On the waxy or amyloid degeneration of the kidney : a communication read before the Medico-Chirurgical Society of Edinburgh / by T. Grainger Stewart.

with the authors Compliments

ON THE

WAXY OR AMYLOID DEGENERATION OF THE KIDNEY:

A COMMUNICATION

READ BEFORE THE MEDICO-CHIRURGICAL SOCIETY OF EDINBURGH.

WITH AN APPENDIX.

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EDINBURGH: PRINTED BY MURRAY AND GIBB.

MDCCCLXI.

[REPRINTED FROM THE EDINBURGH MEDICAL JOURNAL, FEBRUARY 1861.]

ON THE WAXY OR AMYLOID DEGENERATION OF THE KIDNEY.

I VENTURE to bring under your notice to-night the waxy or amyloid degeneration, as a constitutional malady, affecting different organs, and more particularly as constituting one form of Bright's disease. Having had numerous opportunities, while studying in Berlin under Professor Virchow, of examining pathologically the different forms of this disease—viz., the fatty, the waxy or amyloid, and the contracting kidney—I wished to know how to diagnose them during life. I examined the works of such authors upon the subject as I could get, but without being able to frame for myself a clinical history of the different forms. Last year, while resident physician in the Infirmary, I had occasion to observe many cases of Bright's disease; and these cases divided themselves, for the most part, into three well-marked classes, corresponding to the three chief pathological lesions of the kidney. By the kindness of Professors Bennett and Laycock, I am able to bring before the Society the history of some of these cases. I do not think that my own limited experience is sufficient to establish as certain the clinical history of the waxy degeneration which I shall lay before you; but, as every case has tended to confirm the opinions formed from the first few observations, I submit them to you, in the hope that those who have better powers and wider fields of observation will test my views by their experience. I am encouraged to think my views correct by finding recorded occasional isolated cases distinctly confirmatory of them, although those who recorded them were not led to draw any general conclusion. Among them I would mention one by Dr Wilks,[1] in the eighth volume of the Second Series of *Guy's Hospital Reports*, and one or two recorded, under the head of Scrofulous Liver, in Dr Budd's work on the diseases of that organ.[2]

[1] *Guy's Hospital Reports.* Second Series. 8th vol., p. 261.
[2] *Budd on the Diseases of the Liver*, p. 311.

Dr Bennett, in his work on the *Principles and Practice of Medicine*,[1] narrates several good examples, and one in particular, as a case of Polydipsia, which he pointed out to the class as being exactly similar to the first case in which the group of symptoms which I associate with the waxy kidney attracted my attention. Drs Todd[2] and Johnson[3] record cases in so far confirmatory of my views; but the disease must be rare in London; for Dr Goodfellow,[4] who is at present publishing a course of lectures on Bright's disease in the *Medical Times and Gazette*, has not met with cases of it, and has only recently learned that it is sometimes associated with scrofula, caries, and necrosis.

The waxy, or amyloid degeneration, has been more or less accurately described by many authors; but of late much advance has been made in our knowledge of it. Rokitansky, who described it as the bacony or lardaceous (speckig) degeneration, regarded it as infiltration of albuminous matter. In our own school, it was named the waxy degeneration; and its microscopic anatomy was examined mainly by Drs Bennett, Gairdner, and Sanders.[5] Professor Virchow, of Berlin, having found that, in its chemical relations, the diseased tissue resembled cellulose, called it the amyloid degeneration; and Dr Heinrich Meckel, formerly prosector in the Charite Hospital in the same city, regarding the degenerated substance as a form of cholesterine, named it the cholesterine disease. The terms bacony and waxy were founded, as I shall endeavour to show, not upon the essential disease, but upon a result of it. The term amyloid degeneration has been preferred to that of the cholesterine disease, because it is chemically the more correct of the two.

When the degeneration is present to a considerable extent, it is easily to be recognised without the microscope,—the glands affected with it becoming enlarged in size, firm and dense in structure. Their cut surface is dry, smooth, and dimly transparent, and the whole is pale and anæmic. When examined microscopically, the tissues are seen to be pale or colourless, of a peculiar transparency, the cells appear somewhat shrivelled, the nuclei less distinct than natural, or not to be seen. It is associated with various wasting diseases—scrofula, caries, necrosis, phthisis, syphilis, perhaps chronic arthritis and cancer; but it may occur independently, in a person otherwise healthy. From an analysis of thirty cases collected by Dr Pagenstecher, I find, that in nine cases it was associated with caries or necrosis; in four, with phthisis; in six, with marasmus and

[1] *Bennett on the Principles and Practice of Medicine.* Third Edition, pp. 799 and 974.

[2] *Todd's Clinical Lectures on Urinary Diseases*, p. 93.

[3] *Johnson on the Diseases of the Kidney*, p. 333 (the same case as recorded by Dr Budd).

[4] *Medical Times and Gazette*, December 1, 1860, p. 524, and note *a* on same page.

[5] *Edinburgh Monthly Journal of Medical Science*, pp. 186 and 393.

a cachectic state independent of bone disease, but often with a scrofulous tendency; in eight cases, with constitutional syphilis; in two cases, without any complications.[1]

In order to satisfy ourselves as to the true nature of this degeneration, we must first consider some general facts with regard to the existence in the human body of substances formerly believed to occur only in vegetable organisms.

We are indebted to Virchow for having first shown the existence in the human body of substances chemically related to starch and cellulose; he having ascertained that some of the small, round bodies, described by himself and Purkinje as occurring in the prostate gland and in the brain substance, became blue on the addition of iodine, while others assumed that colour only on the further addition of sulphuric acid. These he named respectively amyline and amyloid bodies, on account of their identity with or resemblance to starch corpuscles. In the prostate there are found other bodies in external appearance identical with the above mentioned, but which do not present the same reactions with iodine and sulphuric acid.

Virchow[2] further ascertained that the Malpighian bodies in the waxy spleen, which had been fully studied and described by Dr Sanders, presented the same reactions as the amyloid bodies,—that is, assumed a violet-blue colour on the application of iodine and sulphuric acid. Meckel[3] took up the subject, and showed that the substance possessing this peculiar property occurs in the waxy liver and kidneys, and also in the intestines. His observations were confirmed by Virchow, and the substance was further observed by him in the vessels throughout the whole digestive and urinary tracts, in lymphatic glands, in muscle, in the heart, in the uterus, in the inside of cartilages,—in fact, in almost all the tissues of the body.

But this substance, as it occurs in the body, generally is structurally quite different from the amyline and amyloid bodies of the prostate gland and the brain substance; for it does not present itself as masses distinctly layered like a starch granule, but is composed of a transparent and perfectly homogeneous mass, in which no structure can be made out.

The exact progress of the degeneration has been traced by Meckel and others. It commences in the delicate muscular fibres which surround the smaller arteries, and spreads to the other arterial coats. It leads to a thickening of these coats, and to a diminution of the lumen of the vessel, and afterwards spreads to the glandular or other structures supplied by the affected arteries. Thus, in the

[1] *Ueber die Amyloide Degeneration.* Von Dr A. Pagenstecher. Wurzburg, 1858.

[2] *Cellular Pathologie*, p. 331.

[3] Meckel, *Die Speck oder Cholesterin Krankheit. Annalen des Charite Krankenshauses zu Berlin.* 4 Jahrgang, Heft 2, p. 264.

liver the hepatic cells, in the kidneys the Malpighian bodies, the basement membrane, and even the secreting epithelium of the uriniferous tubules undergo the degeneration.

In the spleen the disease may not only commence in the arteries, but also in the Malpighian bodies, or in the fibrous stroma.[1] The lesion of the arteries and of the Malpighian bodies is most frequent, and the large pearly appearance of these structures has led to the application of the term, sago spleen. I need not say in this Society how much we are indebted to Dr Sanders for our knowledge of these lesions. In the lymphatic glands, the degeneration is confined mainly to the superficial parts, the tubes remaining generally free.[2] In the small intestine, the arteries of the villi are frequently affected, and, according to some observers, they become so far diseased as to drop off.[3]

A kidney which has undergone the waxy or amyloid degeneration is generally heavier, and larger than natural; its capsule is easily separable; the surface uniformly pale, or marbled here and there with red stellate vessels. On section, the cortical substance is seen relatively increased in size, pale and anæmic, of a dim waxy appearance, but containing, scattered here and there, small shining granules, the Malphigian tufts; the cones remain generally well marked, and present much their usual aspect. On microscopic examination of a thin slice from such an organ, one sees the Malpighian bodies remarkably pale and translucent, and the convoluted uriniferous tubules surrounding them filled to distension with a dense matter. On examining with a higher power, we see that the pale Malpighian bodies have a less definite form than natural, that the tufts of vessels are not to be recognised in them, as in the normal condition. The distended uriniferous tubules are seen to be filled with a dense matter, sometimes presenting no recognisable structure, at others showing epithelium in a state of fatty degeneration. There is no increase of the connective tissue of the organ. If one applies a solution of iodine to such a section, the whole immediately assumes the colour of that solution; but the Malpighian bodies, and the arteries leading to them, assume a peculiar reddish or orange colour, which, on the further addition of sulphuric acid, becomes changed into violet-blue, or purple, or more generally into a peculiar reddish-purple hue. It often happens that one does not succeed in bringing out the true violet-blue colour; but I have never failed to obtain the reddish-purple hue, and it seems to me to be equally characteristic of the degeneration. At times, besides the Malpighian bodies, and the arteries supplying them, the peculiar colour is developed in the vessels of the cones, and, though more rarely, in the basement membrane—and even, it is said, in the epithelium of the uriniferous

[1] See a paper by Dr G. Wilks, in *Guy's Hospital Reports*, Third Series, vol. 2, p. 124.

[2] Pagenstecher, *Op. Cit.*, p. 27, quotes *Virchow's Archives*, B. 8, S. 346.

[3] *Ibid.*, p. 26.

tubules.[1] Of this fact I have never been able quite to satisfy myself, and it does not seem to have been noticed by many observers.

Now, as the production of this colour, by iodine and sulphuric acid, is characteristic of a change in the chemical constitution of the parts assuming it, and as it only occurs in certain limited parts of the diseased structure, it evidently does not constitute the whole morbid change. In almost every case, organs affected with this degeneration are enlarged and hardened to a degree that cannot be explained by the mere change in the arteries and Malpighian bodies. How, then, is this increase of size and of density to be accounted for? Manifestly, I think, by the infiltration of the whole organ with some dense pale matter, evidently not amyloid in its character, because presenting no special reaction with iodine and sulphuric acid. This fact will be quite apparent to any one who examines the structure microscopically, or even with a lens; for the shining Malpighian bodies are only scattered here and there among the dim, dense, pale tissues of the cortical substance,—and if one brushes a little solution of iodine over the surface, it will at once be seen how small a part of the whole structure is composed of the little red dots and streaks which mark the amyloid degeneration.

The further question then arises as to the nature of this matter which constitutes the greater part of the degenerated tissue. I think that it consists of a coagulated exudation, whose transmission through the walls of the vessels has been favoured by their degenerated condition. This view is supported both by pathological and clinical observation. The convoluted uriniferous tubules are filled with a substance quite distinct from that deposited in the arterial walls and the Malpighian bodies, and closely resembling the exuded matter which we see in other forms of renal disease. If we squeeze out from a waxy kidney the substance filling the tubules, we find it exactly similar to the tubecasts found in the urine during life. These tubecasts first occur in such cases shortly after albuminuria has come on, and they continue to increase in quantity as the case advances. I have never seen any distinct reaction in the tubecasts on the application of iodine and sulphuric acid.[2] From these considerations, we may assume that this matter in the tubes is in reality a coagulated exudation.

It may be said that this exudation is simply a result of acute or chronic nephritis supervening upon the amyloid degeneration, because we sometimes see kidneys whose vessels have undergone amyloid degeneration without any increase of size. But the fact, that in a large majority of cases the organs are enlarged, taken along with the very gradual progress of the symptoms, seems to me to warrant the rejection of the view. The origin of the exudation

[1] *Pagenstecher*, p. 25; also, *Foerster's Atlas der Mikroskopischen Pathologischen Anatomie*, 1859, Plate 36, fig. 2, and letterpress.

[2] Dr D. R. Haldane informs me that he has occasionally brought out this reaction in the tubecasts.

would seem to depend upon two causes: first, the pale translucent arterial coats probably admit of a freer transudation of the fluid part of the blood than natural; and, second, when the circulation has become embarrassed in some parts by the diminution of the calibre of the vessels from extreme degeneration, there must arise an overfilling of other vessels, and consequent transudation.

Thus I have endeavoured to show that the waxy degeneration consists of a change in the chemical constitution of the walls of some of the vessels, with a consequent exudation of the fluid part of the blood into the tissues surrounding them.

As to the nature of the substance deposited in the coats of the arteries, two views have been held: viz., that of Meckel, that it is cholesterine, or a form of it; and that of Virchow, that it is cellulose. Meckel founded his view mainly upon the reactions; but Virchow showed that the substance differed from cholesterine in many particulars,[1] and that even in reaction they did not correspond, for cholesterine remains unchanged in colour with iodine alone, and thus differs from this matter, whose reactions are identical with those of cellulose. I shall not enter further into this question, but pass on to the clinical history.

I do not think it necessary to trouble the Society with details of many cases, but shall simply state the general result, and quote one or two cases as examples. The history of general cases of waxy or amyloid degeneration which I have observed is the following:—An individual who has long suffered from wasting disease, such as scrofula, caries, necrosis, or syphilis, or who, though without palpable disease, is of a feeble constitution, feels an increasing weakness, and begins to pass large quantities of urine and to drink largely. He is, contrary to his usual custom, obliged to rise repeatedly during the night to make water, and on each occasion passes a considerable quantity. The amount of urine varies from 50 to upwards of 200 ounces daily, always bearing a relation to the amount of fluid drunk, generally nearly equalling it in amount, or sometimes even exceeding it. The feet and ankles become œdematous after a hard day's work, but return to their natural condition during the night's repose. In many cases there is observed a hardness and swelling in the hepatic and splenic regions, dependent upon an increase of bulk of the liver and spleen. Patient feels a constant lassitude and unfitness for exertion. His urine gradually becomes albuminous, and a few waxy or hyaline tubecasts are to be found in the very scanty sediment which it throws down. It is of low specific gravity—1005 to 1015. The blood presents some peculiarities microscopically, the white corpuscles being somewhat increased in number, and the red presenting a flabby appearance, with a marked tendency to tail,—that is to say, instead of forming into rouleaux, like healthy corpuscles, they become stretched out

[1] *Cellular Pathologie*, p. 335.

into long, spindle-shaped bodies. The blood changes I have observed only when the degeneration affected the lymphatic or blood glands. The patient may continue in this state for months, or even years—may, indeed, undergo a temporary improvement—the liver and spleen becoming diminished in bulk, and the blood resuming a more healthy character; but, sooner or later, for the most part ascites and general dropsy gradually supervene, accompanied frequently by diarrhœa, which is at times found quite uncontrollable. The urine, now very albuminous, diminishes in quantity, so as at times to be almost or altogether suppressed; effusions into the serous cavities, or severe bronchitis, ensue; the patient becomes exhausted, and sinks; or drowsiness comes on, and the disease terminates fatally, amid coma and convulsions.

Let us now examine some of these symptoms more in detail.

1. *The Amount of Urine.*—It has been remarked that increased amount of this secretion is one of the earliest symptoms of the amyloid degeneration. In describing the minute pathological anatomy of the kidneys in this disease, I stated that H. Meckel showed that the degeneration occurs first in the small, non-voluntary muscular fibres which surround the smaller arteries. The function of these muscular bands is to regulate the supply of blood to a part; and if their structure be degenerated, it is evident that this regulating power must be lost, and the vessels and the capillaries beyond them become dilated. In this state, transudation of the watery part of the blood must take place more freely than usual, and consequently the urine would be increased in quantity. Now this is exactly what we find in the first stage of the waxy degeneration. That this increase of urine is not merely a result of the increased thirst which accompanies it, is shown by the fact, of which I have repeatedly satisfied myself, that the amount of urine passed was greater than the ascertainable fluids consumed during 24 hours. The urine is also of low specific gravity—1005 to 1015. This does not seem to depend upon a diminution of the actual amount of solids excreted, but merely upon the extreme dilution of these solids in the greatly-increased fluid. Of course, the amount of urine is affected to a considerable degree by diarrhœa or other complications. Thus, in a case which Dr Todd records,[1] the amount of urine never rose higher than 4 pints, and averaged about 2, apparently because the patient suffered from constant diarrhœa. But towards the termination of the disease the urine becomes diminished in quantity, while the albumen and tubecasts relatively increase. This is evidently caused by the blocking-up of the tubuli uriniferi, so as to prevent the passage outwards of the fluid secreted; and also may in part be accounted for by the great diminution which ultimately takes place in the calibre of the affected arteries.

That in the early stage of waxy or amyloid degeneration the urine

[1] *Todd's Clinical Lectures on Urinary Diseases*, p. 93.

is passed in greatly increased quantity, has not, so far as I know, been previously remarked. Dr Johnson,[1] indeed, states, in his most recent paper, that the urine secreted by the large white kidney is less abundant, and of higher specific gravity, than that secreted by the contracting kidney; but perhaps, by the term large white kidney, he means merely the fatty degenerated organ. Dr Bennett pointed out to me that in some cases there is a much larger amount of urine passed than in others, but he did not seem to associate this with any particular lesion.

2. *The Albumen and the Deposits in the Urine.*—In the earliest stages of the disease there may be no albumen in the urine, or only a trace of it; but, when it has appeared, it seems to go on gradually increasing. Soon after its first appearance we may detect, by very careful examination, a few fine hyaline casts, and these increase correspondingly to the albumen. The state of the arteries and Malpighian bodies affords a clear explanation of the symptoms; for I think it may fairly be assumed that their degenerated translucent walls allow the transudation not only of the watery part of the blood, but of the albumen and fibrin, and that these pass off in the urine, or become coagulated and block up the tubes, forming plugs, which are afterwards removed, and appear in the urine as tubecasts. Sometimes the casts contain fatty cells involved in them, the cells having become imbedded in the cast, and being no longer functionally active, undergoing the fatty degeneration.

It is apparent that tubecasts cannot be considered diagnostic, for fatty cells do not necessarily disprove the existence of waxy or amyloid degeneration; and, on the other hand, we frequently find, in advanced fatty degeneration, hyaline or waxy casts. I have very frequently examined tubecasts, to see if I could get the amyloid reaction, either from the transparent casts themselves, or from the cells involved in them, but have never succeeded in obtaining it.

3. *Dropsy* is not an early nor a very prominent symptom of this disease, occurring mainly in the later stages. It may depend upon various causes—viz., as suggested by Virchow, upon the unhealthy condition of the blood consequent upon disease of the blood-forming glands; or, as Dr Johnson suggests, upon the retention in the blood of salts which, during health, are carried off by the kidneys. It may depend upon the great enlargement of the liver and spleen, which frequently occurs in the disease; but mainly, doubtless, it results from the state of the kidneys themselves, for the dropsy only comes on coincidently with the diminution of the amount of urine, the cause of which has been already considered.

4. *The Blood.*—The characters which I have ascribed to the blood are not constant in this disease; but I have met with them well marked in two instances. In both of these there was an

[1] Dr Johnson in *Medico-Chirurgical Transactions*, vol. 42, p. 153.

evident enlargement of the spleen, and in one, also an enlargement of some of the cervical glands. What the exact condition of these glands may be, which leads to the change in the state of the blood, has not been ascertained, and the point remains for further investigation.

5. *Diarrhœa* is a frequent and severe symptom of this disease, and may, I think, be reasonably supposed to depend upon the degeneration of the arteries of the intestines. Virchow mentions that he has seen the smaller arteries throughout the whole intestinal canal, from the mouth to the anus, in a state of amyloid degeneration; and when we consider the frequency of vomiting and diarrhœa in such cases, without any other lesion being found to account for them, we are, I think, warranted in ascribing these symptoms to the degeneration. In support of this opinion, I can quote the authority of Virchow himself, who has repeatedly observed the symptoms.[1]

It is unnecessary to enter into a consideration of the nervous symptoms which frequently occur, as they are identical in their nature and causes with those in the other forms of renal disease, and are not confined to the waxy or amyloid degeneration in particular.

Having thus shown how the symptoms I have described perfectly accord with the known pathological lesions, I pass on to relate one or two cases, with a view to bring some points more prominently forward.

Case I.—Mary Muirhead, æt. 17, admitted to Ward XI., on March 3, 1860. She states, that at the age of five she lost the power of her lower limbs, and that shortly afterwards an abscess formed on her back, between the shoulders, and ultimately burst. It remained open and discharging for a long time, almost till admission. On the very day it burst, she recovered the use of her limbs. Her spinal column is bent outwards, at an acute angle, opposite the second dorsal vertebra. She states that, excepting this abscess and continued discharge, she has enjoyed general immunity from disease and the usual children's complaints.

Four years ago she had scarlatina, but has since been in her usual health. She has never been able to walk or work much, and was subject occasionally, in the warm summer weather, to severe frontal headaches, which, in her early years, occasionally kept her from school a month at a time. Her respiration was always difficult on exertion, and this has increased during the last three months, since which time she has had cough, at first short and dry, but more recently accompanied by sputum. The patient states that since January she has been subject to lumbar pains, at times so severe as to prevent her working. A month after this, or three weeks previous to admission, she observed that she was passing a much larger

[1] *Cellular Pathologie*, p. 340.

amount of urine than was natural, and at the same time her ankles became œdematous, and her face at times puffy. Her weakness increasing, she applied for and obtained admission to the Infirmary. On admission, heart sounds healthy; pulse 100, small and feeble. There was considerable harshness of respiratory murmurs all over the chest. Tongue clean, but rather dry; thirst great; appetite good; bowels regular; slight ascites; the liver and spleen not enlarged; legs slightly œdematous; skin pale and dry. Urine was copious, about 50 to 70 oz. per diem; sp. gr. 1005; containing much albumen and few chlorides. A sediment was deposited on standing, which contained numerous hyaline tubecasts, involving here and there a cell which had undergone fatty degeneration.

Patient remained under observation without much change for two months, during which time her urine ranged from 50 to 120 oz. daily. On only two occasions during these two months did it fall below 50 oz. I repeatedly tested the casts with iodine and sulphuric acid, but without ever producing a reddish-purple or blue colour. The ascites gradually increased. About the beginning of May she was seized with diarrhœa, with increased cough and dyspnœa, and with advancing dropsy of the legs and abdomen. The daily amount of urine fell to 30 or 40 oz., very albuminous, and containing casts with more fatty renal cells than formerly. She died exhausted on May 20th.

On examination, the lungs were found free from tubercle, but the bronchi congested and full of mucus. Heart small, weighing less than 4 oz.; spleen large and waxy; liver large and waxy, weighing 1 lb. 15 oz.; kidneys large, weighing together 13½ oz. The cortical substance was very pale, and distinctly presenting the characters of the waxy or amyloid degeneration, both in mass and when examined microscopically, and with the chemical reagents. There was no ulceration of the intestines.

In this well-marked case it will be observed that there was a weakly constitution, with a constant, long-continued, purulent discharge from a carious bone, with increase of urine and gradually supervening dropsy.

I shall now relate the history of another case which was for many weeks under observation in the Clinical Wards.

Case II.—Anne Walker, æt. 37, single, a bootbinder, resident in Edinburgh, admitted April 30, 1860. She states that for many years she has been accustomed to take alcoholic drinks in large quantity, and has been subject to rheumatism; that three years ago she had rheumatic fever, and has since been subject to a short dry cough, with great debility, which has lately prevented her working. Three months ago she was seized with cramp in the legs, with pain in the lumbar and hepatic regions; and noticed that she had considerable thirst, and passed large quantities of urine—much more, she thinks, than she did on admission to the Infirmary. She soon noticed her feet swell, and afterwards her legs and abdomen, but without

any rigor, headache, or other acute symptom. On account of the swelling, she sought admission to the Infirmary.

On admission, there was great capillary development over each malar bone, the eyes were suffused, the legs and thighs œdematous, and the abdomen slightly distended. There was dulness on percussion at the base of both lungs posteriorly, with feebleness of respiration and increased vocal resonance; considerable bronchial rattles on both sides. She had a frequent hard cough. Appetite good, tongue slightly furred, thirst great. Liver and spleen not enlarged, so far as could be made out in the state of the abdomen. Bowels constipated. Catamenia appeared last week, for the first time since August. Urine distinctly albuminous, ranging in amount from 74 to 130 oz. per diem; sp. gr. 1005, containing some hyaline and faintly granular tubecasts. Cardiac sounds were healthy, but feeble; pulse feeble. She was put upon general stimulant and tonic treatment, with good diet, but became steadily worse. On the 27th of May she was attacked with diarrhœa; and the amount of urine diminished from about 70 or 80 oz. to 30 or 40, and even less, although, from the state of the bowels, it was often impossible to estimate it. The diarrhœa could not be got to yield, and weakness constantly increased till the 10th of June, when she died. For the last two or three days of her life she was drowsy, and passed her urine and fæces involuntarily in bed, but could always be roused to answer questions. She had no tendency to convulsions.

On *post-mortem* examination, the lungs were almost healthy; heart had a small fibrous mass on the cardiac surface of one of the aortic valves. In the middle of the abdomen the parts were found matted together by a cancerous mass, and in the uterus there was a slight cancerous deposit. The liver, spleen, and kidneys were all distinctly waxy. All the lymphatic glands of the abdomen were enlarged. The left supra-renal capsule was filled with cancerous fluid.

In this case it will be observed that I have not dwelt upon the diagnoses, which were made during life, of the cancerous lesion of the abdomen, and of the deposit on the aortic valve, because these were not essential to the case in the light in which we have to consider it. Still it is important to bear the complication with cancer in mind, as it may be found that it also predisposes to the amyloid degeneration.

I shall now relate two cases in which the symptoms were quite chronic, and which have not as yet proved fatal.

Case III.—Edward Burns, a labourer, æt. 30, married, resident in Edinburgh, admitted to Paton's Ward, January 12, 1860. Patient states that he has had very little sickness, and, in particular, never had syphilis; but he confesses to have suffered from bubos, resulting from a strain; and his prepuce is remarkably contracted, and his throat presents most syphilitic-looking ulcerations.

On admission, his throat was ulcerated, his voice was husky, and

he had a harsh cough, with occasional muco-purulent expectoration. At the apex of the right lung there was harshness of respiration, but no increase of vocal resonance; cardiac sounds normal; pulse 80, small and feeble. Blood poor in corpuscles; the white relatively more numerous; the red pale and flabby, with a tendency to tail, and form into rows like a string of beads rather than a rouleau of coins. Tongue clean; appetite pretty good; bowels open. Hepatic dulness extends from the sixth rib to the umbilicus. The spleen is also considerably enlarged. The urine is highly albuminous, of low specific gravity, and contains a few waxy tubecasts. Patient stated that he never observed anything particular about his urine; but on its being, by Dr Bennett's direction, measured, it was found to amount to upwards of 100 oz. daily. It was always of low sp. gr., and never contained a trace of sugar. There was no œdema of the legs, unless occasionally, when he had been working hard, and then his ankles got swollen at night. He continued under treatment for about four months, during which his general health improved, and his liver diminished slightly in size. The amount of urine became somewhat lower, and his blood presented a more healthy appearance. He was dismissed, at his own request, on April 30th; and since that has been able to work, though, when last seen, he was looking much worse than when he left the house.

In this case it will be observed that we have very distinctly marked the series of symptoms which have been already described, viz., the increased flow of albuminous urine of a low specific gravity, the absence of dropsy, the enlargement of the liver and spleen, and the morbid state of the blood, following syphilis.

The next case is similar to that just recorded, and continues still under observation; but it is interesting in that a diagnosis of amyloid degeneration of the kidneys was made before albumen had appeared in the urine.

Case IV.—Archibald March, æt. 29, a shoemaker, married, resident in Edinburgh, was admitted to Paton's Ward, February 15, 1860.

In April 1859 patient was in the Infirmary on account of enlargement of the liver and spleen, with slight leucocythæmia. He was dismissed considerably relieved; but having felt, of late, great oppression on taking food, with occasional bloody vomitings and increasing general debility, he was readmitted. States that, some years since, he had syphilis, which was followed by eruptions, nodes, etc., and ultimately by the symptoms of which he now complains.

Symptoms on Admission.—His general appearance is cachectic and sallow; his chest covered with brownish patches of pityriasis nigra, which have existed for some years. There is no œdema. Pulse is full, 82 per minute. Cardiac dulness 2½ inches transversely. There is a soft blowing murmur, with the first sound, loudest at the base. There is a slight relative increase of the colourless corpuscles of the blood,

and the red corpuscles have a tendency to tail. Tongue is moist; appetite not good; thirst great. He vomits occasionally after eating. Bowels constipated. The liver measures 9 inches in a line vertical to the nipple; and there is great tenderness on pressure over the whole area of dulness. The splenic dulness, laterally, is 5½ inches from above downwards. Urine was of a pale amber colour; specific gravity 1009; no albumen. Such was his state on admission. He remained for some time under observation; and on March 3d it was ascertained that his urine amounted to 110 ounces daily, and it continued at a similarly high standard, sometimes falling as low as 90 and rising as high as 130 ounces. Finding the amount of urine so large, and the general symptoms so closely resembling those I have just read, I ventured to anticipate the appearance of albumen in the urine. It was carefully tested day by day, and about the 10th of March a trace of albumen was observable. It steadily increased in amount; and, soon after its appearance, a very few waxy or hyaline casts were to be detected by the microscope. Notwithstanding the increased flow of albumen, the patient, under a tonic treatment, with liberal diet, so far improved as to be able to leave the hospital, to resume work, on March 26th. I have seen him at intervals since that time; and, when I last examined him, the following was his condition:—

December 3.—His complexion sallow and cachectic as before; abdomen free from tenderness; liver measures, in line of right nipple, 7½ inches, and the spleen barely 5 inches at the side. He does not know exactly how much water he makes daily, but thinks it is less than when he was in the Infirmary. It is distinctly albuminous. No dropsy. The glands of the neck on both sides have become enlarged within the last ten days. The blood is in the same condition as formerly. Thus it is evident that, except in regard to the kidneys, considerable improvement had taken place.

The cases which I have given illustrate, I think, sufficiently the history and symptoms of the amyloid degeneration; and I now proceed to say a few words concerning the treatment, and that resolves itself into a few simple rules, viz.:—While the degeneration is in progress, good diet, with tonics, produce sometimes most favourable results, as in the cases of Burns and March; and a course of iodide of potassium has been followed, in the latter case, by a considerable diminution of the bulk of organs affected. In the latter stages, when the tubes have become obstructed, the amount of urine diminished, and dropsy supervened, with exhausting diarrhœa, and perhaps a threatening of head symptoms, we have, of course, little hope of improvement; but life may be prolonged, in some instances, by favouring the diarrhœa, by stimulating the kidneys by means of powerful diuretics, and causing the removal of fluid by the skin, at the same time supporting the strength of the patient by all means in our power. For it will be observed that the condition produced in the last stage of amyloid degeneration is essentially in

relation to symptoms identical with that proceeding from the fatty disease.

I subjoin a brief recapitulation of the leading symptoms of the cases of waxy or amyloid degeneration which have come under my notice.

Amyloid, or waxy degeneration, is associated with a cachectic appearance; with an increased flow of urine, which, later in the disease, becomes albuminous, and contains tubecasts generally hyaline. Urine diminishes towards the end of the case, and dropsy then gradually supervenes. There is frequent diarrhœa, hepatic and splenic enlargement. The patient dies either from exhaustion or from uræmic poisoning.

As an appendix to the paper read before the Society, I shall give a brief outline of several other cases of the same disease which have come under my notice.

Case V.—Eliza Hume, æt. 42, washerwoman, admitted to Ward XI., March 15, 1860.

Has long indulged freely in intoxicating drinks. Has observed for some time past that she made more water than natural. Is subject to occasional œdema of the feet and ankles. Has been under observation ever since. Passes from 70 to 120 oz. of urine daily; specific gravity about 1007; very albuminous, containing hyaline tubecasts. She is at times subject to very severe diarrhœa; stools occasionally bloody. There is lesion of the aortic and mitral valves. Liver and spleen not enlarged.

Case VI.—William Gillespie, æt. 41, admitted to Paton's Ward, July 21, 1860. Has been recently troubled with difficulty of breathing, especially at night. On account of this he applied for admission to the Infirmary. He had some degree of bronchitis. Liver measured 6 inches in the mammillary line. Urine varied from 90 to 100 oz. daily; pale, specific gravity 1008, highly albuminous, with hyaline and some granular and fatty casts. No dropsy. He continued under treatment for some time, and was dismissed relieved.

Case VII.—Grace Tait, æt. 32, housemaid, admitted to Dr Keiller's[1] Ward, July 3, 1860. Was at one time a pretty hard drinker, but has lately been temperate. Nine weeks before admission, she noticed that she was passing large quantities of urine. Had frequently to rise at night to make water. Some weeks later, slight dropsy appeared in her feet, and gradually increased, the urine diminishing correspondingly.

On admission, there was general anasarca. Urine about 20 oz. daily; pale, specific gravity 1008, with abundant albumen, and

[1] I would here beg to acknowledge my obligation to Drs Keiller and Warburton Begbie, who have allowed me to make use of their cases; and to their former assistants, Drs Sclanders and Argyll Robertson, who favoured me with notes of these cases.—T. G. S.

hyaline tubecasts. The liver was enlarged. Signs of tuberculosis in both lungs. Powerful diuretics were administered, under which the amount of urine increased to 100 oz. daily, and the dropsy diminished. Soon again, however, the amount of urine fell, the dropsy increased, and she became drowsy and almost comatose. She died in the end of August.

I examined the kidneys, and found the Malpighian bodies and smaller arteries in a state of amyloid degeneration, and the epithelium lining the tubules to a great extent fattily degenerated. The kidneys were somewhat smaller than natural.

Case VIII.— —— M'Kenna, a labourer, æt. 50, admitted to Dr Warburton Begbie's Ward, April 27, 1860. Stated that he had enjoyed good health till within the last year. For some time had been making much more water than usual; but, for ten days prior to admission, the quantity had greatly diminished, and dropsy had come on.

On admission, there was great ascites. The daily amount of urine was about 16 oz., and soon became even less. He gradually sunk, and died about a week after admission.

On examination, the kidneys were found in a state of waxy or amyloid degeneration.

Case IX.—John Fraser, typefounder, æt. 22, admitted to Paton's Ward, February 10, 1860. He was suffering under phthisis, and had improved considerably under treatment. On July 13 I found that his urine had become albuminous. On measuring, I found that it ranged in amount between 60 and 80 oz. daily; specific gravity about 1014. After remaining some time under treatment, he was dismissed, the albuminuria still continuing.

Case X.—John Russell, æt. 18, admitted to Paton's Ward, February 25, 1860. He was under treatment for phthisis, and had been getting gradually worse. In the middle of July I observed that his feet were œdematous. I then found his urine very albuminous, of specific gravity 1010 to 1015, ranging in amount from 54 to 70 oz. daily. The liver measures 6 inches in a line with the sternum, and somewhat less in a line with the nipple. The dropsy increased, and in the end of August the patient died. No *post-mortem* examination was permitted.

Case XI.—Mary Johnston, æt. 45, wife of a traveller, admitted to Ward XI., May 30, 1860.

For seventeen years she has been subject to chronic rheumatism. Six weeks before admission, she had considerable thirst, and made more water than usual. Shortly before admission, her urine diminished, and became loaded with deposit; and, at the same time, considerable dropsy appeared in her feet, legs, and abdomen. On admission, she was pale and anæmic. Her liver measured 7 inches in the line of the right nipple. She had considerable lumbar pain, especially on the right side. Urine distinctly albuminous, and contained a few hyaline tubecasts. She was ordered small doses of

Tincture of the Muriate of Iron. The amount of urine rapidly increased; the dropsy diminished. The urine ranged from 90 to 123 oz. in the 24 hours. She was soon able to leave the hospital, free from all dropsy, the urine continuing as before.

Case XII.—Bernard M'Quaid, æt. 44, French polisher, admitted to Paton's Ward in the end of January 1860.

Sixteen years ago, had syphilis, followed by periostitis and various skin eruptions. Two years before admission, he observed that he was passing more water than usual; and that, after a hard day's work, his ankles became swollen. Had within the last few months suffered much from bronchitis and asthma.

On admission, he looked cachectic. He was greatly troubled with bronchitis and asthma. No dropsy. Urine varied from 40 to 80 oz. daily; specific gravity 1011 to 1015, albuminous, and contained hyaline and granular tubecasts. Left lobe of the liver enlarged. He continued under observation for several months, at the end of which time he was dismissed, though urinary symptoms remaining as at first.

Case XIII.—James Murray, æt. 32, brushmaker, admitted to Paton's Ward, June 29, 1860.

Thirteen years ago he contracted syphilis, and has suffered from rheumatic pains in the joints and bones ever since. During the six weeks prior to admission he observed that he made water more frequently than usual, but does not know whether it was in increased quantity or not. A few days before admission, his feet and scrotum became œdematous; but, on his taking a diuretic, these symptoms rapidly disappeared. On the first day in the Infirmary he passed 30 oz., pale straw-coloured, highly albuminous, containing granular tubecasts. He was ordered a slightly diuretic mixture. His urine increased, and ranged, during his stay in the hospital, from 60 to upwards of 80 oz.; the specific gravity about 1015; tubecasts hyaline, and containing here and there a fatty cell. The pale, cachectic appearance was well marked in this patient. He was dismissed relieved in the middle of August.

Case XIV.—Helen Anderson, æt. 27, admitted to Ward XI. in July 1860.

Stated that for eleven years she has suffered from constitutional syphilis. Her face is pale and cachectic-looking; her forehead scarred with the cicatrix of an old syphilitic ulceration. Throat ulcerated. Two months ago, had a miscarriage, and afterwards observed dropsy of the legs and abdomen.

On admission, the dropsy was very considerable, and the urine about 20 oz. daily, of specific gravity 1017, highly albuminous, containing granular tubecasts. She had rather severe diarrhœa. Ordered small doses of Iodide of Potassium, along with complete rest, to which she had not been accustomed; and notwithstanding the diarrhœa, which was very persistent, the urine increased to 40, 50, and 80 oz. daily. The dropsy at the same time diminished. The

urine was then of low specific gravity, 1006, albuminous, and containing a few hyaline casts. She continued under treatment for some time, and was dismissed free from dropsy, but the urinary symptoms as before.

Case XV.—Janet Gilmour, æt. 34, servant, admitted to Dr Keiller's Ward, January 3, 1861.

Some years ago she contracted syphilis, and has since had pains in the bones, skin eruptions, sore throat, etc. Last July, had erysipelas, and afterwards dysentery. On her recovery she observed that she was making more water than usual; that she had occasion to rise frequently during the night, and made a good deal each time. In the beginning of August dropsy gradually commenced, and has increased since.

On admission, Dr Scott informs me, she looked pale and cachectic. Dropsy very considerable. Amount of urine, she thinks, not half of what it was in the end of July; it is albuminous, containing hyaline casts. Her bowels are very loose. Hepatic dulness cannot be determined.

January 17.—Within the last few days she has been drowsy, but to-day is somewhat better.

She still continues under treatment.

To these cases, which have come under my own observation, I may add a few which I find recorded by previous observers:—

Case XVI.—Frederick Woodman,[1] æt. 15, came under Dr Budd's care in King's College Hospital in June 1850.

He had long had morbus coxarius, and was weak and emaciated. His belly distended from enlargement of the liver and spleen. He was subject to occasional attacks of diarrhœa, notwithstanding which his urine was, on an average, about 48 oz. daily, specific gravity 1008 to 1013, containing a few large waxy and granular casts. In December the urine diminished in amount from 54 to 12 oz.; and in the end of that month the patient died exhausted.

On examination, the liver, kidneys, and spleen were found in a state of waxy degeneration. The intestines presented no lesion to account for the diarrhœa.

Case XVII.—Dr Wilks[2] records the following case: A woman, aged 30, suffered from phthisis, which began, after exposure to cold, four months before her death. "At first, a large quantity of urine was passed, which was albuminous. Soon the urinary secretions diminished, and at the same time diarrhœa and vomiting set in. The urine never increased in quantity, and the symptoms continued, the vomiting being quite uncontrollable. No dropsy was present."

On *post-mortem* examination, her kidneys were found waxy.

[1] *Dr Johnson on Diseases of the Kidney*, p. 333; and *Dr Budd on Diseases of the Liver*, p. 311.

[2] *Guy's Hospital Reports*. Second Series, vol. viii., p. 261.

Case XVIII.[1]—Sarah Wilson, æt. 7, admitted to Royal Infirmary, Edinburgh, November 11, 1853.

"Three years ago she suffered from scarlatina, and has ever since been a weakly child, with a capricious appetite. In the beginning of last summer, œdema of feet and legs was first observed, together with diarrhœa, which has continued, more or less, ever since."

On admission, the urine was of a pale colour, specific gravity 1006, very albuminous.

On November 25 it was noticed, "Urine passed in great quantity, specific gravity 1002, not so coagulable." Diarrhœa severe, and almost constant. The dropsy increased, and she became very drowsy, and died on December 13.

On *post-mortem* examination, the liver, kidneys, and spleen were found very distinctly waxy; and the lower third of the small intestine was ulcerated.

Case XIX.[2]—William Sibbald, a clerk, æt. 31, admitted to the Royal Infirmary, September 7, 1852.

For some years past has not enjoyed good health.

On admission, there was evident signs of phthisis at the apex of the right lung. "Urine normal; but he has frequent calls to micturition, obliging him to rise frequently during the night."

December 16.—"Disease steadily advancing. Bowels rather loose. Urine of specific gravity 1012, of a dark amber colour, slightly albuminous."

January 1, 1853.—"Micturition frequent. Urine strongly coagulable by heat and nitric acid. Œdema of feet and legs, with puffiness of the face."

January 20.—"Is getting gradually weaker and more emaciated. No pain in the loins; but micturition is frequent. Urine of a dark amber colour, specific gravity 1012, very albuminous."

On January 26 the patient died.

On *post-mortem* examination, the lungs were found thoroughly disorganized. Liver and spleen distinctly waxy. "Kidneys also very firm and dense, with partial atrophy of the cortical substance, presenting a slight degree of the waxy degeneration."

Case XX.[3]—Thomas Kegan, æt. 40, admitted December 13, 1858.

"Patient was in good health till last May, when he experienced intense thirst, and began to drink large quantities of water. His urine became greatly increased in quantity; he required to get up three or four times in the course of the night to micturate."

On admission, he had distinct signs of phthisis. No œdema. Skin dry. "Urine acid, unusually transparent, specific gravity 1010, considerable quantity of albumen, chlorides abundant, no sugar." He passed at first 176 oz. of urine in 24 hours, but it

[1] *Bennett's Principles and Practice of Medicine.* Third Edition, p. 799.
[2] *Ibid.*, p. 801.
[3] *Ibid.*, p. 974.

rapidly diminished in quantity. Dec. 22d, 64 oz.; 25th, 54 oz.; 26th, 48 oz. He died on the 27th.

On *post-mortem* examination, the lungs were found very tuberculous. The liver, spleen, and kidneys were much enlarged, and afforded excellent examples of waxy degeneration.

I have thus given a brief account of 20 cases of Bright's disease, from my own notes and from the works of previous authors. In all of them there was a greater or less increase in the daily amount of urine, and a striking general correspondence in the other symptoms. In 9 of them the nature of the lesion was ascertained, by *post-mortem* examination, to be waxy or amyloid degeneration; and in the other 11, both from the similarity of the symptoms and from other considerations, I think that we are warranted in believing the same degeneration to have existed. Their history is markedly different from that of the fatty kidney which Bright[1] figured in his first plate, and illustrated in his first case. Moreover, almost all of them were associated with long-continued wasting disease; and it has been long known that the form of renal affection accompanying phthisis, syphilis, and other wasting maladies, is the waxy or amyloid degeneration.

Of these 20 cases, 6 were associated with phthisis, 6 with syphilis, 2 with caries, 2 with intemperance, 1 with cancer, 1 with chronic rheumatism, and 2 with no particular disease.

Whether further observation may confirm the opinions founded upon these cases, we cannot say; but, in the meantime, they are laid before the profession, in the hope that they may lead to further investigation.

[1] See Bright's *Medical Cases*, vol. i.

MURRAY AND GIBB, PRINTERS, EDINBURGH.