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A Course of Lectures

ON

URINE, URINARY DEPOSITS, AND CALCULI.

DELIVERED AT THE PATHOLOGICAL LABORATORY,
DURING THE SESSION 1857-58.

BY

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LECTURE IX.

URINE IN DISEASE. 2. OF LIGHT AND FLOCCULENT DEPOSITS.

Mucus. Vibriones. Torulae, including the Sugar-Fungus and Penicillium Glaucum. Sarcinae. Trichomonas Vaginae. Epithelium of the Genito-urinary Passages, Ureter, Bladder, Urethra, Vagina. Spermatozoa. Vegetable Bodies resembling Spermatozoa. Benzoic Acid. Casts of the Renal Tubes. A. Casts of Medium Diameter, about the one-seventh-hundredth of an inch. Epithelial Casts. Casts containing Dumb Bells. Granular Epithelial Casts. Casts containing Oil. Fat-Cells. Casts containing Blood. Casts containing Pus. B. Casts of considerable Diameter, about the one-fifth-hundredth of an inch. Large Waxy Casts. C. Casts of Small Diameter, about the one-thousandth of an inch. Small Waxy Casts. Of Casts in a clinical point of view.

GENTLEMEN.—We have already considered the characters of the three classes of urinary deposits, and we will now proceed to examine the different substances comprised in the first class, which includes light and flocculent deposits. Many of them occupy a considerable bulk, although the actual quantity of matter entering into the formation of the deposit is exceedingly small. If dried, one of the most bulky of these deposits from six or eight ounces of urine would hardly weigh half a grain.

II.—FIRST CLASS OF URINARY DEPOSITS.

Mucus. If healthy urine be allowed to stand for a few hours after it has been passed, a bulky, flocculent, and very transparent cloud will be deposited towards the lower part. Upon examining this in the microscope, we see a few delicately granular cells, rather larger than a blood-corpuscle, scattered sparingly through a clear and perfectly transparent substance, in which only a few minute granular points can be detected. A few cells of epithelium from the bladder, or from some other part of the urinary mucous membrane, are not unfrequently met with. Nothing more is observed in the mucus found in healthy urine. In disease, however, this mucus increases in quantity, and forms a thick transparent deposit, containing numerous cells similar to those above referred to, with much epithelium, the character of which depends upon the particular part of the mucous membrane affected. The characters of mucus are represented in Fig. 24. Little collections of mucus, with imperfectly formed cells, are not unfrequently met with in urine. These are generally derived from the follicle of the urethra, or from the prostate. Long shreds of mucus-like material are sometimes formed in the seminal tubules, and escape with the urine. (*Illustrations*, Pl. xiii, Fig. 2.)

Fig. 24.—Mucus and small granular cells from healthy urine. The large cell is from the bladder. $\times 215$.

The very thick glairy deposit, which is frequently found in the urine in cases of disease of the bladder, must not be mistaken for mucus. This consists of pus altered by the action of carbonate of ammonia which has been set free in consequence of the decomposition of the urea by the action of some animal matter acting upon it as a ferment, after it has left the bladder. In some cases, this change even commences in the bladder itself; and the expulsion of the viscid substance often gives rise to serious inconvenience. When we attempt to draw off the urine with a catheter, the instrument becomes completely plugged up. Urine of this kind exhibits a highly alkaline reaction, evolves an ammoniacal odour, and frequently contains a considerable deposit of crystals of the triple or ammoniaco-magnesian phosphate, with granules of phosphate of lime. I have observed in several cases, that when the pus came from an abscess in the kidney, or from the pelvis of the kidney, it was not accompanied with crystals of triple phosphate. When it is derived from the bladder, earthy salts are generally present. This point should be taken into consideration before arriving at a diagnosis in doubtful cases. Liquor ammonia and potash exert an action upon pus similar to that of carbonate of ammonia.

It should, however, be borne in mind that, if basic phosphate of soda be added to urine, ammonia is always set free in considerable quantity. Dr. G. O. Rees suggests that the ammonia is often set free in this manner, and not by the decomposition of the urea. The same observer (Lectures, *Med. Gaz.*, 1851) considers that the alkalinity of the urine is dependent in certain cases upon the secretion of a large quantity of an alkaline fluid from the mucous membrane of the bladder. When the mucous membrane is exposed, it is always found to be moistened by an alkaline fluid. When irritated, a quantity more than sufficient to neutralise the acidity of the urine is poured out. Dr. Rees explains the fact, that the acid reaction of urine not unfrequently becomes more intense after giving alkalies, by supposing that the alkali allays the irritable state of the mucous membrane, which in consequence secretes less of the alkaline fluid. In injuries to the spine, the beneficial action of alkalies is explained by supposing that the mucous membrane requires a greater quantity of alkali to protect it than in health. Still it is difficult to associate this explanation with the fact that healthy urine is *always* acid. If a slight excess of this *natural* acid really endangered the integrity of the mucous membrane, by exciting the secretion of excess of a *destructive* alkaline substance, one is almost forced to the false conclusion that the actual condition which exists is not so advantageous to the individual as the existence of a mucous membrane adapted to bear without change the constant action of an acid fluid would be.

Dr. G. O. Rees, as is well known, has also shown that in many cases the urine is actually secreted alkaline; indeed, he was the first observer who showed "that the degree of the acidity of the urine may to a certain extent be regarded as a measure of the acidity of the stomach".

The mucus which is deposited from many specimens of urine often contains a great number of octohedral crystals of oxalate of lime, frequently so very minute as to appear, under a power of two hundred diameters, like a number of dark square shaped spots. Their crystalline form may be demonstrated by the use of a very high power; but they may be recognised with certainty with a little practice, as their square shape presents a characteristic appearance, with which the eye soon becomes familiar. They are insoluble in a solution of potash, and also in strong acetic acid. These crystals are commonly not deposited until after the urine has left the bladder; and if it be allowed to stand for a longer period, they frequently undergo a great increase in size. Fragments of hair, small portions of cotton fibre, and other substances of accidental presence, are not unfrequently encrusted with them.

Vibriones. After urine containing a little epithelium or other animal matter has been allowed to stand for some time, numerous elongated bodies, varying much in length and possessing active movements, are developed in it. These

little bodies appear as simple lines under a magnifying power of two hundred diameters; but, by careful focussing, under one of five hundred or six hundred diameters, the longest of them are seen to consist of filaments with numerous transverse lines, indicating a similarity of structure with some of the lower vegetables. They sometimes very closely resemble one of the algæ ordinarily found in the mouth. Most observers agree as to the vegetable nature of the bodies in question; but Dr. Hassall has recently arrived at the conclusion that they are animal, and that the movements are voluntary (*Lancet*, Nov. 19th, 1859). That the movements are not merely molecular, is quite certain; but it seems to me that much stronger evidence of the animal nature of the vibriones is required than is afforded by the character of their movements, before we are justified in regarding them as animals. As investigation proceeds, the conclusion that many forms, which were considered animal, are really of a vegetable nature, is more frequently forced upon us than that organisms hitherto held to be vegetable, must really be regarded as animal. There is little to be gained by attempts to draw an arbitrary line between the lowest classes of the animal and vegetable kingdom.

These vegetable organisms are seen as minute lines under the microscope; and they undergo very active movements, the longer ones twisting about in a serpentine manner. They are sometimes developed in urine before it has left the bladder, and always occur in decomposing urine.

Other organisms are frequently met with in urine. Numerous forms of animalcules, one of which Dr. Hassall includes in the genus *bodo* (*bodo urinarius*), are also observed in various specimens of urine. It is probable that many of these forms merely indicate different stages of existence of one species.

Torulæ, including the *Sugar-Fungus* and *Penicillium Glaucum*. Certain forms of vegetable fungi or *torulæ* are developed in urine after it has been standing for some time. The period which elapses before the appearance of the fungi, and the particular species which is developed, vary much in different specimens of urine, and in different cases of disease. In diabetes, *torulæ* are often developed in quantity very soon (within a few hours) after the urine has been passed; and their growth at this early period leads the observer to suspect the presence of sugar, which must be confirmed by the application of chemical tests. (Lecture v.) Different forms of fungi are represented in the *Illustrations*, Pl. xix, Figs. 1 to 7; Pl. xxi, Fig. 6; Pl. xxiii, Figs. 2, 3, 4, 5.

Dr. Hassall has communicated a most interesting paper upon the development of *torulæ* in the urine, to the Royal Medical and Chirurgical Society, which will be found in the volume of *Transactions* for 1853. Dr. Hassall arrives at the conclusion that there is a species of fungus which is developed in specimens of urine, containing even very minute traces of sugar, which may be looked upon as characteristic of the presence of this substance, as it occurs in no other condition of the urine. This is the sugar fungus; but most observers are agreed that the characters of the fungus are by no means sufficiently constant to enable us to conclude as to the presence or absence of sugar in the urine. The sugar fungus in diabetic urine is identical with the yeast plant.

Besides the sugar fungus, however, there is another species which is very commonly met with in acid urine containing albumen, if exposed to the air. This is the *Penicillium glaucum*, the same fungus which is developed in the lactic acid fermentation. This species is represented in the *Illustrations*, Pl. xix, Figs. 1, 4, 5.

The microscopical characters of the fungi in different specimens of urine vary considerably; but, as Dr. Hassall has stated, these differences depend not upon the existence of several distinct species of plants, but rather upon the stage of development which the fungus has reached. Thus, in some specimens of urine, the growth of the fungus is arrested at the sporule stage; in another, not until a thallus is formed; and in a third, it goes on until aerial fructification takes place, and new spores are developed. The degree of acidity of the urine, and the length of time during which it has been exposed to the air, appear to determine, in great measure, the stage of development which the fungus attains. Dutrochet long ago stated that an acid reaction and albumen are necessary for the development of *penicillium*; but Dr. Hassall, in some more extended experiments, proved that the fungus often appeared in acid urine which contained no albumen; and I have frequently observed the same point myself.

The *penicillium glaucum*, as well as the sugar fungus, may be met with in saccharine urine, because all the necessary condi-

tions for its development may be present, namely, exposure to air, an acid liquid, and a certain quantity of nitrogenous matter. Mr. Hoffman of Margate showed that the spores of *penicillium* would, under favourable circumstances, give rise to the development of the sugar fungus.

From a careful consideration of this question, then, I think we may conclude that, although well defined differences may be made out at certain periods of growth of these fungi, *penicillium glaucum* and *torula cerevisiæ*, it must be conceded that there are also forms which could not be distinguished from one another. The large circular sporules of the sugar fungus are distinct enough from those of *penicillium glaucum*; but oval and circular sporules, which cannot easily be distinguished, are to be obtained under certain circumstances from each plant.

Sarcinæ are little vegetable organisms resembling little cubes, which are from time to time met with in peculiar cases of obstinate vomiting. They have been observed, however, in other fluids, and occasionally occur in the urine; but the specimens which have fallen under my notice in the urine were smaller than those which I have usually observed in vomit.

Sarcinæ have been met with in the urine by Heller, Dr. Mackay, Dr. Johnson, and by myself, under circumstances which leave no doubt that this vegetable organism is sometimes developed in urine. I once analysed a specimen of urine containing *sarcinæ*, which was sent me by my friend Mr. Brown of Lichfield. It was acid; specific gravity, 1018.6.

Analysis 59.

Water	952.8
Solid Matter	47.2
Organic Matter	37.9
Fixed Salts	9.3

The specimen was carefully examined for lactic acid, but not a trace could be detected.

Trichomonas Vaginæ. Donnè some years ago described, under the name of *trichomonas vaginæ*, an organism which he considered to be of an animal nature. It consists of a rounded cell, with vibratile filaments projecting from it, and was found in the urine of females suffering from leucorrhœa. Kölliker and Scanzoni have confirmed Donnè's observations, and have detected the *trichomonas* in the vaginal mucus both of impregnated and of unimpregnated women. I have never been fortunate enough to meet with a specimen of this organism.

Epithelium of the Genito-urinary Passages. The epithelium from the kidney has been already described. It is figured in the *Illustrations*, Pl. xxiv, Figs. 1, 2, 3, 4. The cells from the ureter are of the columnar form, and some are spindle-shaped. (*Illustrations*, Plate xxiv, Fig. 5.) In form, and indeed in their general appearance, these cells much resemble those found in scirrhus tumour. Care must be taken not to make the mistake in cases of suspected cancer of the kidney.

The epithelium of the bladder varies much in different parts of the organ. In the fundus, there is much columnar epithelium mixed with large oval cells; whereas, in that part termed the trigone, large and slightly flattened cells, with a very distinct nucleus and nucleolus, are most abundant. Columnar epithelium appears to line the mucous follicles, while the scaly lies on the surface of the mucous membrane between them. Various forms of bladder-epithelium are represented in Fig. 25.

Fig. 25.—Epithelium from the bladder. Many of the large cells lie upon the summit of the columnar and caudate cells, and depressions are seen on their under surface. One is seen in the centre of the figure.

The epithelial cells of the *urethra* are, for the most part, of

the columnar form; but mixed with this there is also a good deal of scaly epithelium. Towards the orifice, the epithelium is almost entirely of the scaly variety.

The large cells of scaly epithelium, so commonly met with in the urine of females, and derived from the *vagina*, are represented in Fig. 26. They vary, however, much in size and form, and are sometimes very irregular in shape, with uneven ragged edges.

Fig. 26.—Vaginal epithelium from urine.

Spermatozoa. The urine should be examined for spermatozoa as soon as possible after it has been passed, as they very rapidly become destroyed. They may be distinguished with a power of about two hundred diameters; but, unless the eye is familiar with them, it is better to employ one of from four hundred to five hundred.

Spermatozoa often form, with the mucus from the seminal tubules, whitish flocculi, which are suspended in the urine. They may sink to the bottom, forming a deposit invisible to the unaided eye.

Fig. 27.—Spermatozoa from urine. X 215.

You will sometimes be called upon to examine stains upon linen, or the vaginal mucus, in cases of suspected rape. Such an investigation must be undertaken with the greatest care; and you must not express a positive opinion if you have the slightest doubt as to the nature of the bodies in question; neither should you draw a conclusion from the presence of one body like a spermatozoon, nor from supposed fragments of their bodies. Fragments of cotton or linen sometimes assume forms very like those of spermatozoa. The mucus in which they are suspected to be present may be remoistened with distilled water, without the forms being destroyed. For cases in which spermatozoa were detected, see *Archives of Medicine*, vol. i, pp. 48, 139; *Illustrations*, Pl. xxi, Fig. 2.

Spermatozoa are not uncommonly found in the urine in health. It is only when their appearance is constant, and accompanied with other more important symptoms, that the practitioner is justified in interfering. Let me impress upon you the importance of exercising the greatest caution in these cases; for the mere allusion to the condition may do more harm to the patient's mind than can be counterbalanced by the good produced by medical treatment. The occasional presence of spermatozoa in urine must not be looked upon, in itself, as evidence of that condition to which the name of *spermatorrhœa* has been applied—a term which I am sorry to employ at all, and which, I think, ought to be abolished altogether.

Vegetable Bodies resembling Spermatozoa. The only structure occurring in urine, or of renal origin, at all liable to be mistaken for spermatozoa, as far as I am aware, are a form of vegetable growth which I have only once met with, in a specimen of urine kindly sent to me by my friend Mr. Masters of Peckham Rye. Mr. C. Roberts of St. George's Hospital has

Fig. 28.—Bodies very closely resembling spermatozoa, but probably of a vegetable nature. The one marked *a* especially resembles a spermatozoon.

taken very careful notes of the case. Some of the bodies in question very closely resembled spermatozoa; but their true nature was ascertained by noticing the characters of many other specimens of the vegetable growth. (Fig. 28.) An account of this case is given in the *Archives of Medicine*, vol. i, p. 251.

[To be continued.]

Addresses and Papers

READ AT THE

TWENTY-SEVENTH ANNUAL MEETING OF THE BRITISH MEDICAL ASSOCIATION.

[Held in LIVERPOOL, JULY 27th, 28th, and 29th, 1859.]

RETROVERSION OF THE GRAVID UTERUS.

By THOMAS SKINNER, M.D., Physician to the Northern Dispensary, Liverpool.

[Read in abstract, 29th July, 1859.]

II.—RETROVERSIO UTERI POST CONCEPTIONEM.

[Continued from page 519.]

(c) *Dimensions and Form of the Pelvis favouring the Displacement.* As regards the dimensions and form of the pelvis favouring retroversion of the gravid uterus, the facts are scanty; but there are sufficient to show that the accident happens in most of the ordinary varieties. In two cases of my own, besides the cases I have cited of retroversio uteri ante conceptionem, the pelves were perfectly natural. In Professor Godefroy's case (*Gazette Médicale de Paris*, 24th January, 1857), and in that of Mr. Greaves of Manchester (*JOURNAL*, 1859, p. 269), the pelves were of the *aquabiliter justo major* type. In four of Dr. Ramsbotham's cases, in one of Dr. Wm. Hunter's, and in one of Dr. Carmichael's, there was slight contraction of the conjugate diameter. Lastly, among the many cases of retroversion of the non-gravid uterus which I have examined, I have never found one which gave me the slightest cause to believe that the conformation of the pelvis had anything to do with the origin of the displacement. No one supposes that any peculiar form of the pelvis gives rise to anteversion or flexion of the unimpregnated uterus; wherefore, then, should the shape of the pelvis give origin to retroversion?

So far as the limited number of facts go, I think we are justified in concluding, that the accident may happen quite irrespective of the form of the pelvis; that a capacious one will admit of the displacement at a later date than where it is of a smaller type; and that a contracted brim indirectly favours