Pharmacopœia and that of the general body of prescribers; and such a separation would be out of harmony with the main purpose of the Pharmacopœia. But to offer the doses in terms both of the metric system and of the imperial notation, especially if the former were given the first rank, would give the decimal plan an opportunity with the prescribers of the future, without creating any division between the Pharmacopœia and the practitioners of the present day. No doubt, even if such a change is made, movement will be slow. But almost certainly there will be some movement, whereas, under existing conditions, the metric system in practical medicine and pharmacy gains many compliments, but makes no progress. It is in vain that advocates of this system address themselves to prescribers whose habits of thought and expression are already fixed; these are beyond hope and must be left in their sins. With the future generation there is some chance. But the Pharmacopœia must lead the way, and, in the fashion here proposed, it can do this without any sacrifice of the object and purpose for which, under the authority of the Legislature, it has been called into existence.

Harley-street, W.

THE BISMUTH URETERAL CATHETER, COLLAGOL SOLUTION, AND BARIUM SULPHATE SUSPENSION IN THE DIAGNOSIS OF SOME URINARY DISEASES.

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(With Illustrative Plate.)

Catheterisation of the Ureters.

As it is not possible to arrange to have the help of the same assistant every time I catheterise a ureter, I rely entirely upon myself for the performance of this operation. During an experience of six and a half years not a single patient has been infected, and this I attribute (1) to using strong antiseptics for my hands and (2) to the constant use of my aseptic ureteral catheter sheath which I introduced in 1907.

Aseptic ureteral catheterisation sheath.—This sheath (Fig. 1) reduces to a minimum the danger

base and funnelled apex); these are fixed to one another by two thin side rods marked A in the diagram. The screw-cap is a replica of the one on the upper end of the compartment for transmitting the ureteral catheter of the Nitze catheterisation cystoscope. A piece of rubber tubing, 22 inches long and with a bore of one-eighth of an inch, completes the apparatus. The rubber tubing is made to slip over the bulbous bell-mouthed apex of the "cone," and the whole is screwed on to the cystoscope. The ureteral catheter having been introduced into the rubber tubing the catheter is pushed onwards. Owing to the funnel-shaped apex of the metal portion the catheter B readily enters the lumen of the "cone," reappears between the two metal connecting rods, and negotiates the orifice leading into the ureteral compartment of the cystoscope. When the *vis a tergo* has introduced the catheter as far as possible, grasp it between the thumb and index finger of the right hand and push onwards as required. The advantages of this sheath are obvious. It is simplicity itself. The present real dangers from sepsis owing to the catheter touching the operator's face, hair, and being breathed upon are avoided. It is easily sterilised, for both rubber and metal portions will boil. Excepting for the end remote from the tip there is no need to handle the ureteric catheter until it is well inside the cystoscope. The rubber tubing can lie anywhere, over the cystoscopist's shoulder, in between the patient's legs, &c. Without this addition there is a great liability for the catheter to double up at the point of handling when it is being pushed onwards; the opposing thumb and index finger slide up and down the side rods and give the necessary support. It is necessary to use a lubricant for the rubber tubing in order to make the catheter travel more easily; a suitable one is glycerine, and it may be introduced by a sterilised pipette. This sheath can be fitted to any cystoscope.

I usually wear rubber gloves during the operation. Just before the introduction of the cystoscope a sterilised cotton glove is put on to the right hand over the rubber glove, as this cannot grasp the slippery lubricated ureteral catheter.

Technique.—I always have the patient in the full supine position on a reasonably firm bed or couch. During the early part of my career I failed in one or two cases to get a catheter into the ureter entirely because the patient was lost in the depths of a feather bed! If possible a general anæsthetic is never employed. Anæsthesia undoubtedly interferes with the renal function, which interference renders it difficult to get an accurate record of the amount of work each kidney is capable of performing. Moreover, I have a wholesome dread of injecting, either by a syringe or by gravity, any fluid into the renal pelvis of a patient who is unconscious through anæsthesia.

To avoid inserting a catheter into the wrong ureter.—Experience has taught me that to insert a catheter into the wrong ureter is a matter of great ease, especially if the patient is restive during the catheterisation. I have made this mistake more than once, and Fig. 2 shows an X ray photograph, with abnormal shadows

in the pelvis, where a bismuth bougie is in the wrong ureter. To avoid a recurrence of this mistake I now always put a blue pencil cross on the skin over Poupart's ligament of the side I wish to

FIG. 1.

Author's aseptic ureteral catheterisation sheath.

of carrying sepsis to the high urinary tract, and it comprises two detachable portions—namely, metal and rubber. The metal one consists of a perforated screw-cap and a conical-shaped portion (with broad

catheterise. This "cross" is constantly catching the operator's eye during the catheterisation and eliminates the source of error mentioned.

Mapping Out the Line of the Ureter.

To be able to map out the line of the ureter is of great use in the interpretation of any abnormal shadow in the situation of the renal pelvis, or line of the ureter. These abnormal shadows include a calculus in the pelvis of the kidney or the lumen of the ureter, also phleboliths, calcareous glands, and seminal vesical concretions (in the case of the male).

Methods of demonstrating the ureter.—These are (1) a silver stylet in the lumen of an ordinary ureter catheter; (2) a catheter, or bougie, impregnated with bismuth; and (3) collargol solution. Neither (1) nor (2) have proved to be quite satisfactory. Excepting in thin patients my results with the wire have not been very successful. The bismuth bougie and the catheter are both most unsatisfactory, for they are expensive, unreliable, and the deterioration is rapid; even if one capable of giving a good shadow is obtained, these bougies have a short, even if a useful, life. The last-mentioned method is, I think, the most certain way. The lumen of an ordinary ureter catheter is filled with a column of collargol solution, or the radiogram is taken while the collargol is trickling down the ureter from the renal pelvis. I understand that this method has now entirely replaced the use of the silver wire in the Mayo clinic.

Calculus in the renal pelvis.—Fig. 3 shows a bismuth bougie lying in the right ureter, and actually touching a large calculus in the pelvis of the right kidney. The patient was a young woman who seven years previously had had the appendix removed for persistent right iliac fossa pain; the operation of appendicectomy gave no relief. The calculus was subsequently removed by Professor Rutherford Morison, and the patient did well.

Calculus in the ureter.—Fig. 4 shows a bismuth bougie touching a stone. In such a case as this, with a stone lying in the lower end of the ureter, it is important not to move the cystoscope until the radiogram has been secured, otherwise there is a great danger of the catheter being withdrawn to a slight degree, and it will then fail to touch the stone. In this case the stone had been lodged in the same situation for some weeks previously. Dilatation of the ureteric orifice was sufficient to enable the stone, which was a spiculated one, to pass, and the patient voided it per urethram.

Shadows outside the ureter.—Fig. 5 demonstrates shadows in the pelvis, which by means of the bismuth bougie were proved to be away from the line of the ureter. The patient had previously passed renal calculi, which he showed to his medical attendant, and after a radiogram had been secured showing shadows in the pelvis he was sent to have these removed by operation. Fortunately for the patient, the bismuth bougie showed that the abnormal shadows were not calculi, and he was spared a useless operation.

To illustrate the necessity of sometimes mapping out not only the line of the ureter but also the renal pelvis.—Fig. 6 illustrates the necessity of not only using a bismuth bougie, but of employing collargol. This patient complained of right-sided renal colic, and X rays on two separate occasions showed a shadow in the same situation. A bismuth bougie was inserted as far as the renal pelvis, showing that the shadows were external to the line of the ureter. These shadows were then interpreted to

be in the lower pole of the kidney. Had pyelography been resorted to in this case I feel quite sure that I would have been able to have shown that these shadows were away from the kidney altogether; that they were not renal calculi was subsequently proved by operation.

Pyelography.

Voelcher, of Heidelberg, ingeniously conceived the idea of mapping out the renal pelvis with collargol solution in order to gain information as to its size, shape, and position. This was enthusiastically taken up by Braasch, who recently recorded having successfully done over 1000 cases by this method.

Strength of collargol solution used.—With regard to the degree of dilution of the collargol, I have used solutions varying from 3 to 20 per cent., but 10 per cent. is the strength usually employed. The strength of the solution largely depends (1) upon the stoutness of the patient; (2) upon the degree of a hydronephrosis (if such be present), which it is impossible, as a rule, to empty completely through the ureter catheter, and which results in a further dilution of the collargol solution; and (3) if an abnormal shadow has been seen in the situation of the renal pelvis a weak solution must be employed, for should a stone be lying in the pelvis or a calyx and too strong a solution used, the probability is that the calculus shadow will be obliterated by the collargol shadow.

Effects of collargol.—Various dangers in the injection of collargol have been mentioned. In addition to sepsis Oehlbecker reports a case where there were areas of necrosis, infarction, and cast formation after the renal pelvis had been distended under high pressure. Zacharisson found casts one year after injecting the healthy kidney; Jewell reports embolic gangrene; while Eckehorn records a case of œdema of the kidney. In order to ascertain the truth of these statements Strassmann experimented on live rabbits, and came to the conclusion that the injection of collargol in proper amounts and under moderate and careful pressure into the renal pelvis does not produce harmful results and in no way brings about noteworthy changes in the pelvis of the kidney.

I have now injected collargol in a large number of cases without any ill after-effect. Braasch also reports over 1000 cases without any harmful result. I have had one case where a considerable quantity of collargol lay in a hydronephrotic kidney for a fortnight without doing any harm whatever, the condition being found at operation. If I

DESCRIPTIONS OF ILLUSTRATIVE PLATE.

FIG. 2.—Showing abnormal shadows in pelvis, with bougie in wrong ureter.

FIG. 3.—Showing bismuth bougie in right ureter, touching calculus in right renal pelvis.

FIG. 4.—Showing bougie touching a stone, with cystoscope in position.

FIG. 5.—Showing shadows in pelvis proved by bougie to be away from ureter.

FIG. 6.—Showing shadows external to line of ureter.

FIG. 7.—Showing large hydronephrosis.

FIGS. 8 AND 9.—Showing shadows following injection of collargol.

FIG. 10.—Showing hydronephrosis. Note that shadow of pelvis is separate from that of catheter in ureter.

FIG. 11.—Radiograms of different solutions.

1.	BaSO ₄	= 10 + 1	...	...	...	
2.	"	= 10 + 2	...	...	...	
3.	"	= 10 + 4	...	...	...	i.e., 10 parts of ol. amygd. dulc.
4.	"	= 10 + 5	...	...	...	+ 1 part of BaSO ₄ .
5.	Collargol	= 10%	...	...	...	

FIG. 12.—Showing bladder distended with barium sulphate solution in oil.

make a collargol injection for diagnostic purposes the renal pelvis is emptied through the ureter catheter before the latter is withdrawn. If, however, the collargol is injected for purposes of medication, then it is not withdrawn, but left to find its own way out. I feel satisfied, therefore, that where harm has been done it has been due to

FIG. 13.

Syringe and piston.

over-distension of the renal pelvis, amounting, perhaps, to even rupture, and in all these cases the patient was probably under a general anæsthetic.

Technique of injection without a general anæsthetic.—After getting the ureter catheter *in situ* the kidney area is palpated to empty a hydronephrosis, if such be present, and in any case I collect sufficient urine to make a complete examination before proceeding to inject the collargol. In this way the catheterisation serves two separate useful purposes: (1) the renal function is estimated; and (2) the degree of any hydronephrosis is ascertained. The collargol is then injected with a syringe if the patient has not had an anæsthetic, or by means of gravity if an anæsthetic has been employed.

To obtain a syringe which is satisfactory for the purpose of injection has been a matter of no small difficulty, owing to leakage past the piston. It is necessary to have a syringe of about four ounces capacity and one easily sterilised. The piston must work easily; although if it is too free then the solution leaks past the piston and the actual amount injected into the renal pelvis is unknown. The piston of the syringe I now use has two rings on it, and these prevent any leakage past of the collargol solution. (Fig. 13.) The lumen of the barrel should be lubricated with sterile vaseline

before sterilisation of the syringe in order to facilitate its working. The metal rod connecting the piston to the handle is marked off in 5 centimetres in order that the amount of solution injected can be easily ascertained.

It is absolutely essential to make the injection slowly. As the lumen of the ureteric catheter is very small the nozzle of the syringe must also be of small calibre. The funnel of a ureter catheter is of little use to me, as I usually withdraw the cystoscope and leave the catheter *in situ*, and of course the large funnel cannot travel along the small compartment of the cystoscope.

If it is desired accurately to determine the degree of hydronephrosis the ureteric orifice must be watched by means of the cystoscope during the injection of the collargol. Immediately the black-coloured fluid runs into the bladder alongside the catheter the operator knows that the limit of distension of that renal pelvis has been reached.

Technique of injection with a general anæsthetic.—For injecting collargol where the patient is under an anæsthetic I ascertain if possible the size of the renal pelvis by bimanually compressing the same, and carefully measure any urine secured. It is only safe to allow a similar amount of collargol to run into the renal pelvis, and even then I use an

FIG. 14.

Irrigator and nozzle.

irrigator attached to the small nozzle by flexible rubber tubing, this nozzle being of smaller size than that of the syringe. (Fig. 14.) The collargol solution is allowed to run in by gravity.

I attach great importance to the distension of the renal pelvis *without* a general anæsthetic, for the patient can promptly indicate when sufficient has

been injected by informing the operator of discomfort felt in the side. Under an anæsthetic I consider it more than possible that the renal pelvis can be ruptured by excessive distension, for it is impossible to know when the right amount has been injected. If anæsthesia is necessary I recommend that the renal distension be postponed until the patient is again in full possession of his normal sensations.

Hydronephrosis.—Where there is a hydronephrosis I endeavour to gauge the degree of distension and inject an equal amount of collargol. It has not proved very satisfactory, for in the first place it is not easy to empty completely a hydronephrosis through a ureter catheter; and secondly, the collargol injected mixes with the urine lying in the pelvis or calyces, and produces dilution to a greater or less degree. Moreover, with an anæsthetic, even if one gauges the amount of urine obtained and injects an equal amount of collargol, it is usually far short of full distension of the renal pelvis. Fig. 7 shows a large right-sided hydronephrosis which comfortably held 180 c.c. of 10 per cent. collargol solution, together with a left-sided renal pelvis with a capacity of 15 c.c. No anæsthesia was used. Figs. 8 and 9 also show injections without an anæsthetic. Fig. 10 is an interesting radiogram (taken without general anæsthesia), for there is not only a hydronephrosis, but the pelvis shadow is separated from the ureter catheter, which was impregnated with bismuth. Apparently, although the patient did not complain of any colic, the renal pelvis was in a state of spasm, which accounts for the interruption of the shadow. Injections of collargol in suitable cases of pyelitis are, I am convinced, productive of much good.

Neoplasms.—Pyelography has proved useful in the diagnosis of early neoplasms. If a growth is in one of the kidney poles a tilting of the organ occurs and pyelography demonstrates an alteration in the position of the renal pelvis. Again, the shadows of the calyces are sometimes very much elongated, due to encroachment of the growth, and this flattening out is suggestive of a renal tumour.

Sacculi of the Bladder shown up with Barium Sulphate Solution.

In some cases it is extremely useful to get a radiogram of the bladder to show up a diverticulum or a sacculus. To do this with collargol solution is almost prohibitive on account of the cost. I made some experiments with suspensions of barium sulphate, which was held in suspension by oleum amygdalæ dulcis. A solution of 10 per cent. of collargol in a test-tube was compared with various strengths of barium sulphate suspension. I found that the suspension which corresponded nearest to the collargol solution was one made up of two parts of barium sulphate suspended in 10 parts of oleum amygdalæ dulcis. See Fig. 11 for a radiogram of the different solutions.

In a cystoscopic examination of a case I noticed sacculi of the bladder. I distended this bladder with a pint of the mixture mentioned—i.e., two parts barium sulphate and 10 parts of oleum amygdalæ dulcis, and Fig. 12 shows the radiogram obtained. On one side of the pelvis are two sacculi. After the patient had emptied his bladder I cystoscoped him and found that all the barium sulphate had been voided. I would not care to take the responsibility of injecting this mixture into the

renal pelvis, but probably before long a satisfactory medium will be introduced which will enable us to dispense with the expensive collargol solution.

The radiograms were taken by Dr. W. D. Arnison, of Newcastle-upon-Tyne.

Newcastle-upon-Tyne.

PROTEIN METABOLISM DURING STARVATION AND AFTER THE ADMINISTRATION OF MILK PROTEIN.¹

By GUSTAV MANN.

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THE question of protein metabolism during starvation and after the administration of albuminous foods is one so full of difficulties that all means should be employed which promise to throw some light on this question. Curiously enough, the apathy towards physiological histology has resulted in not a single paper having been produced in which actual observation is substituted for speculation. How little the question of protein metabolism is understood, and how wild theories may become, is especially well seen when dealing with explanations of Abderhalden's test for pregnancy.

Under normal conditions, in both the male and the female, when the amino-acids resulting from the digestion of protein food are placed at the disposal of all the cells of the body through the blood stream, the competition for these acids will be proportional to the needs of each cell, and also proportional to the capacity each cell has of incorporating the amino-acids. As long as a cell is able to compete successfully against its fellow cells, so long will it thrive; when the competition becomes too keen, then the cell dies, undergoes autolysis, by which it is converted into free amino-acids, and thus it helps to feed its more vigorous fellow cells.

When no protein food is available a readjustment of the cells in the body takes place, in consequence of which those cells which have most work to do live on other cells which have less work to do, without leading of necessity to the death of the latter. Each normal cell, in such an environment as to be able to procure its protein food substances, will store the latter within itself or, to put it more correctly, will build itself up on larger proportions.

The protein which is not simply in the cell and in the tissue fluids, but which has been built up into the cell and which is specific for that cell, is in largest amount after a cell has just finished feeding, and this protein we may call the "total" cell protein. If a cell is given food at regular intervals of time then an adjustment takes place, in consequence of which a certain percentage of the total protein is made use of by each cell in the time which elapses between the end of the last meal and the commencement of the next meal. The protein which a cell loses in this way, either by providing for its own needs or for those of the body as a whole, we may call the "available" cell protein. If food be withheld for a sufficiently long time cells will die from starvation, notwithstanding the fact of there still being left a considerable amount of protein material surrounding the nucleus. That protein which cannot be made use of in the general

¹ In continuation of a paper published in THE LANCET of Oct. 19th, 1912, p. 1069, on the Changes induced in Blood by Feeding, by Professor Gustav Mann and Dr. John G. Gage.