NOTES
ON THE
KIDNEY & ALBUMENURIA
BY
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The form of the kidney is almost too familiar to require description. Its shape has been compared to that of a French bean. Perhaps nothing can define its appearance better than by saying it is reniform. The kidneys are the secreting organs of the urine, and are situated in the lumbar region, behind the crest of the ilium on each side of the vertebral column, embedded in a mass of fat. The weight of each organ in the healthy adult may be estimated at from three to four and a half pounds. Each kidney is between four and five inches in length, about two and a half in breadth, and in thickness about one inch. The right kidney is somewhat lower than the left, on account of the position of the liver. In life, the kidney is dense, and fragile, and is invested by a proper fibrous capsule, which is easily torn from its surface.

The knowledge possessed by the ancients regarding the structure of this
Organism, especially of a very limited nature, for with them to touch a dead body was prohibited as a profanation, both by Jew and Greek, and consequently they must have been almost entirely ignorant of anatomy. They may have understood something of the skeleton from their practice among fractures and dislocations, and they may have formed some general idea of the viscera from researches in comparative anatomy, but the minute structure of the human body must have been to them a profound mystery.

The description of this organ as given by Aristotle is confined chiefly to its external form, and relations. Hippocrates, born in the 80th Olympiad, upwards of 400 years before the Christian era, did more for medicine than all who had preceded him. He classed the kidney among the secreting organs, and was acquainted with the virtues and their uses, but so little of its function was understood that it was even doubted by Ctesistratus.
of the Alexandrian School, whether the kidneys were of any use at all. The only anatomical work published of any merit, or originality appeared about the commencement of the 16th Century. It was that of Mundinus a Milanæ. The existence of the tubuli had been hinted at by S. Biringavius. But the first author who gave an accurate account from personal observation was Gabriel Fallopius in his Treatise, Observations Anatomicae, in which he mentions the tubuli seminiferi and describes with considerable minuteness the course of the blood vessels. He regarded the papilla as continuations of the tubular substance, which he discovered in the internal and outer parts of the gland. Highman, who followed Fallopius, described the kidney as consisting of an outer or cortical layer, fleshy in its nature, and of a medullary or central part, composed of tubes. The work of Marcellus Malpighius which appeared towards the close of the 17th
The colour of the kidney is a purplish brown. When divided by a longitudinal incision carried from the convex to the concave border, the kidney presents in its interior two structures, an external or vascular (cortical) and an internal or tubular (medullary). The former is generally conceived to be the secreting portion of the
Kidney: the latter merely the tubular or conducting portion through which the urine passes on its way to the urinary bladder. The cortical portion occupies about three times the space taken up by the medullary, and is very much more vascular. The tubular or medullary portion is formed of pale reddish-coloured conical bodies corresponding, by their bases with the vascular structure, and by their apices with the hilus of the organ. These bodies are named cones and are from eight to fifteen in number. These cones are composed of minute straight tubuli about the diameter of a fine hair; they divide into parallel branches in their course, and commence by minute openings upon the apex or papilla of each cone. The papilla are invested by mucous membrane, which is continuous with the lining membrane of the tubuli, and forms a cup-like pouch, the Calyx, around each papilla. Like all other secreting structures in the animal kingdom, the renal tubes consist of follicles more or
left elongated and closed at their distal extremities. They commence in the cortical part by a dilated pouch and after various convolutions in the same section of the organ, they become straight, and pass through the medullary portion. Each tube after its commencement soon divides into two others and each branch again splits dichotomously, thus multiplying the number of tubes, while subdividing in this way they also diminish in size. These tubes are contractile and are subject to the same changes as the arterial vessels after death. The intervals between the cones are filled with the convoluted portion of the tubes, and also contain the Malpighian bodies as well as the large arterial and venous branches. The secreting structure of the cortical part of the kidney is distinguished by the large size of its tubes, their tortuous course, and loops formed by them, not merely on the surface of the kidney but also in its interior, and by the globular enlargements in which they terminate and
by the large size of their contained cells.

The vascular, or cortical portion may be regarded as composed of multitudes of the Malpighian bodies, accompanied by thin blood vessels, and of the plexiform convolutions of uriniferous tubuli, and not only forms the surface of the kidney, but dips between the cones and surrounds them nearly to their apices. The tubuli uriniferi communicate freely with each other, in the vascular structure of the kidney, and terminate in anastomosing loops, and Cal'yctermities. Both the urinary tubes, and the infundibuliform enlargements embracing the Malpighian bodies, are composed of two distinct structures: viz. a basement membrane and epithelium. The former of these does not differ materially from the same structure in other parts of the system, excepting that it is here of extreme tenuity. When freed of epithelium and examined under lenses of high magnifying power, it is a perfectly clear homogenous membrane.
it forms the outline of the tube, and the epithelium is attached to its inner wall; it is elastic and does not exceed 120,000 of an inch in thickness. The epithelial lining of the tubes differs materially in character according to position, thus that immediately in contact with the infundibulum expansion of the tube, or capsule, embracing the Malpighian body is of remarkable beauty and transparency. As we proceed, however along the tube (away from the Malpighian tuft), the epithelium scales gradually assume a firmer and more marked character, becoming thicker, nucleated, granular, and rounded in form, they cover the basement membrane completely. This epithelium consists of nucleated particles, the nucleus of which is clearer than the rest of the cell contents, which are of a granular nature. They usually adhere to each other, so that in scraping they come away from the membrane in the form of
complete tubes.

In the cortical substance in all animals, besides these tubes, we find a number of rounded bodies, and upon injecting these with coloured way, by the renal veins they appear at the end of arterial twigs, and have much the appearance of fruit on a tree. They may be viewed as composed of globular masses of arterial capillaries, enclosed in the expanded extremity of a urinary tubule. They are not scattered indiscriminately throughout the cortical substance, but are arranged in columns. These are the Malpighian bodies.

The Artery, and vein, for the supply of the kidney, as well as the ductus, pass in at the hilus, carrying along with them a reflection of the investing fibrous capsule which forms the common sheath; and ultimately becomes the matrix in which the tubes are lodged. The artery, while in contact with the pelvis is divided into several branches which are distributed
to the gland. Some of these pass between the medullary cones, others traverse these in sets, and form a series of loops from whose convex surfaces they proceed several straight arterial twigs, which run to the surface. From these, lateral branches arise on which the Malpighian bodies are suspended, while others continue onwards to the surface of the kidney, and then terminate in capillaries. The artery after reaching the Malpighian body becomes subdivided into a Vetri Mirabili, which form a series of loops collecting again into a single trunk of smaller diameter than the incoming one. This passes out at the same part at which the artery entered. It is seldom that a branch of the artery reaches the surface of the kidney, without first communicating with the Malpighian dilatations.

The blood, after the secretion of urine has taken place, is returned by a vein corresponding to the main arterial branch.
entering the capsule. This vein does not return its blood to the eminently vein directly, but as seen in drawing at end, it first communicates with a plexus of veins surrounding the ureterous tubes, which plexus eventually becomes continuous with the branches of the eminently vein.

Of the diseases to which the kidney is liable, probably the one which most commonly comes under the notice of the Physician for care, or rather treatment is, that known under the name of Bright's disease or Albuminuria.

There is no albumen in healthy urine, nor can its presence be recognized by mere inspection. Its existence in the urine is generally the indication of some serious organic change in the structure of the kidney.

According to some writers, albumen so frequently appears in the urine, and under conditions of the body so slightly varying from health, that its presence or absence would appear to be a matter of little consequence. But its presence taken
along with other facts easily to be ascertained in kidney disease, is a very sure guide to the determination of such lesion, and even its presence alone must be regarded as one of the most valuable, and certain signs afforded for the guidance of the practitioner. Some of the conditions under which Albumen may be found in the urine, independently of those lesions of the kidney recognized under the head of Bright's Disease, are as follows.

1. During the last hours of life.
2. When any cause of obstruction retards the passage of blood, through the great system of vessels in any part of its course, and difficulty opposed to the return of blood, the lower extremities and inferior parts of the trunk become edematous. Then it is obvious that the kidney may become congested, a state highly favourable to the effusion of serum into the urine - but this must be regarded as a case, but rarely met with.
3. In all cases of Haematuria, we shall find albumen in the urine; we are not however in a position to ascertain the truth of the case until the red particles of the blood have ceased to appear.

4. Pus may exist and its serous part diffuse itself into the urine, while the corpuscles may subside and in this way albumen may be detected. It is important to be aware of this, and to wait until such pus may disappear before arriving at our conclusion.

5. The presence of semen is sometimes a cause for the existence of albumen in the urine. This however is a rare fallacy; the albumen generally being in small quantity. A microscopical examination will however, determine the question by ascertaining the presence of seminal albumen.

6. The urine first passed by patients recovering from acute cholera contains albumen.
Cheese, or milk diet, have had the credit of producing an albuminous condition of the urine. I believe I am correct in stating that Prof. Christian, in one of his clinical lectures, mentioned the case of a young man, a student, who could produce albuminous urine at will by eating cheese. I think I am also correct in saying this individual fell a victim to this disease not very long after. Dr. Christian always regards the presence of albumen in the urine as cases of great suspicion.

A full meal has been supposed to produce albuminous urine, probably from the fact that both albuminuric urine, as well as urine passed after a full meal, will often become clouded by heat, owing to the deposition of Phosphate of Lime, an appearance which has led the observer to conclude that albumen was present.

Mercury freely administered has been
regarded by some as the cause of albuminous urine, and although we cannot say it is never the cause, yet we may not depend too much upon loose assertions. It has been observed by some that urine containing albumen sometimes became freed from that substance by the exhibition of Mercury.

10 Certain irritants such as cantharides or even a blister applied to the skin have produced it. Among other causes to be enumerated are those of heart disease, delirium tremens, and it is not at all infrequent in the putrefied state.

In testing for albumen it is requisite to filter before testing, as the urine may become hazy from the presence of mucors, thus leading to false results. It sometimes happens that albuminous urine is already turbid from the presence of lithates; these dissolve as heat is applied and the urine becomes clear, and as the temperature rises the albuminous opacity
becomes visible.

The phenomena observed in heating urine, vary in different cases, owing chiefly to the variable amount of albumen. The while being sometimes converted in uncoagulated gelatinous masses, but this is of rare occurrence.

The whole albumen more frequently appearing in the form of a whitish cloud, collecting afterwards in small curdy plates, which soon subside, leaving the supernatant liquid clear. In testing urine it frequently happens that on the first addition of Nitric Acid the albumen is precipitated for a second or two, and is then redissolved. A further addition of Acid causes a second precipitation, and perhaps again a resolution, after the addition however of a considerable quantity of acid a permanent precipitate is obtained. Owing to ignorance of this fact it has frequently happened that urine has been considered unprecipitable by Nitric acid. The nitric acid must always bear a certain proportion to the albumen present.
Nitric acid may cause a white precipitate when no albumen is present. This has been observed in cases of low typhus, and also in small-pox.

The precipitate of Lithic acid may be distinguished from that of albumen, by testing a second portion, by the addition of Hydrochloric acid, which will precipitate the urine equally well as the Nitric, if the effect be owing to Lithic acid, but will produce no reaction if albumen be the cause of the precipitate by Nitric acid.

The urine of patients taking Copaiba or Cuba, will yield a white precipitate on the addition of Nitric acid which at first closely resembles albumen. The method of distinguishing these is by allowing the tested liquid to remain at rest two or three hours; when if albumen has caused the opacity, the whole of it will be found as a precipitate, the supernatant urine being quite clear, while if the opacity has been occasioned by the resinoid matter of Copaiba, or Cuba, the precipitate will not have subsided, the urine remaining milky for many hours or even days.
Note. Urine impregnated with the resinoid matter of Cibetes or Copaiba, usually possesses a strong, volatile, odour, and is not precipitated by boiling. Some specimens of urine effervesce strongly on the addition of Nitric acid. These, when they contain albumen, sometimes present a difficulty to its detection. This effervescence is always produced when the acid is added to warm urine, and is thus a source of fallacy, in consequence of the bubbles which arise catching up the flocculi of albumen precipitated by the acid. The whole of the precipitate may thus be carried up and concealed in the froth, while the liquor below remains perfectly clear. It is therefore right before pronouncing an opinion to wait until the froth has broken up.

Dr. Christison recommends that the urine should always be tested if possible before it decays and becomes Ammoniacal, as he has found that sometimes even Nitric acid added in excess did not separate albumen, which had been present in large quantity.
- a fact which is probably to be ascribed to the albumen itself having undergone more or less decay, along with the other principles of the wine. The amount of albumen is estimated by the height it occupies in the tube after subsidence. The quantity is various, but always in the early stage abundant. Although proportionally great as estimated by its volume in the fluid, its weight is insignificant. Ten parts by weight in a thousand of wine will render it almost a thin uniform pulp when heated. Less than this in the early stage is seldom met with.

The Test by Heat alone is not conclusive nor sufficient, and not to be solely depended upon, these being circumstances which may prevent the coagulation of the albumen, which nevertheless is present, whilst on the other hand it may under other circumstances produce a fallacious appearance of albumen when none exists. When albuminous wine is heated to about 160° Fahr. the albumen begins to coagulate, and by
Continuing the heat, the liquid becomes opaque—owing to the precipitation of flocculi. These, after a time, collect at the bottom in the form of a precipitate. It is requisite to test the urine with litmus paper, before we can arrive at a correct opinion by the application of heat alone, as we can never have a positive result unless the urine be acid. If alkaline urine be first acidified by acetic acid, we obtain a precipitate of albumen by heat. Albuminous urine has more frequently a less acid reaction with litmus paper, than when in a healthy state. When alkaline, or even neutral, it will not coagulate when heated, even though loaded with albumen. The alkalinity is probably owing either to the presence of ammonia or of soda.

Heat may moreover cause a flaky deposit, consisting of earthy phosphates, although no albumen whatever is present. This precipitate may be obtained by urine whether it be in an acid or alkaline state. This is
readily detected by the addition of Nitric Acid, which it immediately redissolves.

Method of testing by Heat and Nitric Acid. To avoid these sources of error or fallacy, however, before testing it is necessary to render the suspected urine acid by means of Nitric acid which has the property of precipitating the albumen in a flaky or pulpy form, and thus not only being the means of detecting it when alkaline, but has the effect of retaining in solution the earthy matter which would otherwise be thrown down by the application of heat. The test by Nitric acid requires a certain degree of care and accuracy, the principal risk being that of being too sparing of the acid. The combination of Nitric acid and albumen (commonly called nitrate of albumen) is soluble in water and not coagulable by heat. It is therefore requisite that more than only a sufficient quantity capable of neutralizing the urine should be employed - as without it no satisfactory result can be obtained as before mentioned.
but when more nitric acid is added, the nitrate of albumen, being insoluble in excess of nitric acid, becomes perfectly visible. Therefore in testing urine supposed to contain albumen it is preferable to operate on a small quantity at first, boiling it in a long test tube, and gradually adding nitric acid drop by drop, until there is an excess, instead of the two common practice of nearly filling the test tube and adding only a drop or two of nitric acid. It must be remembered that nitric acid alone, as well as heat alone, is no decisive test of the presence of albumen, as it may occasion a cloudy precipitate of lithate of ammonia, whereas albumen is present. But the result is easily obtained by the combined action of heat, and nitric acid. The precipitate formed by the addition of nitric acid alone being redissolved by an increase of temperature, while any coagulated albumen remains insoluble.

It is well to be aware that albuminuous urine of excessive acidity from its containing
either free acetic or hydrochloric acid, will fail in giving a precipitate when heated. The acetate and hydrochlorate of albumen being both soluble in water, and uncoagulable by heat. By the addition of an excess of nitric acid, after heating the urine, this liability to error may be obviated, and so avoid all risk of mistake.

The tests above enumerated are sufficient for all practical purposes, though other tests have been proposed, such as Kreasote, gallic acid, dichlorid of mercury &c. One method of readily distinguishing the precipitates is by using a solution of ferrocyanamid of Potassium, previously acidulating the urine by acetic acid. If albumen be present, it is immediately thrown down; but in the other case, even if the acetic acid produced a slight turbidity it will not be increased by the addition of the ferrocyanamid.

The morbid appearances presented by the kidney denote some change in its intimate structure. That more than one cause can
produce the same effect, is daily brought before our observation. It requires but little deliberation to perceive that deposits, whether cancerous, strumous, or of adhesive character, are equally capable of producing analogous, though not identical physiological conditions in the structure of the kidney of causing albuminous urine, by interrupting circulation through that organ, and of obliterating eventually all traces of its normal anatomy. Congestion, whether resulting from obstruction to the return of blood through the renal vein, or a rapid determination of arterial blood to the kidney as the result either of an inflammatory condition, or of suppressed cutaneous excretion, are alike causes capable of producing the symptoms of albuminous urine and causes of the latter kind, chiefly owing to their connection with dropsy and scarlatina, and by their easily admitting of cure are early distinguished from the graver forms of albuminuria.
The disease is a morbid degeneration of the kidneys. Its progress is essentially chronic, and the morbid deposit appears to be thrown out gradually and slowly. It is attended by irritation of the kidneys of that kind which is characterised by the excretion of blood, or of its albuminous portion. It tends to diminish or suppress the excretion of the solids of the urine, both in the early stage by causing functional disturbance, likewise in the advanced stage by inducing excessive disarrangement of organic structure. It also tends singularly to impoverish the blood, by depriving it of a large proportion of its colouring matter. Ultimately it overbalances the functions of the brain, probably in consequence of the blood, the proper stimulant of that organ; being on the one hand poisoned by the accumulation of urea, and deprived on the other of its colouring matter. It also engenders in the constitution a state peculiarly characterised by a liability to fevers.
effusion, as well as inflammation of the serous membranes, and internal viscera. And it is through the intervention of these secondary circumstances that the disease of the Kidneys most generally proves fatal.

The disease has been variously divided into different stages by different authors, and the Kidney presents various anatomical appearances. It is sometimes enlarged, sometimes excessively shrivelled, at one time little firmer than recent brain, in some cases composed of a smooth homogenous mass, in others finely granulated like herring roe, and in others, coarsely tuberculated, so as to present somewhat the appearance of being thickly studded with peas. The progress of the disease may be conveniently divided into three stages. 1st. The Incipient Stage—a stage of congestion or reaction. 2nd. The Middle where the cortical structure is nearly or entirely destroyed. 3rd. Final where the tubular masses are also invaded and more or less obliterated.
1st Incipient Stage. In the generality of instances when the disorder has not commenced in the acute form, the change of structure is apt to go on for a long time insidiously. There being scarcely any symptoms to attract the attention of the patient, or his physician. When the disease in its acute form proves fatal in the early stage, the Kidneys are found flabby, friable, and unusually large. Sometimes twice the normal size, much darker, and more vascular externally, with innumerable black star-like points, visible throughout their whole structure, but more especially in their cortical portion, which are not easily removed by washing. These are the Corpora Malpighiana dilated, and their vessels distended with blood, seen through the capsule. The whole Kidney is more or less gorged with blood, which drips from a cut surface in unusual quantity.

The cortical structure almost always seems considerably broader than in the healthy state, as if it were distended towards the circumference by its gorged condition. Occasionally there is
also an appearance in the cortical substance, of a granular matter of a dark reddish-yellow tint deposited here and there, so that its natural striated texture is somewhat obscured. These spots derive their appearance from a collection of fatty matter. This state by the French Pathological writers is considered to be hypertrophy of the organ. The peculiar features of this stage consist of an enlargement of the arteries entering the Corpora Malpighiana, the dilatation of the vessels of the lefth, the capillaries and veins, an increase in the size of the capsule of the corpus and of the tubuli, and a large addition to the quantity of the Parenchyma of the organ. The condition of the arteries is visibly changed, even at this early period; the artery entering the corpus being actually twice, or thrice its natural size, which is the case also with the Malpighian tuft, and the capillary vessels, which spring from the tuft. The tubuli in this stage are also much increased in their dimensions; but the fat which is found in
There is soft and of a yellowish colour.

Middle Stage. In this stage the deposition of granular, or cheese-like matter is deposited. The most characteristic and uniform Morbid appearance are those presented by the cut surface of the Kidney. When it has been divided into two symmetrical portions by a longitudinal incision, we then perceive that the cortical substance is the main seat of the morbid alteration. As the morbid deposit advances, the natural structure of the organ gradually disappears; it has lost in a great or less degree, its proper red colour and uniform aspect, sometimes it puts on a speckled, or granular, appearance but this is less common than a pale, nearly homogenous surface. Its natural striae are confused, or obliterated, and the incised surface gives one the notion of some deposit, whereby the original structure of the part is obscured. At length the former takes the place entirely of the latter; but still the tubular portion of the Kidney may remain
little, if at all, affected. This is the condition
of the kidney in which the disease most com-
monly first manifests itself by symptoms,
and leads to serious disturbance of the health.
Although the chief seat of the disease is
confined to the cortical, or secreting portion
of the organ, its secreting or medullary portion
is frequently implicated in a more or less
degree. In this stage, the organ is usually
increased in size; its surface is smooth, the
capsule is but slightly adherent to the surface,
and the tissue of the organ is flabby. The
structural changes are in this stage.
1st. The Artery of the Corpus Maligneina
becomes so greatly enlarged that frequently
it equals the dimensions of the tube itself,
and is eight or ten times its natural size.
It is tortuous and dilated, and sometimes
previously to entering the capsule of the corpus,
presents swellings analogous to those of
Varicose Veins. The primary branches of
it forming the tuft, are also distended to
ten or fifteen times their natural size. The
vessels forming the tuft are likewise enormously enlarged, and very often the minutest branches are fully as large as the main artery in a healthy state. An enlargement of the renal arteries and dilatation of their branches are also observable in this stage. The tubuli differ considerably from their healthy condition, being enlarged to two or three times their natural size and aggregated together in masses so as to lie in contact with each other. They are also extremely convoluted with numerous dilatations, frequently they are varicose—At other times they present distinct aneurismal sacs, which bulge out from one part of the wall of the tube to which they are attached by a small neck. The tubuli in the masses are so closely packed, that the blood vessels are evidently compressed, and rendered incapable of admitting an injection. In cases where the kidney is much enlarged the parenchymatous cells will be found not merely increased in size, but adipose deposition will be seen through them.
3d or Advanced Stage. As the morbid deposition proceeds it generally proceeds not only the cortical, but likewise the tubular portion of the Kidneys, occasioning in the latter as in the former both a morbid formation, and absorption of the normal structure. The Kidneys are still sometimes of the natural size, or even larger; but more generally they are diminished and at times do not exceed two inches in length. Their surface is sometimes lobulated, commonly pale, very frequently rough and irregular, or even botryoidal, like the row of a Salmon. The capsule is adherent. The colour outwardly is uniform pale grayish yellow, sometimes with vascular spots, but more commonly without them; when they are very much reduced in size, this proper brownish red tint is preserved. Their firmness varies exceedingly from that of healthy liver, to that of the same organ when affected with tubercle, and Dr. Bright has found them so hard as to cut almost like cartilage. If the Kidney is not less than natural, on a
longitudinal section being made, the portion usually occupied by the cortical structure is of the natural breadth, and entirely occupied by greyish yellow granulation, or by a homogenous substance somewhat like fatty degeneration of the liver. If the kidney is reduced in size the cortical portion is contracted in breadth, so that the outer extremities are pushed, as it were, towards the external surface. On making a section, the organ is found to be deprived of blood; the blood vessels are large and their walls thick. The arteries are in a more contracted condition than that described in the second stage; and the Malpighian tuft is often so changed from its natural state, that the greater part of its vessels are not capable of being injected. The capsule of the corpus has assumed a more contracted appearance. The veins in this stage present, on the surface of the organ, the well known stellated aspect, which arises from gradual pressure exerted on their trunks, and contraction of the organ. The tubuli are larger than in the preceding
Nags, and are gathered into rounded masses, which form the granules on the surface of the organ. The latter are of a white hue, and are most commonly distended with fatty depositions; though not unfrequently they appear like dark spots; the tubule in that case being full of blood. The parenchyma is hard, and is composed of elongatedstellated cells, from the angles of which fine threads proceed, and communicate with each other. In the proper of matters the kidney is sometimes converted into one entire mass of uniform granular or homogenious degeneration, with the exception of a single tubulus at one side, or perhaps one at each extremity. In other instances where the morbid deposition has been either scanty from the first, or has subsequently been absorbed we sometimes find one of the kidneys exceeding by small flatly, thin, and so entirely deprived of its proper structure, that no vestige of either cortical or tubular substance remains.

In such cases the ureter is of course useless; and in one instance Dr. Solon found its
canal obliterated. More frequently there are little cavities, or cysts interspersed which are either true cysts, or more commonly the infundibula remaining after their corresponding tubuli have been destroyed. It is usual to find one kidney more advanced in disorganisation than the other and in general this is the right. Occasionally one of them is in the very last stage of the disease, the whole cortical and tubular structure having disappeared, while the other is but slightly advanced in the final stage, or even in the middle stage only.

Granular disorganisation of the kidneys may commence in two forms, either as an acute or as a chronic disorder. When it appears in the acute form, it usually begins at once with symptoms unequivocal, and even urgent. In such cases generally after some decided exposure to cold, or to wet and cold together, there is a preliminary fit of chilliness or rigor, followed by febrile reaction, with its customary accompaniments.
of frequent hard pulse. Head, pain in the
head, dry skin, thirst, disordered digestion,
loss of appetite, a diseased state of the urin.
ary secretion, the urine becoming quickly scanty,
high coloured, and albuminous, a frequent
desire to pass water. The urine at times almost,
may altogether be suppressed, occasionally bloody
and in rare instances mingled with clots of
blood. At times positive pain in discharging
it—not uncommonly dull, more rarely
acute pain in the loins aggravated by pressure,
and sometimes shooting downwards to the
inside of the thighs, or external parts of gen-
itation. Nausea, sickness, and vomiting,
are of common occurrence. This train
of symptoms does not continue long, seldom
above two days, without the supervenion of
secondary affections, the most common
of which are dropsy, especially of the limbs
and face. There is a deranged state of
the general circulation, together with an
altered condition of the blood. Leuco-
phlegmatic and a variety of incidental
affections of the lungs, and organs, at a distance from the primary seat of the disease, among which the most frequent are edematous effusions into the serous sacs. Inflammation of the serous membranes more especially pleurisy, bronchitis, diarrhoea, rheumatism affections of the brain, such as coma either with or without convulsions. As regards edema, we may frequently have palor, the eyelids and face swollen without any such condition of the trunk or extremities. This palor and swelling of the face when seen in men may be regarded as the most common indication when more prominent symptoms are wanting, and if combined with puffiness of the under eyelid, presents an aspect most significant to the practiced eye.

If the acute symptoms are not ingrafted on any old disease of the kidneys and receive timely, and proper treatment, the patient may completely recover. the albumen no longer exist in the urine and the disease may never return. It would be a great
born to the Profession could we discover some sure sign by which to determine in all cases whether the acute symptoms are connected with old disease, or not. The prognosis of this disease is thus extremely embarrassing.

The progress of the disease varies much in different circumstances, though it may be checked altogether under active treatment yet often death is occurred at an early period, sometimes even in four or five days, by coma or some acutaneous inflammation. More usually the symptoms verge into those of the chronic state.

The symptoms which characterise the disease in the chronic form are much the same as those observed in the acute, but are much less severe. These symptoms of granular degeneration, when they put on the chronic form, may do so merely as the sequela of the acute affection just described. But much more generally the malady is very obscure in its origin. Often indeed like chronic visceral derangements in general,
it seems absolutely latent throughout a great part of its progress. Occasionally, for many months there is no symptom to attract the patient's notice, or withdraw him from his ordinary employment, till at length the gradual increasing debility arouses his own anxiety, or the growing pallor of his countenance excites that of his friends, or the appearance of more acute symptoms, or of some secondary disorder at once unequivocally announces the presence of disease. Nevertheless, in such cases an attentive examination will not infrequently show that warnings of mischief were not altogether wanting, though the patient had neglected them. It is thus that we are so often called in, only when medical advice can be but of little avail, so far at least, as respects permanent cure. It is not uncommon to find, in cases apparently the most obscure in their origin, that the urine has been very long scanty, or too abundant, or occasionally of a cherry red colour, or that it was passed frequently and with difficulty, or with positive
pain, or that there were frequent gnawing pains in the loins, or flanks, extending at times to the thighs or groins. Dr. Christian says: "No single symptom now allotted to has appeared to me so invariable, or of so much service for indicating the commencement of the disease, as the fact of the patient being awakened once or more during the night time by the necessity of passing urine. I have scarcely ever known it wanting, where no other local symptom existed; and it is so remarkable a deviation from the ordinary rule of health, that although it may have been neglected, no individual can fail to recall it when his memory is tasked on the subject by his physician." The essential indications of the disease are distinguished as follows, there is reduction of the strength, emaciation, not always, however considerable; a remarkable uniformity, and commonly, great paleness; yet on the other hand, at times, a peculiar pale brownish dizziness of the complexion; defective transpiration, as indicated by the dry state of the skin, and the want of
preparation under specie; often a tendency to
drowsiness; often too, weakness of digestion or even
well marked dyspepsia, not unfrequently attended
with sickness, or retching in the morning on
awaking from sleep. Thirst, together with an
important pathological condition both of the
urine, and of the blood. Of these symptoms
none are invariable except the altered condition
of the urine, and blood with perhaps that
the unhealthy complexion. The two former
are not only invariable, but likewise very
characteristic, and therefore of great import.

The condition of the urine varies materially
at different stages of the disease, but is at all times
essentially morbid. In the early stages, where
the symptoms put on the acute form, the urine
is sometimes natural in quantity, very rarely
increased, far more generally diminished.
Instead of passing between thirty five and fifty
ounces a day, which constitute the average of
health, the patient discharged only eight
twelve, or sixteen ounces. Sometimes the
quantity does not exceed two or three
ounces, and occasionally the secretion is altogether suppressed. The latter very commonly proves of fatal import and speedily usher in coma with convulsions. Besides being reduced in this stage, the urine is also much altered in its constitution, sometimes it presents a blood red tint of more or less intensity; occasionally the tint is so dark as to render it opaque; in a few instances clots are intermingled with it; and still more rarely the fluid discharged, seems to consist of nothing but blood, which afterwards partially coagulates.

Note. Care must be taken, not to mistake for the effects of disease, the colours imparted to urine by many articles of vegetable food.

Hematuria from other causes may be distinguished, as stated in M. Tolome's work, by the urine ceasing to present coagulability as soon as it ceases to be red. Most frequently of all, the colour of the urine deviates little from that of health; but in that case it is often rendered muddy or slightly opalescent by the presence of fine.
light particles which do not disappear on the application of gentle heat—In general the urine froths more than usual when shaken; and on blowing into it through a tube, bubbles are formed as with soapy water. This property is confined however to the urines which are loaded with albumen. Many specimens of urine in this stage, are much more prone to decay than the healthy secretion. In some cases T. Christison has observed a decided ammoniacal odour, so soon after its discharge that he supposed that decay must have commenced within the body, and frequently so much carbonate of ammonia is formed in eight or ten hours that a powerful ammoniacal odour is exhaled, earthy phosphates are thrown down in abundance, brisk effervescence is caused by acids, and another character to be stated, coagulation by heat, may be prevented from being developed.

The density of the urine does not differ much from the natural standard, but in the truly incipient stage, the density always
lies within the limits of health. In Bright's disease, the presence of albumen is by no means permanent. It is a remarkable fact that in some instances the albumen suddenly and for a time disappear from the urine. This state may continue for a longer or shorter period. Violent purging or a full dose of astringent has been known to produce this effect. This occurrence is more frequent in the advanced stages of the disease. The albumen, present in the urine, has been supposed by some to be a substitute for the urea, which is defective; but the only explanation which can as yet be given of the presence of albumen is, that it results from some peculiar irritation of the kidneys, which prevails during a tendency to granular deposition of its substance.

As the disease is connected with so perilous results, it is a matter of much importance to know whether an albuminous state of the urine is always an indication of Bright's disease. And is Bright's disease always
accompanied with albuminous urine? To both these questions we may give an answer in the negative, although Dr. Christian regards its presence as a case of very doubtful nature.

The next subject of investigation is. Albumen being present, how are we to ascertain whether Bright's disease is present, or not? An approximate conclusion may be arrived at, by frequently testing the urine, and ascertaining whether the impregnation be transitory or persistent, and also by ascertaining its amount in a given quantity of urine. If it be of considerable proportion it may be strongly suspected that the disease is progressing.

Besides containing albumen, the urine also deviates from the healthy standard, in so far as it contains an unusual small quantity of its solid ingredients. This character though presented more or less in every stage of the disease, is commonly much better marked when it is somewhat advanced. In ascertaining the characters of urine, either as a diagnostic, or for any other purpose, a clear distinction must always be drawn.
between the early and advanced stages of the disease. When the disease is partly for advanced, the quantity of urine is often but little reduced below the standard of health, frequently it rather exceeds than falls short of it, and in not a few cases, where diuretics either had been long abandoned, or had never been administered, the amount has continued for weeks together double or even treble the natural quantity. In two circumstances however the quantity falls off materially, either when accidental causes occasion acute symptoms like those which sometimes attend the early stage, more especially general reaction with a tendency to local inflammation, or to coma, or where the granular degeneration has been allowed to go on to an excessive extent without the case being cut short, as more usually happens, by some fatal secondary affection. The urine secreted in the course of the disease varies greatly both in quality and quantity; most persons are aware that it is often characterized by a very low Sp. gr. and that this indication is always considered as unfavourable.
in prognosis. This anxiety is felt for the reason that a low sp. gr. is characteristic of the advanced stage. The low density is an essential character of the middle and final stages, whether its quantity be great or small, and the density goes on diminishing as the disease advances. It is a great mistake to suppose, as some do, that the proportion of albumen in the urine necessarily increases as the disease advances. The very opposite is the general rule, and as the proportion present is commonly small, it is on the one hand easily suspended or decomposed by decay of urine, and the consequent formation of Carbonate of Ammonia; and on the other hand it is more easily imitated by the discharge of earthy phosphates which sometimes take place on the application of heat when no albumen exists. Besides these changes which take place in the characters of the urine the blood also undergoes a remarkable difference. In the early stage, when the symptoms present themselves in the acute form, the blood very generally puts on the character of inflammatory action; it
coagulates with a thick, firm, and commonly capped buffy coat. The serum is usually somewhat dextrorse, and yields to sulphuric ether, when agitated with it a small quantity of concrete oily matter, which seems to differ little from the fat of the cellular tissue. The most remarkable alteration however of the serum is a great decrease in density, together with a corresponding reduction of its solid contents. On account of the loss of albumen the serum coagulates but poorly when heated. The albumen existing in the urine passed by those suffering from this disease, is derived immediately from the blood, it is therefore obvious that the constitution of that fluid must be greatly modified early in the disease, and the most obvious, and probably the most important change important change consists in this loss of its albumen. This causes very important changes in its physical character; the liquor sanguinis becoming watery, a condition which leads to a variety of secondary evils. Another remarkable departure from the healthy constitution of the serum is the
presence of a large quantity of Urea. Urea is invariably found in the urine at all stages of the disease, when the daily discharge of it by the urine is diminished materially. As regards the proportion of Terebin, it is not necessarily changed. It has occasionally been noticed in excess in the early stage. When however we have inflammatory affections of important organs occurring, which is by no means uncommon, the case during the progress of this disease, then it is that the blood becomes buffed. It is requisite to be aware that in any stage of the disease the intervention of febrile disturbance from local inflammation or other cause, tends to renew for a time, those qualities which belong to the early stage. As the disease advances we find important changes effected in the blood. That fluid recovers more or less of its lost Up go in proportion to decrease of albumen in the urine. But the most characteristic and striking change is the rapid disappearance of the Flavinaemia or colouring matter of the blood. The
A proportion of Bacillotoxin is unaffected in the early stage. In the next place, the density and solid contents of the serum, which are invariably much reduced in the beginning of the disease, gradually return to the healthy standard, or even exceed it. In the third place, the urea frequently disappears from the serum of the blood as the disease advances, but in the most advanced stage it commonly reappears, and it is sometimes present towards the close in larger proportion than ever.

The cause of these variations is apparent. The urine in the middle stage, though defective in the proportion of solid ingredients, is often not so in the total amount of them discharged daily; because, though low in density, it is frequently increased in quantity. But as the disease draws towards a close, the quantity decreases as well as the density, and at length there is sometimes an almost total suppression. Here in short, as in the early stage, however there is a material reduction of the daily discharge of urea, it may be
distinctly found in the blood, but not otherwise. In the fourth place, the fibrous is most usually natural in its proportion after the early stage is passed, and it becomes abundant only when reaction incidentally occurs, and when the blood is decidedly buffy. Lastly by far the most remarkable character of this blood in the advanced stage of the disease is the gradual and rapid reduction of its colouring matter as paramount as I have above stated. At the commencement this ingredient undergoes little or no diminution. But in the progress of time its proportion sinks, and at length is reduced so much as to form less than a third of the healthy average. The patients thus acquire that peculiar leucophaemic, palid or waxy hue of countenance, which is so characteristic of this complaint.

It is not very easy to explain how the corpuscles subsequently become deficient, in as much as the disease is not characterised by the discharge of red corpuscles in any quantity either by the urine or in any other way. These attempts to explain
their deficiency in the following way. He argues thus:

1st. In health the corpuscles is supplied with nourishment by the chyle.

2d. The chyle is of lower Sp: gr. than the liquor sanguinis in which the corpuscles float.

3d. In the early stage of Bright's disease the Sp: gr. of the liquor sanguinis is greatly diminished. In blood of every kind the corpuscles float in a liquor which is of the same density as the fluid contained within them. This is a necessary result of the physical law of endosmosis. We are all aware that the blood corpuscle is a membranous vesicle, and if its contained liquor were by any chance for a moment to become lighter or heavier than the fluid in which the vesicle floated, endosmotic currents would be set in motion through the membrane and the result would be, that both corpuscle and the fluid it floated in would eventually be found of the same Sp: gr. Now the liquor sanguinis in which the corpuscles float, is of much lighter Sp: gr. than the chyle and when
therefore that fluid comes in contact with the blood corpuscles, a considerable quantity of this lighter fluid passes through the coats of the vessels.

The character of the urine and blood when carefully compared, not only reveal the existence of renal disease, but give us such information as may lead us to conjecture to what extent disease has actually arrived at.

The state of the kidney also indicates the stage to which it belongs but this can only be ascertained after death. The large red kidney belongs to the early stage of the inflammatory varieties of the disease; the contracted and granular kidney to the latter, while the large pale smooth gland, is believed to be rendered so by the accumulation of internal fat. These visible differences though only disclosed after death may sometimes be made out during life by observing the general character of the disorder, learning its history and probable origin, but more certainly by a microscopic examination of the urine.

From the constant drain of the kidneys in the
increasing Pallor is constant, and disease of the heart common. The skin in general even in the absence of fever is remarkably dry and unperspiring.

Having referred to the different stages of this disease I shall briefly mention some of the principal complications attendant on the malady. They are of much consequence for, in the course of the disease, more or fewer of them are sure to occur. Most of them are a production of serious distress, and some of them place the life of the patient in immediate jeopardy, and often bring it to a premature end. From the insidious nature of the disease, it is often that the secondary symptoms are the first to arouse our suspicions as to what may be the real primary cause, and it is to the prevention or removal of these secondary affections that our curative endeavours must be directed. Among the most common of these is Anaesthesia. Another and very important one is that generally termed head symptoms, including various derangements of the central functions such as
headache, drowsiness, delirium, epileptic
seizures, apoplexy, and frequently death pre-
ceded by coma either with or without con-
vulsions which Dr. Christian considers to be
the natural termination, when life is not cut
short by some other incidental or secondary affection.
When death takes place from Coma it is mostly
after any great diminution, or the entire suspen-
sion of the secretion of urine, but the rule does
not admit of exception. Dr. Christian records
remarkable instances of this. Apoplectic symptoms
sometimes occur and carry the patient off though
there has been no extreme or material diminution
in the quantity of urine.

When death has occurred by the intervention
of Coma, and the case had been complicated
with Anasarca, and also serous fluid accu-
ulated in unnatural quantity in the ventricles
and tissues of the Pia Mater in all probability,
death may be occasioned by the presence of that
fluid. Drosophy having extended to the brain
the removal of the drosophy if taken in time will
in many cases remove the drowsiness and
tendency to coma. In many cases we cannot attribute death by coma to a morbid accumulation of fluid within the cranium, nor perhaps dropping elsewhere, the stupor being in all likelihood occasioned by the poisonous influence of an undue quantity of blood circulating in the blood. Dr. Watson in his tenth mentions, that from the pale and watery state to which the blood is reduced, it has occurred to him that this may have something to do with the stupor and coma. The blood from its deficiency in hematocrit failing to supply its appropriate stimulus. Another of the secondary affections observable in this disorder is the readiness of various organs to inflame, particularly the serous membranes. Acute inflammations of these membranes are a very common cause of the patient's death. The Pleura seems to be the seat of its most common occurrence. And on inspection of the dead body, we seldom find the kidney to be the only part in which structural changes are plainly visible. Most commonly traces of disease are elsewhere found.
Disorder of stomach and bowels are a frequent attendant on this malady, nausea, vomiting, flatulent distension and diarrhea. Vomiting and diarrhea, are more frequently observed by Edinburgh practitioners, while coma and other head affections are those observed in London. There seems to be no reasonable explanation why such should be the case among secondary affections.

Disease of heart is a frequent companion to the other maladies attendant on this disorder; Intemperate habits often precede the development of this disease and are probably the cause of heart disease. Dr. Watson however is of opinion that the altered condition of the blood has a direct tendency to generate cardiac disease. The anemic condition implying debility of the muscular texture of the heart and leading to dilatation of its cavities, the weak muscle growing more irritable, becomes thicker with its increased ejection to propel the blood. It is a matter of some doubt whether renal disease is ever produced by the cardiac...
"While speaking about the urine, I should have mentioned that besides the lithiasis and phosphato-8e which are considered as ordinary urinary deposits, we can observe by the aid of the microscope a number of more or less organised bodies, which are to be considered as more characteristic of the condition of the kidney. These consist of blood corpuscles, of epithelium of two kinds, mucous corpuscles, and of hollow cylinders or tubes studded with spherical epithelium, and which are now recognised as casts of the smaller uriniferous tubes from the neighbourhood of the corpora Malpighiana. This appears to be accounted for in this manner that as inflammation of the thin terminaled in an active development of epidemics and a desquamation of its surface, so the inflammation of the kidney excites an increased development which lines the urinary passages or tubules; this material partly accumulates in and choke up the tubes, while part of it becomes washed out with the urine, and may be detected there in large quantities. The phialical
epithelium is peculiar to the smaller tubes or tubules. The other form of epithelium is seen in these urines is of the ordinary flattened kind and comes from the vicinity of the larger uriniferous tubes constituting the cones or pyramids. It is in the bloody urines that we observe the casts of tubes and the epithelium in largest quantity. I have yet to notice another fact to which considerable importance has been attached by some observers, I allude to the presence of oil globules in the urine as indicative of a fatty degeneration of the kidney.

In a paper communicated by McD. Bush to the Medical Chirurgical Society, he states his opinion founded on the examination of a great number of kidneys, that adhesive inflammation of the tubuli uriniferi, and various pleuras of the kidney was by far the most frequent cause of chronic albuminuria, and what he termed granular degeneration. Dr. Johnson explains his views under four heads.
1. Acute desquamative nephritis
2. Chronic desquamative nephritis
3. Simple fatty degeneration
4. A combination of fatty degeneration with desquamative nephritis.

Fibrinous deposits are fatty, sometimes sufficiently so as to deceive the sense of sight into a belief that they are entirely composed of fat, and the microscopic oily particles contained in the tubules of the cortical substance and occasionally found attached to the casts of the tubules thrown off in the urine, may be regarded as necessary consequences of the existence of fibrinous matter in the organ.

The increase in the proportion of fatty matter natural to the epithelium of the seminiferous tubules, produces according to Dr. Johnson, a congested state of the kidney in the following manner. By the distention of these tubules, the capillary plexus of veins surrounding them becomes compressed, and an obstruction is thus afforded to the return of blood from the Corpora Malpighiana.
and so a congested state of the kidney is eventually brought about.

D. Gardner is opposed to this view. He considers it rather the cause than the production of an anaemic state of the kidney, than as competent to the production of congestion. He argues from the the various post-mortem appearances - and the uniformly pale and blood less condition of the cortical substance as shown in plates published by Dr. Bright, is quoted in proof of this.

D. Gardner also alludes to the important fact that in complete and confirmed fatty degeneration of the kidney, the vessels are not full, but on the contrary in a state approaching depletion. And indeed it is true that the change observed in kidney affected by deposit, whatever form that deposit may assume, is that which would appear to result from such deposit having interfered with the arterial supply of blood to the part. According to D. Johnson's view, deposit is the cause of congestion.
and should therefore precede it.

It is now pretty certain established that by far the greater number of cases of kidney disease, connected with albuminuria, are the result of inflammation, probably of an adhesive character, affecting the organ, and causing deposit in its substance — a state which may or may not be followed by contraction, and that this rarer form of disease is that in which the kidney is infiltrated with tuberculous matter containing fat as a constituent. The angion isoe may precede or accompany this cachetic deposit is probable, but it is not likely that it is a necessary antecedent to all chronic forms of the disease.

Albuminuria, though a very frequent symptom, is by no means always present, or a necessary one even to the full development of the disease. It is easy to imagine the cause when that does take place. As I have before mentioned, the blood deprived of its albumen and colouring constituents being in a state of delusion and subjected to a degree of pressure this repre
can no longer contain it. Its thinner parts transudate, and drop by is the result. The kidneys being intensely congested as shown by the state they are found after death, and by the Haemorrhage which occurs during life, which can be traced distinctly to congestion of the Malpighian plaeus of capillaries, such a state of congestion renders the circulation slow, and of itself consequently diminishes the amount of secretions. The congestion may be in part produced by the repulsion of the blood from the surface of the body, or it may be secondarily caused by the kidneys being called upon to exert matters normally thrown off by the skin, to which latter cause Dr. Johnson attributes the dequamation of the epithelium. He thinks this separation of these noxious matters from the blood, by the renal cells to modify the latter that they separate entire from the basement membrane. Sheriffs on the contrary, consider the dequamation to be mechanical, from the epithelium being entangled in the fibrin which is exuded into, and coagulates in the tubes.
Dear [Name],

I am writing to share [some thoughts].

Yours sincerely,

[Name]
The causes of this disease are often explained
otherwise, one of the many causes which in this
as well as other diseases are produced by the
combined action of exposure to cold and wet,
Intemperate habits. Brewers' men are especially
liable to the disease. Yet we have reason
to believe that intemperance in drinking is
rather a predisposing than an essential cause,
the disease having been known in children
and also in persons whose habit of life
have been strictly sober. In many instances
it has been known to follow a sudden
suppression of the cataractemia, and it often
serves its origin to blows received upon the
leins. When young girls, at or soon
after puberty, become the subject of degener-
ation of the kidney, and Albuminemia,
the Anemia produced may be mistaken
for the anemia of Chlorosis. It appears
that no age is proof against it, cases
having occurred in the very earliest periods
of life, but more frequently in adults, not
that the kidney is more susceptible at one
period of life than at another, but because as life advances, the circumstances which tend to produce, become of more frequent operation.

Having now stated most of the principal facts connected with the disease. In concluding, I have to apologize for the very imperfect manner in which these Notes are arranged. Having commenced late, my time as well as studies and professional duties have prevented my paying that attention which I could have wished to this subject. Trusting however it may meet with the kind indulgence I have always experienced from the Professors I respectfully submit this for your perusal and remain

Gentlemen

Yours obediently

William Lewis Hughes
a. Artery giving off a terminal twig to the Malpighian body
b. Infundibuliform enlargement of the urinary tubuli continued so as to completely surround the Malpighian body.
c. Other efferent vessels
d. Efferent or portal vessel joining the capillary plexus of veins

Uriniferous tubes of a bird (Gallus Indicus), vide Nassau's Microscopic Anatomy
Longitudinal Section of Kidney shewing the Corpora Malpighianæ. From Hassall's Microscopic Anatomy

II

Vessels of the surface of the Kidney

III

Transverse Section of Kidney shewing the Corpora Malpighianæ as well as Capillaries which encircle the uriniferous tubes.