. When in excess in the blood, it is deposited sometimes in the joints, in the form...
of urate of soda, it also enters into
the composition of urinary calculi.

The mucin in the urine consists in the debris of the mucous surfaces of the uriniferous tubules.

Hippuric acid exists in the urine of man, but not in a free state. It is said by writers to be combined with soda, forming the hippurate of soda.

The salts contained in the urine are derived from various sources.

They may be in abundance, owing to the administration of salts in the food, or in the way of medicine. Among the great number of salts, enumerated by writers, I shall not attempt to explain all
This minutiae, but only to give the most general parts in this formation. It is a disputed point in physiology, regarding the nature, and peculiarities of these ingredients; and perhaps in my imperfect knowledge of medicine, to attempt to explain scientifically, these minutiae, would be far beyond my power. They are formed by the wasting of the tissues of the body. They may be, to a certain extent, taken in with the food. We have the sulphates, and phosphates making up certain portions of urine. Their formation is accounted for by the sulphur, and phosphorus com-
Gaining with the acids, contained in the urine. The sulphur is formed by the decomposition of the nitrogenous tissues and by uniting with the oxygen, supplied by the lungs, forms sulphuric acid, and this combines with the substance in the urine, and forms the sulphates.

The phosphorus is formed by the wasting of the osseous tissues, and this uniting with the oxygen forms an acid; this acid combining with the substance in the urine forms phosphates. Phosphorus may be derived from another source, by the disintegration of the nervous tissues. In great mental exertion, it is said to be increased.

Jan. 6, 1857,

G.W. Fox