A Lecture ON URINARY CALCULI.

BY

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[Continued from page 3.]

CLASS II. *Calculi which Leave a Considerable Quantity of Fixed Residue after Exposure to a Red Heat.*

Oxalate of Lime Calculi. I have seen an oxalate of lime calculus not larger than the 1-500th of an inch, and have traced the formation of these stones through their several stages. I believe that the dumb-bell crystals formed in the kidney, in the first place become aggregated together (Fig. 54); crystalline matter is then

Fig. 51.—Small collection of dumb-bells, such as often forms the nucleus of a calculus.

deposited in the interstices, and gradually a microscopic calculus results, as represented in Fig. 55. These minute calculi remain probably for some time in the kidney, and slowly increase until they form the concre-

Fig. 55.—A very small oxalate of lime calculus formed from a collection of dumb-bells, parts of some of which are still seen on its external surface. *a.* A much smaller calculus, consisting of two dumb-bells.

tions known as the hempseed calculi. Not unfrequently a number of them are found in the kidney, and pass down the ureter one after the other at various intervals of time. Sometimes one becomes impacted, and gives rise to the most serious and distressing symptoms. Having arrived at the bladder the slow deposition of the oxalate may continue, or layers of uric acid or phosphate may be deposited, according to the state of the urine. In cases where the oxalate increases, the surface becomes tuberculated, in consequence of the irregular deposition of the salt; the colour varies from a pale brown to a dark brown purple. They are commonly called the mulberry calculi. Such stones often attain a large size. They are very heavy and hard. On section, the laminæ are well seen, and you may often observe

that the calculous matter has been deposited most unequally.

Occasionally the oxalate of lime is deposited almost colourless and crystalline. Dr. Prout figures one of

Fig. 56.—A form of the mulberry calculus, composed of oxalate of lime, of a dark plum colour. Half the actual size.

these calculi. I show you a beautiful specimen, which was given me by my friend Dr. Gibb, and was obtained from the horse. You can see distinctly the large octohedral crystals all over it. These are some of the small hempseed calculi, white on the surface, and they also exhibit numerous beautiful crystals, although they are smaller than those in the last specimen.

Here is a beautiful example of another form of oxalate of lime calculus, in which the surface is of a pale brown colour, and the tubercles small and delicate compared with the mulberry calculus.

Fig. 57.—Oxalate of lime calculus, of a brown colour. Its surface was very uneven. The figure represents the calculus of its natural size.

Oxalate of lime calculi often give rise to extreme pain when impacted in the kidney, and while passing down the ureter, or lodged in the bladder. In the kidney the pain is often of the most violent character, and frequently the patient suffers from many attacks before the stone is dislodged. Very frequently hæmorrhage occurs, and sometimes inflammation is excited, which terminates in the suppuration of the tissues contiguous to the stone.

Occasionally, however, in *post mortem* examinations, we are somewhat surprised to find these calculi in the kidney, although the patient never suffered the slightest symptom during life. Here is a calculus the size of an almond, which was found fixed very firmly in one of the ureters of a man who died of another malady. Although its surface is rough, and it is half-an-inch in diameter, it caused scarcely any uneasiness, and we had no suspicion of its existence before the man died.

This large calculus (fig. 58) was removed from a man aged 45, by Mr. James H. Ceely, of Aylesbury. Mr. McCormick sent me the following history of the case. It is not a little remarkable that a rough calculus like this, weighing twelve drachms, should have been present without causing great pain and uneasiness:—

“At the age of 15 years the patient (now 45) suffered from pain in the hypogastric region, extending along the urethra to the glans penis. At intervals during the succeeding twelve months the pain was very violent, and was at each attack followed by the evacuation of bloody urine. Occasionally since then he experienced pain in these situations, while taking horse exercise, or during unusual exertion, but never to any great extent, and he was never compelled to seek advice.

With these exceptions his general health, although delicate, had been good till last June (1858), when he

had an accession of symptoms resembling those mentioned, but greatly aggravated. The urine, in addition to blood, contained 'gravel.' At this time he consulted Mr. Reynolds, of Thame, who detected a vesical calculus, and on the 20th September, Mr. J. H. Ceely performed the lateral operation and removed a rough, irregular, mulberry calculus, weighing twelve drachms.

"During the first ten days subsequent to the operation, the urine contained considerable quantities of pus and blood, after which time all abnormal characters disappeared, and the patient was discharged from the Bucks Infirmary perfectly well on the 8th of Oct., and had suffered little pain or inconvenience. This patient had enjoyed excellent general health during a period of twenty-nine years, notwithstanding the presence of a calculus probably during the whole period."

Fig. 58.—Mulberry calculus weighing twelve drachms. Two-thirds the natural size. From a photograph.

A calculus of very curious shape, the nucleus of which consisted of oxalate of lime, is described by Mr. Price in the eleventh volume of the *Transactions* of the Pathological Society. Mr. Price removed fourteen calculi from the bladder of an old man by the lateral operation of lithotomy. Two of the calculi were peculiar in possessing several spine-like projections. The largest of these was about the size of a chestnut, and from its surface projected from eight to ten spines, two of which were upwards of half an inch in length. Surrounding the oxalate of lime nucleus were several layers of uric acid and urates, with some earthy phosphate. The spines were formed of the latter salts alone, and there was no projection of the oxalate of lime nucleus into them.

The cause of their peculiar shape could not be ascertained. The stone was not in any pouch in the bladder, but was free in its cavity, and the absence of any spines projecting from the nucleus militates against the idea of the peculiar form having been given to it while in the kidney. No *post mortem* was allowed. It seems possible that the formation of the spines might have depended upon the more rapid deposition of calcareous matter on those parts opposite to the intervals between the smaller calculi, than over the part of the surface in immediate contact with them. Only the two largest calculi exhibited this peculiarity.

The circumstances under which oxalate of lime was deposited were referred to when we were discussing the characters of this urinary deposit, and the formation of the dumb-bell crystals has also been alluded to. With regard to this question, it is interesting to find that both Dr. Prout and Kletzensky have noticed deposits of oxalate of lime in patients who had had cholera, and that in two cases of this disease dumb-bells were found in the urine by myself. Dr. Prout also alludes to the frequency of cases of calculous disease in those who had suffered from cholera. The concentration of the fluids which occurs in these cases is favourable to the deposition of the least soluble substances in a solid form. The intermediate stages between dumb-bells and small calculi have been observed, as I have before mentioned.

Chemical Characters. The powdered calculus is soluble in the mineral acids, and the oxalate of lime is precipitated as a white powder by ammonia. Acetic acid will not dissolve oxalate of lime. After the powder, on

platinum foil, has been exposed to a dull red heat for some time, a white ash consisting of carbonate of lime remains. This gives off bubbles of carbonic acid when it is treated with an acid. If the temperature be much higher than a dull red heat, a certain quantity of the carbonate of lime undergoes conversion into quick lime, which does not effervesce on the addition of an acid.

Calculi composed of Earthy Phosphate. Both phosphate of lime and ammoniaco-magnesian phosphate enter into the composition of calculi. Dr. Prout showed that the phosphates were very often deposited upon other calculi, while there were very few instances in which uric acid, urates, or oxalate of lime, were deposited upon the phosphate. These two earthy salts enter into the composition of the *fusible calculus*; its

Fig. 59.—Calculus consisting principally of triple phosphate deposited round a smaller calculus composed of uric acid.

degree of fusibility varying according to the proportion of triple phosphate present. The latter substance is easily fused in the blow pipe flame, while the phosphate of lime is quite infusible.

Fig. 60.—Calculus composed of phosphate of lime.

When the calculus contains but a mere trace of triple phosphate, its structure is dense and even, it is heavy, and its surface is smooth and polished; but large calculi of this kind are exceedingly rare. A small quantity of triple phosphate is almost always present in the large calculi. Portions of the laminae of these calculi are easily broken off.

Phosphate of lime calculi are often found in the kidney. In some cases the whole of the pelvis is occupied with calculi, varying in size and shape, mixed with a considerable quantity of pulverulent matter like fine sand. Each particle of this is found, upon microscopical examination, to consist of a minute calculus, containing a certain quantity of organic matter, probably mucus and disintegrated epithelium, for its nucleus. Several of these calculi are represented in the *Illustrations*, Calculi 1, Fig. 1.

Occasionally a phosphatic calculus lodged in the pelvis of the kidney gradually increases until a large calcareous mass is formed by the deposition of earthy salts, layer after layer, until the whole pelvis of the kidney is occupied with it, and its prolongations extend into the infundibula and calyces.

The calculus, which consists almost entirely of triple phosphate, has a very porous structure, it is light, easily broken down by pressure, and perfectly white. Its surface is rough, and large crystals of triple phosphate can often be discerned upon the surface with an ordinary lens.

In the deposition of phosphatic calculi, the alkali which causes the precipitation of the phosphates is secreted, according to Dr. G. O. Rees, by the mucous membrane of the bladder. The earthy salts are preci-

pitated from the urine, not *secreted* from the mucous membrane, as was formerly supposed.

Chemical Characters. The phosphate of lime calculus is infusible. It contains, like other calculi, a little animal matter, but this is often so small that laminæ which have been exposed to a red heat retain their general characters after ignition. It is soluble in the mineral acids, and slowly in acetic acid. Phosphate of lime is precipitated in an amorphous form when the acid solution is neutralised with ammonia. When oxalate of ammonia is added to the acetic acid solution, a precipitate of oxalate of lime is formed.

The calculus composed of triple phosphate and phosphate of lime is fusible. The solution in acids, when neutralised by ammonia, gives a precipitate of ammoniaco-magnesian phosphate in stellate crystals, and a little phosphate of lime in an amorphous form. The quantity of phosphate of lime present is sometimes so small that the solution in acetic acid does not give a precipitate when oxalate of ammonia is added. Calculi composed of triple phosphate generally contain more mucus and organic matter than the other phosphatic calculi.

Carbonate of Lime Calculi, though common among herbivorous animals, have rarely been met with in man. They are friable and sometimes perfectly white. Mr. Smith has described some which are very like the mulberry calculi (*Med.-Chir. Trans.* vol. ix., p. 14). There are specimens of this form in the Oxford museum among Mr. Hitchings' collection, but unfortunately no history is attached to them. Dr. Thudichum states that he has examined prostatic concretions which consisted almost entirely of carbonate of lime. A small quantity of carbonate of lime is usually deposited with the earthy phosphates.

This calculus effervesces freely when exposed to the action of acids previous to incineration; white oxalate of lime yields carbonate only after having been exposed to a red heat.

Silicic Acid Calculi. I have never met with calculi which contained silica; but Berzelius, Vauquelin and Fourcroy, and Mr. Venables and others, have detected it. It exists usually in very small quantity only, and in order to obtain it a considerable quantity of the calculus must be operated upon.

Prostatic Calculi. These calculi vary very much in size. The small ones are generally roundish, but often the sides are more or less flattened when many have been lying in apposition. They are generally hard and

Fig. 61.—Small prostatic calculi. Natural size.

white, like porcelain or alabaster. The surface is generally perfectly smooth. They consist of organic material, with phosphate of lime and a trace of carbonate; but it is seldom that triple phosphate is to be detected. The earthy matter may vary from 50 to 90 per cent.

These calculi are formed in the follicles of the prostate gland, and commence as minute very transparent concretions, which contain scarcely any hard calcareous material, and at this early period of their formation, therefore, are not entitled to the name of calculi. The microscopic concretions have been detected in the follicles during the periods of youth and early manhood by Mr. Thompson, who states that he found them in every one of a series of fifty prostates which he subjected to

examination. In old age, as is well known, they are often found of considerable size. When small, they do not give rise to any symptoms, but they may increase in size and number, and cause the greatest inconvenience and distress.

In the sections of the prostate which I show you, from a man of about forty years of age, who died from pneumonia, the various stages of growth of these concretions can be observed. The specimen has been immersed in glycerine, in order to increase its transparency, and is placed under a power of 215 diameters. Each follicle of the gland is seen to be occupied with many small roundish bodies, and a considerable number of epithelial particles. Many of the follicles are distended by a number of transparent microscopic concretions, varying from a pale yellow colour to a dark reddish brown. Some of the smallest are not more than the one two-thousandth of an inch in diameter, and yet these are seen to be composed of several concentric layers. In the centre of almost all the concretions you cannot fail to notice a quantity of minute globules, and in some you can see one or more roundish cells most distinctly. These, in fact, constitute the nucleus of the concretion. The concretions under observation consist entirely of organic matter which resists the action of moderately strong solution of potash and acetic acid. It is an albuminous material, which, in its chemical characters, agrees with the substance of which the cell wall is composed. The walls of hydatid cysts, and some of the elastic albuminoid concretions occasionally found in the peritoneal cavity, and in other situations, are composed of a substance closely allied to this. These bodies, I believe, are formed by the slow deposition of albuminous matter round a nucleus consisting of epithelial cells or *debris*. The material which is deposited in successive layers is probably the same which enters into the composition of the cells. It is sometimes colourless, but more commonly of a yellowish colour, and sometimes reddish. A small concretion being once formed, new matter is poured out from the lining membrane of the follicle, deposited on it, and gradually becomes hardened by the absorption of its fluid constituents. At present there is very little earthy matter in the concretion, but gradually a change takes place, and granules of phosphate of lime are precipitated in the substance of the transparent organic matter. This change having commenced, the further separation of calcareous matter goes on. The particles already formed increase by attracting more phosphate from the surrounding fluid, which holds it in solution. As the concretion enlarges the proportion of phosphatic salts to the organic matter becomes greater, and a *prostatic calculus* at last results. The calculus may attain a very large size, and may even extend forwards into the urethra and backwards into the bladder. The characters of these concretions are well described by Mr. Thompson, whose remarks are illustrated by careful drawings (*The Enlarged Prostate*. Plates iv and v, page 265). The account above given only differs slightly from the view entertained by Mr. Thompson, who thinks that the concretions are first formed by the coalescence of the small yellow bodies or granules, which afterwards coalesce and form a small mass. Professor Quekett considers that they commence by a deposit of earthy matter in the secreting cells of the gland, while Dr. Handfield Jones believes that the concretions originate in a vesicle, which increases by endogenous growth.

You may see in various parts of the preparation concretions, the nucleus of which appears to consist of granular matter; others in which concentric layers may be traced to a central point; some which have a perfectly transparent centre; and not a few in which the nucleus is composed of small granular cells, varying in number from one to twenty, or more (*Illustrations, Calculi Plate I, Fig. 4, b, c*). For further information on this interesting subject, I must refer you to Mr. Thompson's excel-

lent monograph on *The Enlarged Prostate*, where you will find the question of diagnosis and treatment fully discussed.

[To be continued.]

Original Communications.

TEN YEARS OF OPERATIVE SURGERY IN THE PROVINCES.

By AUGUSTIN PRICHARD, Esq., Surgeon, Clifton, Bristol.

V.—OPERATIONS ON THE EYE.

[Continued from p. 12.]

CASE CLXXXVI. M., aged 45, had been growing blind for nearly six years, but he had only given up work a fortnight before I saw him. He had so sunken an eye and so overhanging a brow that it was difficult to operate. I made a puncture in the cornea of the right eye, and finished the section with the convex knife and scissors. He had an excellent recovery, and went away with a circular pupils and good sight.

About a year afterwards, he came up to have the other eye done. I therefore extracted the left lens, and he recovered speedily, and both his pupils were round and active.

CASE CLXXXVII. M., aged about 60. I operated first on the right eye with an upper section, and extracted the lens easily; and then, also by an upper section, I operated on the left eye. On the twelfth day after the operation, he could see the time by my watch without a glass. He went home with circular pupils and excellent sight in each eye.

CASE CLXXXVIII. M., aged 67, was operated on six years before in the right eye, and recovered his sight for awhile, but it gradually was lost. I made the upper section in the left eye, standing in front; and removed the lens easily. He recovered good sight, and was able to work.

CASE CLXXXIX. M., aged 71. The right eye had been unsuccessfully operated on before. I made the lower section in the left eye; but, immediately on its completion, the lens and some vitreous humour started out upon his cheek. He had excessive spasmodic contraction of his orbicularis palpebrarum. Went home with improved sight.

CASE CXC. F., aged 70. Deeply sunken eyes and prominent brows. I operated on both eyes, making the lower section in the left eye, and upper section in the right. She recovered, with very good sight in the left eye; but in the right it was not so clear.

CASE CXCI. F., aged 63. The right eye was amaurotic; I extracted the lens in the left. She was very faint during the operation, but recovered with very good sight.

CASE CXCI. F., aged 65. The left was a sightless eye; the left had been blind from cataract for three months. I made the upper section with difficulty, owing to her unsteadiness; and, as soon as it was completed, she jumped out and jerked out the lens from her eye, with a considerable quantity of vitreous humour. Her eye looked a little collapsed afterwards. She recovered well, and went home with very good sight.

CASE CXCI. F., aged 64. I operated on the right eye by the upper section (the cataract in the left was incipient), and removed the lens with a small quantity of vitreous humour. She had a little pain afterwards, and I applied some belladonna at night. She went home in twelve days, with a clear circular pupil and good sight.

CASE CXCI. F., aged 73, excessively deaf. I operated on the left eye, and extracted a large amber coloured lens by the lower section. A little vitreous humour fol-

lowed. She recovered with excellent sight, and could see to read well for four or five years afterwards, when she died. The pupil was a little drawn downwards.

CASE CXCV. F., aged 74. I operated on the right eye by upper section, slightly wounding the margin of the pupil. She recovered well, and went home on the eighth day with excellent sight, but complaining much of having been made a prisoner so long. She saw well for some years after, when I lost sight of her.

CASE CXCVI. M., aged 71. I operated on the left eye in the month of August, during some of the hottest weather we have had for years. A little vitreous humour escaped with the cataract. He recovered very well, and in seven days was able to open his eye and see clearly.

CASE CXCVII. F., aged 56. I operated on the left eye. She recovered well in ten days, although she was a feeble, unhealthy person. A year afterwards, I operated on the right eye (left left remaining quite sound and useful); and she had inflammation following the operation, and went home before the eye had recovered itself. I do not know the result of this second operation.

CASE CXCVIII. M., aged 58. I operated on the left eye by lower section. On the eighth day, pain in the brow and head came on, and the pupil became irregular and contracted. I gave him some calomel and opium pills until the mouth became sore, when his eye cleared; but when he went home, the sight was still somewhat imperfect.

CASE CXCI. M., aged 72. Amaurosis of the left eye, and cataract in both. I operated on the right eye, just touching the iris with the knife, so that it bled. The corneal flap was disposed to fall down under the lid. He recovered with good sight and a circular pupil, although the iris had been touched.

CASE CC. M., aged 60. The left eye had been lost in early life by accident. Cataract in the right for two years and a half. I operated on the right, and made the upper section. He recovered well, and went home with excellent sight. This operation was performed in the winter.

CASE CCI. M., aged 56, with cataract in the right eye of six years standing, in the left only six weeks. I operated on the right. The eye was very tense, and the iris flapped in front of the knife, so that I was obliged to withdraw it, and complete the section with the convex knife. About the fifth day, inflammation came on, and required some active treatment with mercury; and he went back with good sight.

He came back the next year, and underwent an operation on his left eye, the lens and some vitreous humour escaping. He returned home with good sight in both eyes.

CASE CCII. F., aged 59. I extracted the left cataract by an upper section, standing in front of the patient; the incision requiring to be a little enlarged with the convex knife before the lens would escape readily. The flap of the cornea was much disposed to fall down. She recovered with a closed pupil, which I incised with the iris-knife, and she saw well at once. In the course of two years afterwards, the sight became dull again.

CASE CCIII. M., aged 59, with cataract in each eye, and external strabismus and amaurosis in addition in the left. I operated on the right eye, making an upper section, and extracting the lens easily. He saw my watch afterwards, and recovered with fair sight. A year afterwards, he became amaurotic.

CASE CCIV. M., aged 54. His left eye was amaurotic. I operated on the right, and extracted the lens without accident. He was well, with good sight, by the eighth day.

CASE CCV. M., aged 55. I operated on both eyes; the lower section in the left eye, the upper section in the right. He recovered without a bad symptom, and by the eleventh day his sight was strong and clear in both eyes.