

*Bailey (Wm.)*

ALBUMINURIA.

By WM. BAILEY, A. M., M. D. *B*

PROFESSOR OF PRINCIPLES AND PRACTICE OF MEDICINE AND CLINICAL MEDICINE  
IN THE LOUISVILLE HOSPITAL MEDICAL COLLEGE.

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*READ BEFORE THE KENTUCKY STATE MEDICAL SOCIETY, 1874.*

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Dr. Richard Bright made a valuable contribution to pathology and practical medicine by his "Report of Medical Cases," published in the year 1827, in which he showed that the relation so often observed between the dropsies and albuminuria depended upon certain organic changes in the kidneys. Since his publications many of the great men of our profession have labored zealously and successfully in the field of renal pathology. Much additional light has been shed upon these investigations by chemistry and microscopy. Notwithstanding these important labors and the consequent advancement in our knowledge of renal pathology, yet the terms *albuminuria* and *morbis Brightii* do not convey to the mind of the practitioner any very definite idea as to pathology. We have had during late years several important contributions upon this subject by such men as Johnson, Roberts, Dickinson, Harley, Flint, Grainger Stewart, etc. Every one feels that it would be profitable to have the main characteristics and differentia presented within a narrower space, and thereby made more available to the ordinary practitioner of medicine, for his time and facilities will not afford him a careful perusal of these extended monographs. Hope to accomplish this result, rather than to present any thing new upon this important subject, prompts this essay to-day.

If time and your patience allowed, I should be pleased to premise what I shall say by an extended consideration of the physiology and minute anatomy of the kidneys; but I must content myself with a very imperfect statement in relation thereto. I will take for granted your familiar acquaintance with the position, size, and general appearance of the kidneys, but will refresh your memories as to the three elements constituting the organ.

We have a secreting structure, blood-vessels, and connective tissue. In speaking more minutely of these structures we will also state what

we deem essential as to function. The secreting structures consist of the convoluted uriniferous tubes of Ferrein, lined by mucous membrane. These go largely toward making up the cortical portion of the kidneys, and terminate in the capsules of the malpighian corpuscles. In addition to the convoluted tubes we have in the medullary portion the straight tubes of Bellini, calyces, infundibula, and pelvis. These last, together with the ureter, bladder, and urethra, constitute a conduit for the escape of the secretion.

The blood-vessels have two separate systems of capillaries; the first one constituting the malpighian corpuscles, and the second one surrounding the convoluted tubes. From the malpighian tufts, which hang pendant within their capsules, the watery portion of the urine is secreted. The structure of these vessels is well adapted for this purpose, as they have no epithelium. This water passes into the convoluted tubes, where it receives and holds in solution the solids, urea, etc., secreted from the second system of capillaries. We are perhaps indebted to Mr. Bowman more than to any one else for information upon these points, elicited by diligent research. He demonstrated that when blood escapes from one of the small vessels constituting the tufts it will appear in the tube, showing that the cavity of corpuscular capsule communicates with the cavity of the tube.

The epithelium lining the vessels changes according to function required. The tubes, blood-vessels, etc., are bound together by a fibrous connective tissue. The whole organ is covered by a white fibrous capsule, attached so delicately by its fibers that ordinarily it is easily removed from the surface; but we will find that in that form of disease, consisting of an extra development of fibrous tissue, the attachments have become so firm that the capsule can not be removed without lesion of structure.

By common consent it is appropriate that the name of Bright shall still be associated with these diseases of the kidneys, not only as commemorative of his greatness, but also of the value of his contributions in this department. There can be no doubt but that, as the differential phenomena shall be more and more fully comprehended, a necessity will arise requiring that his name shall be limited to some one of the diseases characterized by albumen in the urine and dropsy. It seems to me proper that when that time comes his name should be retained in connection with tubal inflammation, both acute and

chronic, as this form of disease more uniformly presents the relation of albuminuria and dropsy, which first secured his close attention, and finally led on to deeper research as to the organic changes in the kidney frequently presenting this same phenomenon.

The quantity of urine in health is about forty ounces, and its specific gravity is about 1020. Its density over and above water is due to the solids eliminated from the blood. Urea is the principal one. About four hundred and fifty grains of this should be separated every twenty-four hours, and the entire solids should be near seven hundred grains.

No albumen should be present in healthy urine; at least such as may be coagulated by heat and nitric acid. However, its presence is by no means conclusive proof of disease of the kidneys. If the kidneys find present in the blood albumen that can not be assimilated by the tissues, they proceed at once toward its removal, as they do with urea or any other noxious or effete substance. We have albumen in the urine under a variety of circumstances. We may have it from obstructed circulation in the kidney, or when the mucous membrane is deprived of its epithelium; in either case the serum of the blood is transuded. It may be present as an element of pus or of blood. It is also found in some cases of pregnancy, being either from obstructed circulation by pressure or as a result of organic change. It also occurs in the course of very many acute and chronic diseases. Whenever albumen is *persistently* found in the urine, especially in quantity, and when in connection with renal derivatives as tube-casts, it becomes an important indication of disease. I think it worthy of mention that albumen appears in the urine in connection with vascular bronchocele and exophthalmos, without any of the forms styled Bright's disease of the kidneys.

A very interesting paper upon this subject was read so recently as the 4th of March ultimo before the Medico-chirurgical Society of Edinburgh by J. Warburton Begbie, M. D. Albumen appears in the urine in very great abundance in some of these cases, but no derivatives such as tube-casts appear under the microscope. It may exist for a year or more without organic change in the kidneys, yet it can not be styled *persistent* in the sense of that term used in this paper, for there is a very marked peculiarity in the observation; namely, that albumen appears only in connection with the digestive processes. More singular still is the fact that it is much more abundant after breakfast than after

either of the other meals. It is absent from the urine secreted a few hours after the digestion has been perfected. I think that perhaps Dr. George Johnson has given the true solution of the phenomenon referred to, that the urine is more highly albuminous after breakfast than at other times. He suggests that after a long fast the absorption of materials is apt to be more rapid, and the albumen introduced into the blood is in a very crude state, and hence is removed by the kidneys as other noxious elements are from the blood. This paper of Dr. Begbie is a very interesting one, and the relation of albuminuria and this complex affection should not be forgotten.

Albumen in the urine is at the expense of that element in the blood; hence the tendency of all these diseases to produce anæmia, diminished density of the blood-serum, and œdema. Blood deprived of its albumen does not circulate as readily through the capillaries, and the extra pressure caused thereby, together with the diminished density of its serum, causes serous transudation.

Generally speaking, the amount of albumen in urine indicates nearly the extent of failure of the kidneys in regard to the elimination of urea; however, this is not always true. Neither does the quantity of urine always determine the amount of urea eliminated, for the malpighian corpuscles may secrete a large quantity of water, while the convoluted tubes may not be industrious in eliminating urea; so you are not necessarily exempt from uræmia when you have abundant urine. On the other hand, you may have small quantity of urine more than ordinarily dense from a relative increase in the elimination of solids. Usually they correspond. The amount of urea can only be determined by quantitative analysis; but an approximate estimate may be made by considering the total amount of urine secreted in twenty-four hours and its specific gravity. If we have a large secretion of urine, a proper elimination of the solids may occur, although the specific gravity is low; yet if the secretion is greatly diminished and the specific gravity is likewise low, there must of necessity be a deficiency of the solids.

Albumen is coagulated by heat and nitric acid; also by acetic acid. These constitute the best and most convenient tests. Gallippe has very recently introduced a most delicate test. He makes a saturated solution of picric acid in water at a temperature not below 60° F. By adding a few drops of this solution to a small quantity of the

urine in a test-tube the albumen is very speedily and certainly coagulated without the aid of heat or other appliances. Generally the urine should be tested by both heat and acid separately and combined.

When the serum of the blood is transuded, giving us albumen in the urine, we also have another element of the serum; but one that does not, like albumen, remain in solution; but, like fibrin always does when removed from the blood-vessels, coagulates, taking upon itself the form of the tube into which it is received, and embracing in its coagulum whatever the tube may at the time contain, whether epithelium, blood, pus, or smaller casts. These casts of fibrin are dislodged and washed out by the urine, appearing in its sediment, and under the microscope become of paramount importance in diagnosis. They vary greatly as to their elements and also as to their size, often thereby indicating the size and condition of the tubes in which they were molded.

The most satisfactory classification of these diseases bearing the name of Dr. Bright is that after the manner of Virchow, according to the anatomical structure of the kidney. We propose to adopt this division, and propose to consider these diseases as they involve one or more of these structures heretofore enumerated; namely, tubes, blood-vessels, and connective tissue. I will first discuss inflammation of the secreting structure, styled "acute desquamative nephritis," "tubal nephritis," "large white kidney," etc. Afterward I will present the diseases of the blood-vessels, styled "waxy" or "amyloid" degeneration; and then the disease involving the connective tissue, styled "contracted" or "cirrhotic" kidney. I propose to give you the clinical history of each of these diseases, and afterward some general observations upon their phenomena, both agreed and differential.

#### ACUTE TUBAL NEPHRITIS.

Inflammation of the secreting structure may be either acute or chronic in its character. As an acute affection it occurs most frequently as a sequel of scarlet fever. It may occur also as a result of exposure to cold, as from lying upon the damp ground or exposure to draught of air after exercise while the skin is bathed in perspiration. Also following several other diseases. We have at once inflammation of the mucous membrane with proliferation and desquamation of the epithelium, which, together with extravasated blood and exudation, fill

up the tubes, and mechanically interrupt secretion and elimination. Secretion is largely dependent upon the "*vis-a-tergo*" force within the circulation, there being no counter-pressure from the tube, and when the contents of the tubes accumulate till the counter-pressure is equal to that from within secretion is greatly diminished, if not suppressed. Urine under these circumstances is highly albuminous, and the result of this state of things is dropsy and often general anasarca. The urinary deposits placed under the microscope show tube-casts in abundance, composed of epithelium, blood-corpuscles, etc. This microscopic phenomenon is characteristic of acute tubal inflammation, if not even pathognomonic, and will often detect its supervention upon the other forms of these diseases. If this smoky, highly albuminous urine becomes very scanty or suppressed, we are likely very soon to have evidences of blood-poisoning.

The mind of the profession is not a unit upon the proposition that the effects upon the nervous system are due solely to the retention of the urea. Frerichs has a theory that the poison consists of carbonate of ammonia, into which the urea is transformed; while Traube thinks the oftentimes disastrous effects are due to an impoverished blood-serum, with an increased blood-pressure, resulting in transudation into or oedema of the brain; the different manifestations being dependent upon the part of the brain involved. At any rate the question is an open one. Yet, alas! we all know full well that suppression very speedily and inevitably ends in death.

If the kidney be inspected after death from tubal nephritis, it is found to be enlarged by increase of the cortical structure from the contents of these tubes more than by exudation into the parenchymatous tissue. The surface is smooth; capsule easily torn off. The kidney will often weigh twice or thrice its normal amount.

#### CHRONIC TUBAL INFLAMMATION.

By frequent attacks or by persistency of the disease we may have chronic tubal inflammation; the kidney in size and appearance the same as before, modified by the deposit of fat, mostly within the epithelial cells. Tube-casts have now lost their blood-corpuscles and abundance of epithelium. We are supposed to have finally from this condition atrophy of the organ. This is a very different thing from the small contracted, hard kidney due to cirrhosis.

## WAXY KIDNEY.

The "waxy" or so-called "amyloid" degeneration of the kidney is not a local affection, but is regarded merely as a local manifestation of a diathesis. It is usually confined to the walls of the blood-vessels, and is regarded rather a degeneration than an inflammation. It also involves the epithelium, but does not pour out an exudation into the parenchyma of organs.

The structures involved in this degeneration become impaired in the performance of function, the vessels permitting the transudation of serum. The degenerated structure is supposed to more nearly resemble fibrin when deprived of its alkali, and is recognized in the dead-room by a certain reaction with iodine, being turned to a brown color by that agent. It follows diseases of exhaustion, such as syphilis, tuberculosis, caries, and chronic suppuration from whatever source. Being the result of a diathesis, it is often and even generally associated with a similar degeneration elsewhere, as in the liver, spleen, stomach, and bowels.

No doubt exists in my mind but that many of the cases of persistent vomiting and purging that have been regarded as an effort on the part of the system at vicarious elimination of urea have been due to waxy degeneration in the structures of the alimentary canal. The disease is essentially chronic in its character, the symptoms being developed very gradually.

Albumen appears in the urine from the transudation of serum through the impaired structures. However, unlike the former described disease, the secretion in this is above the normal quantity, often exceeding one hundred ounces in twenty-four hours. It is of necessity of low specific gravity on account of an excess of the watery elements. Tube-casts are hyaline in character, but toward the latter stages of the disease epithelial and blood-casts may be observed, indicative of the supervention of tubal inflammation. From this results diminished secretion or suppression, with the symptoms before enumerated.

## CIRRHOTIC KIDNEY.

Cirrhotic or small hard, contracted kidney consists essentially of a hypertrophy of the fibrous or connective tissue, with resulting atrophy

of the other tissues of the organ. It is by no means certain that this increase of the connective is due to the processes of inflammation, for we very rarely find exudation infiltrating the parenchyma. It is always chronic, never developing rapidly, but is insidious in its approaches. The symptoms are often overlooked for a long time, the patient only realizing after a while that necessity compels him to arise during the night to relieve the bladder. Like the preceding form, the urine is secreted in superabundance and of low specific gravity. It is not often accompanied by dropsy, at least in its earlier stages, and frequently not in its whole course unless complicated with tubal nephritis. It has its analogue in cirrhosis of the liver.

This disease does not constitute, as some have maintained, an advanced stage of tubal nephritis, when the atrophy would be due to the contraction of the exudation. If it was, then the clinical history would show that the early part of its course—namely, when there was active tubal nephritis—was characterized by an abundant albuminuria, dropsy, and the microscopic phenomena indicating this stage. These cases give no such history, but are developed very insidiously.

This form of the disease is very prone to produce hypertrophy of the left ventricle of the heart. Bright observed this, and attributed it to an irregular stimulation of the organ on account of contaminated blood, or because this poisoned and altered blood did not circulate as readily through the capillaries, and therefore required additional force to accomplish it. Traube takes a different view from this. This hypertrophy, occurring in that form of the disease in which atrophy of the organ is one of its marked features, thereby lessening the secreting structure and increasing arterial tension by lessening the amount of blood passing from the arteries to the veins, is a necessity in order to accomplish natural results; namely, a proper secretion and elimination, and a healthy circulation through the crippled organs. Hence he regards the hypertrophy as conservative, as much so as when it is to overcome aortic constriction or any valvular obstruction. If the resistance to be overcome and the compensating power are evenly adjusted, very little effect will be produced upon the health, as is the case with the other cases given as illustrations; but if the obstruction is increased, as it may be, by inflammation of the thoracic viscera, then the ventricle, although hypertrophied, will not be equal to the work devolving upon it, and dropsy with deficient elimination

will ensue. Traube found in seventy-seven cases that the left ventricle was hypertrophied in ninety-three per cent of them.

When valvular disease exists in this affection it is usually the result of induced endocarditis.

Neuro-retinitis is another affection incident to this form of renal disease. Impaired vision may even be the first indication regarded by the patient as serious. Dr. Argyll Robertson records a number of cases where the ophthalmoscope led to the diagnosis of contracted kidney when no thought of renal disease had been entertained. By inspection we observe extravasation of blood, and also exudation into the retinal connective tissue and degeneration, of a fatty character, of the same. The ophthalmoscope should be used where this form of disease is suspected. This form of disease occurs so often in connection with a gouty diathesis that by some it has been styled "gouty kidney." It also occurs in those who have been the victims of lead-poisoning.

We shall be pleased, if possible, to present you in close contrast the groups of symptoms upon which we must depend for differential diagnosis as between these three forms of so-called Bright's disease.

We rely mainly upon the urine, its amount and character as determined by chemistry and microscopy, dropsy, history of the patient, and the complications. The urine in the first stage of the inflammatory form is very greatly diminished, if not suppressed, smoky, highly albuminous, with epithelial and blood-casts in its sediment, as shown under the microscope. In the later stages, or when the inflammation is chronic, the urine may be normal in quantity, or even greater than normal, and the blood may be absent. In the "waxy" form as well as the contracted the quantity is greatly increased over the normal amount, and is pale in color.

Albumen is present in much greater quantity in tubal inflammation than it is in either one of the other diseases, for in these it is often absent or present in a mere trace for a long time. If either the "waxy" or "contracted" kidney is complicated by the supervention of tubal inflammation, then the urine assumes the characteristics already described.

Tube-casts do not avail us much in differential diagnosis of these diseases under discussion, but they are of paramount importance in determining the existence of some one of them. We may have them all in any one of the forms, yet the epithelial with blood more often

accompanies tubal inflammation. These, with the granular and hyaline, constitute the principal ones. Dropsy is characteristic of the inflammatory form, and indeed does not often occur unless this is present. When dropsy occurs in the course of the waxy or cirrhotic disease it indicates that tubal inflammation has supervened upon the original affection.

History may very greatly aid us in diagnosing any given case. If we know, for instance, that the patient is just recovering from scarlet fever or some acute disease, the presumption is in favor of its being a case of tubal nephritis. If it occurs after a protracted, exhausting suppuration or disease of any kind, the supposition is that it is a waxy degeneration. If it occurs in one possessed of a gouty diathesis or one suffering from lead-poisoning, then the probability is in favor of it being a case of cirrhotic kidney. The inflammatory occurs mostly in the young, perhaps because it is at that age that scarlet fever most often occurs. "Waxy" degeneration may occur at any age, but generally in middle life; while the cirrhotic occurs most frequently in the middle and advanced periods of life.

In regard to complications I avail myself of some tables prepared with unusual care by Dr. Grainger Stewart, and in reporting from these I will always speak of the three diseases in the order in which I have already considered them—tubal nephritis, waxy degeneration, and cirrhosis. I will give you his percentages, and from this data you can calculate the probability of each from a given complication; or, in other words, determine the value of a given complication in differential diagnosis.

Pericarditis, . . . . .	nearly equal, 7 or 8 per cent.			
Pleuritis, . . . . .	14	2	15	"
Fatty liver, . . . . .	25	6	15	"
Waxy liver, . . . . .	0	32	0	"
Waxy and fatty degeneration of the liver, . . . . .	0	46	0	"
Cirrhotic liver, . . . . .	14	0	15	"
Waxy and degenerate spleen, . . . . .	0	74	0	"
Waxy and degenerate intestines, . . . . .	0	58	0	"
Tubercle of intestines, . . . . .	3	18	15	"
Sanguineous apoplexy, . . . . .	7	2	15	"
Dropsy, . . . . .	67	6	23	"
Hypertrophy of the heart, . . . . .	39	4	46	"
Congestive and œdematous lungs, . . . . .	64	20	54	"
Pneumonia, . . . . .	21	4	7	"
Tubercle, . . . . .	7	48	23	"

Prognosis, except in acute tubal nephritis, is always unfavorable. This latter, considering the gravity of the phenomena presented, is not a very fatal disease.

Treatment of tubal nephritis is of the utmost value, but in the other forms it consists simply of management. It is essential at all times to remember that the tendency in all these diseases is toward anæmia, and that so strongly that depletive measures as such are not to be thought of. Also remember that opium and mercury are not tolerated.

In the inflammatory disease the most important indication is to increase the quantity of urine, for usually you will thereby increase the elimination of the solids from the blood. You will also see an additional indication for this measure by remembering that secretion and elimination are mechanically impeded by the accumulations in the tubes, and these are washed out by an increased flow of water. However, do not use such diuretics as will irritate the kidneys. Water in large quantities acts as a diuretic, assisted, if necessary, by digitalis, salts of potash, etc. Give iron early and persistently, and supply the blood with albumen to furnish the waste through the kidneys.

Formerly it was the custom to treat these diseases of the kidneys by copious purging and sweating, with the view of relieving the blood of its extra water and at the same time rest the kidneys. By remembering the physical condition of the tubes you will see that this is not the true policy. Pass large quantities of water through the kidneys in order to keep the tubes clear.

When peril is imminent from dropsy then we may use purgatives and diaphoretics actively, elaterium, and vapor-bath; acupuncture to be practiced, but use needle in order to avoid erysipelas. Do not treat uræmic complications as if there was an inflammatory condition of the brain, for oftentimes it is anæmic. Restore the circulation through the brain, and eliminate poison from the blood. Small doses of opium may be efficient for the first indication, but remember its effects upon secretion. Treat complications upon general principles, but do not deplete.

Waxy degeneration is not curable, but it may be somewhat prevented. Obviate the development of the disease, or even its progress, by preventing the waste upon which the degeneration is supposed to depend, whether suppuration, tubercle, or what not. Improve the

general condition. If from syphilis, give iodide of potassium; if from tubercle, give cod-liver oil; if from caries, remove dead bone, etc. If suppuration can not be controlled, supply waste albumen, alkali, etc. Indeed in all these diseases supply the blood with albumen lost through the kidneys.

Cirrhosis is also an incurable disease. We may mitigate and obviate its complications by engaging the skin very actively by clothing, vapor-bath, and climate. Give iron, and remove the dyspeptic symptoms by the bitter tonics, acids, etc.

Knowing full well the imperfections of the foregoing paper, your charitable consideration is asked therefor.







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The Preliminary Term will begin on the first Monday in September, and continue until the second Tuesday in October. This course is free to all students of medicine.

The Regular Term begins on the second Tuesday in October, and closes with the last week in February.

For circular or further information address

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