and suitable steps taken to conclude the operation efficiently. Otherwise the misery of a long-persisting discharge from a sinus will ensue, and there is also quite a probability that the patient will have to be treated for a recurrence of cyst formation at a later date.

It does not follow that because two or more cysts are discovered they should all be operated on at the same sitting. Do not let zeal outstrip discretion. The old wisecrack that I first heard at the Mayo Clinic over thirty years ago is still worth repeating: "There are some things worse than a second operation, and one of them is a funeral."

The Alveolar Type of Hydatid Cyst

Alveolar echinococcosis of the liver, common in the Bavaro-Tyrolean regions of Europe but non-existent or almost so in other hydatid countries, is quite likely to be mistaken for cancer, and no wonder, for it is an infiltrating malignant toxic type of hydatid infection almost invariably fatal. Space forbids further reference to it in this article.

NON-OPAQUE URETERIC CALCULI

BY

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The well-defined and typical case of renal colic for which no satisfactory explanation is afforded by a urological investigation is well known, and presents one of the most perplexing problems of surgery. The group of cases described in hospital records under the heading of unclassified renal symptoms has been somewhat diminished in recent years by the elimination of cases of renal sympatheticotonus. There still remain, however, a number of these unsatisfactory cases which constitute at once a reproach to surgery and a problem to the patients themselves and to their family practitioners. Again, it is not an unheard-of situation for the surgeon, on the strength of negative x-ray findings, to assure the patient that no stone is present and for the patient to pass a stone within a short period.

The excellence of the x-ray services in the majority of our hospitals has in all probability deflected attention from consideration of the non-opaque stone, which does not appear to be as infrequent as is generally supposed. On the one hand, Thurstan Holland (1913) states that in 5,000 kidney examinations there has never been a stone found at operation when he has returned a negative report. Similarly, Swift Joly (1929) can demonstrate by a plain radiograph 98 per cent. of renal and 96 per cent. of ureteric stones, and says that "with an ordinary adult patient any stone larger than a pin's head ought to show a definite shadow unless it is composed of urates or uric acid." The late Sir John Thomson-Walker considered that 5 per cent. of urinary stones could not be demonstrated by a plain radiograph. On the other hand, Hinman (1935) thinks that 10 per cent. of stones are missed, which, when compared with the above figures, may mean that Americans are poorer radiologists or better diagnosticians. Cabot (1936) confirms Hinman so far as America is concerned, and definitely commits himself to the statement that 8 per cent. of stones throw no shadow. Shanks and others (1938) point out that the proportion depends on the quality of the radiographs and on the

thoroughness of the clinical diagnosis, antagonistic factors which probably account for considerable variation in the published figures.

This particular aspect of urinary lithiasis has excited more interest on the Continent than in this country, and a number of papers have been written during recent years, notable among which is the contribution of Rangl and Bachrach, who go so far as to state that 15 to 30 per cent. of stones are translucent to x-ray examination. These Continental figures are also confirmed by K. Brandes (1933), who gives a percentage of 10 to 30, and by Tebaldo Cimino (1933), who describes a series of transparent stones dealt with personally. While deprecating the extreme figures quoted by these Continental authorities, I suggest that the classical figure given in this country of 2 per cent. is somewhat low, and that probably 2 to 5 per cent. of stones are non-opaque to x-ray examination. If the majority of these cases can be weeded out of the "unclassified renal colic" group, definite progress will have been achieved. It is the object of this communication to indicate possible methods of distinguishing these obscure and difficult cases.

Pathology

Although some authorities allege that cystine stones do not throw an x-ray shadow, this is extremely doubtful, and for all practical purposes the stones of importance in this connexion are composed of uric acid and urates. Stones thus constituted are said to be more common in America than in Europe, and these particular constituents often form a nucleus of a large stone which becomes demonstrable by radiograph on account of deposition of oxalates, carbonates, and phosphates. Such a nucleus may lodge in the ureter before deposition of opaque substances has taken place. Hinman points out that "a stone of indifferently opacity (mixed composition) may have its shadows obscured by the position of a bone—that is, a lumbar transverse process or ilium." The absence of a definite shadow and the obscurity of the diagnosis in these cases encourages procrastination, which in time may lead almost imperceptibly to marked renal damage by hydronephrosis or even pyonephrosis. This is well illustrated by one of the cases described below. In short, the complications which may be encountered in a case of non-opaque stone in the ureter may be more severe by the time the case reaches operation than when the stone is demonstrable by x rays. Dr. Girdwood, who analysed one of these stones for me, writes as follows:

"The stone (Case V) was of a brownish colour on the outside and of a soft consistence, the centre being white and rather chalky. On analysis the stone gave positive reactions for uric acid and phosphates, but failed to respond to the tests for cystine and xanthine.

"Substances which enter the composition of urinary calculi are uric acid, urates of sodium and ammonia, calcium phosphate, calcium carbonate, ammonium and magnesium phosphate, cystine, xanthine, and indigo. Cystine, xanthine, and indigo calculi are extremely rare. Uric acid, calcium oxalate, and other crystals may be passed for years in the urine without any tendency to calculus formation. Colloidal substances are necessary for 'binding' purposes. These colloids may be divided up into two groups—namely, reversible and irreversible. The latter are necessary for stone formation, but are never found in normal urine. The most important of these is fibrin, found in the urine in inflammatory conditions and in haematuria.

"Pure uric acid stones are transparent to x rays, and in a suspected case of such a calculus valuable corroborative evidence may be obtained by the demonstration of the charac-

teristic crystals in the urine. Uric acid, the end-result of purine metabolism, and its intermediate products may well give rise to calculi which are non-opaque to x rays."

Diagnosis

The diagnosis is always difficult, and so rarely is it precise and definite that, even when the condition is suspected, confirmation may be almost impossible to obtain. Where a typical attack of renal colic associated with haematuria is accompanied by negative x-ray findings, a non-opaque stone should be considered in the differential diagnosis, and if possible confirmed or excluded. The multiplicity of methods cited in the diagnosis of this condition indicates the difficulties encountered. Among these methods are the following:

1. An intravenous pyelogram may reveal the following abnormalities: (a) the film may show a clear area in the ureteric shadow; (b) a hydronephrosis, and a hydro-ureter involving the upper portion of the ureter, may be demonstrated. The difficulty which arises is that the opaque fluid may completely cover the stone and give a regularly opaque appearance.

2. *Obstruction of the Ureter.*—This is demonstrated by the inability to pass a ureteric catheter more than a certain distance up the ureter. In order to put the test on a sounder basis, it is necessary to repeat the manoeuvre with varying amounts of lotion in the bladder. The size of the catheter should be large, as one of a narrow bore may pass the stone with a little difficulty.

3. *The Use of Wax-ended Ureteric Bougies.*—I have never found these of any value, and the method appears to have little or no place in the scientific investigation of the condition.

4. *Lateral X-ray Film.*—Munchener demonstrates the importance of this method of investigation. Owing to the relatively dense and irregular shadow thrown by the articular processes and by the outline of the fifth lumbar vertebra (and the vascular crossing), faintly opaque stones may be missed in the middle third of the ureter. He considers that a lateral view of this portion of the ureter should be carried out in all suspected cases, and may yield a positive result.

5. *Cystoscopic Findings.*—Delay in the unilateral excretion of indigo-carmin may be helpful, and when the stone is situated at the lower end of the ureter, oedema, actual bulging of the interureteric portion of the ureter (the so-called "stone orifice"), or excretion of pus and a cloudy efflux may be observed.

6. *Injection of Air or Oxygen.*—This is a method more favoured on the Continent than in this country, where it has been little used owing to the danger of air embolism. That this is no idle fear is emphasized once again by Dible, Ross, Hewer, and Walsh (1938), who recently reported sudden deaths due to air distension during urethroscopy and insufflation of the Fallopian tubes. Rangl and Bachrach, however, point out that the injection of oxygen into the ureter and renal pelvis causes little or no risk and may be helpful in demonstrating a stone. Although K. Brandes advocates the use of air, he also points out that the renal pelvis may be so inelastic on account of inflammatory induration that distension is impossible.

7. *Retrograde Pyelography.*—Rangl and Bachrach indicate the value of this method when the stone is shown as a clear area surrounded by the opaque shadow, the precise definition distinguishing it from a filling defect due to a neoplasm. It is especially of value when small quantities of opaque fluid—that is, 2 to 3 c.cm.—are injected, and a second x-ray film is taken after the renal pelvis has been drained of opaque fluid. On the latter x-ray film a thin covering of opaque fluid may adhere to and outline a non-opaque stone (Kummel). Dilution of the opaque fluid is sometimes an advantage (Gottstein).

8. *Uretero-pyelography.*—This appears to be the logical method to be adopted in all cases of suspected non-opaque stones, especially those thought to be in the ureter. Professor Chevassu, in a personal communication, says: "Quand les calculs transparents aux rayons X ont une dimension suf-

fisante, ils deviennent visibles sous forme d'une tache claire au milieu de l'injection opaque. J'en ai décelé ainsi un assez grand nombre." Chevassu goes on to point out that, although it is most necessary to avoid the introduction of an air bubble, should this accident occur the regular rounded appearance of the clear area suggests its true origin. The method is straightforward, involving the use of a special ureteric catheter with a pear-shaped extremity which fits readily and forms a water-tight plug in the lower end of the ureter. The opaque fluid is then injected and the x-ray film taken while the special catheter is held firmly in the lower end of the ureter to obviate leakage. An excellent outline of the renal pelvis and ureter can then be obtained. I have used this method of investigation in a number of suspected cases, and in Case V, described below, the non-opaque stone was readily demonstrated. The size of the pear-shaped end necessitates the use of an operating cystoscope rather than the single or double catheterizing instrument.

Treatment

The ordinary opaque stone in the ureter is rightly treated by expectant means, by forced diuresis, and by antispasmodic drugs such as belladonna and tinct. amni visnagi, for a number of months, always provided that there is no supervention of urinary infection and no evidence of obstruction causing early hydronephrosis. Another proviso is that the size of the stone should be such that there is a reasonable chance of its passage. Bumpus (1932) is of the opinion that stones larger than 1.5 cm. to 2 cm. in diameter should be removed by open operation, as this figure represents the extreme degree of dilatation possible at the uretero-vesical orifice in the average individual. The progress of such a stone is observed by periodic x-ray examination, and its passage may be assisted by the insertion of large-sized ureteric catheters, by dilatation, or division by scissors or diathermy of the vesical opening of the ureter, and by the intra-ureteric introduction of liquid paraffin, papaverine, etc. It is common experience for a fair proportion of such stones to be passed per urethram, and in a large series of 1,000 cases Bumpus reports that 146 were passed within a few weeks of the simple passage of a ureteric catheter.

In the non-opaque stones under discussion, however, no regular check can be employed, and in fact the diagnosis is never certain until the stone has been passed or removed by operation. The dangers attendant on leaving such a case appear to outweigh far the inconvenience of an open operation. It has been the custom to assume that any stone not apparent on x-ray examination is of minute size, and so certain to pass without intervention that such stones have been termed non-surgical calculi. That such a comfortable supposition is untenable is shown by the cases described below, in one of which a pyonephrosis developed. Further, in each of the three cases in which a calculus was removed from the middle third of the ureter the stone was definitely impacted. In the fifth case the ureter was inflamed and much thickened in the vicinity of the stone, the increased size being due more to thickening of the ureteric wall than to actual dilatation of the lumen.

Case I

A woman aged 37 who had had increasing dysuria and frequency from the birth of her child eight months previously was admitted with a right-sided pyonephrosis. An x-ray examination revealed an enlarged kidney but no calculi, and at cystoscopy a cloudy efflux was obtained from the right side, the left kidney functioning well after intravenous administration of indigo-carmin. A nephrectomy was performed, the kidney comprising a bag of pus, and impacted at the uretero-pelvic junction was found a calculus half an inch in diameter. Following operation her convalescence was uneventful.

Case II

A youth aged 17 was admitted to hospital complaining of several characteristic attacks of left renal colic associated with haematuria. A straight x-ray film of the urinary tract failed to reveal any stone, but a uroselectan examination showed some pelvic hydronephrosis of the left kidney, the ureter being also dilated as far as the pelvic brim. At cystoscopy it was found to be impossible to pass a ureteric catheter of any size further than the pelvic brim. Accordingly, a tentative diagnosis of non-opaque ureteric calculus was made, and operation proposed. At operation the left ureter was exposed extraperitoneally at the brim of the pelvis by a midline infra-umbilical incision. The ureter was found to be thickened and congested, and to be dilated as far as the brim of the pelvis, and of normal size below that point, at which a calculus could be palpated. A vertical incision was made in the axis of the ureter, the stone was removed, and the patency of the whole length of the tube was demonstrated by the passage of a sound up to the renal pelvis and down into the bladder. The ureteric incision was sutured in a transverse manner to obviate the possible development of a stricture, and the wound closed with a drainage tube. The patient progressed satisfactorily following the operation, which was performed in 1936. He wrote recently to say that he had had no further symptoms of any sort.

Case III

A youth aged 18 was admitted to hospital suffering from left renal pain which radiated to the left groin. The pain was severe enough to cause him to vomit on several occasions, and there was associated vesical tenesmus. A similar attack had occurred six weeks previously. No shadow of a calculus was shown on straight x-ray examination, but a moderate degree of hydronephrosis was seen on the left side following administration of uroselectan. There was also a hydro-ureter extending downwards as far as the sacro-iliac joint. At cystoscopy a ureteric catheter could not be passed higher than the sacro-iliac joint. A tentative diagnosis of non-opaque stone in the ureter was made and operation carried out. The left ureter was exposed extraperitoneally just above the pelvic brim through a left gridiron incision, and a small stone was found impacted just below the pelvic brim, above which the ureter was dilated. It was impossible to milk the stone upwards owing to its impaction, so removal was carried out *in situ* by incising the ureter in its long axis over the calculus, which was the size and shape of a small date-stone. The patency of the ureter having been established, the incision in the ureter was sutured and the wound closed, with drainage. Convalescence was satisfactory, and a uroselectan examination carried out some months later revealed a normal left kidney, the left ureter showing no evidence of dilatation or stricture.

Case IV

A woman aged 57 was admitted with severe attacks of pain situated in the right iliac fossa accompanied by a sense of discomfort in the right loin and frequency of micturition. A straight x-ray film of the urinary tract revealed no opacity; a uroselectan examination showed the right kidney to be hydronephrotic and the right ureter to be dilated in its whole length. When reporting the uroselectan films Dr. R. E. Roberts suggested the possibility of a small stone in the lower end of the right ureter on to which the uroselectan appeared to have been adsorbed. At cystoscopy considerable oedema and swelling was observed in the vicinity of the right ureteric orifice, and a ureteric catheter on its way up to the kidney successfully passed a hitch or obstruction 2.5 cm. from the bladder. As a stone was suspected a ureteric catheter was left *in situ* for forty-eight hours, during which period sterile liquid paraffin was injected through the catheter at regular intervals. Forced diuresis was instituted, belladonna and tinct. amni visnagi were administered, a tiny stone being passed a few hours after the removal of the ureteric catheter. A subsequent uroselectan examination showed that all evidence of hydronephrosis and hydro-ureter had disappeared.

Case V

A woman aged 30 was sent into hospital as a case of suspected appendicitis. The localization and severity of the pain, in conjunction with pyuria, dysuria, and frequency of micturition, rendered the right ureter suspect. A straight x-ray film of the urinary tract was completely negative, but a uroselectan examination showed a pelvic hydronephrosis of moderate degree. There was no hydro-ureter on this occasion. At cystoscopy a ureteric catheter could not be passed beyond the pelvic brim on the right side, and a blood-stained efflux was obtained from the ureteric orifice on attempting to do so. The diagnosis appeared to be still somewhat doubtful, so a uretero-pyelogram was carried out by the method of Chevassu. Approximately 12 c.cm. of opaque fluid was injected, and the uretero-pyelogram revealed a definite filling defect of the pelvic brim, suggesting a diagnosis of non-opaque stone. At operation the right ureter was exposed by a right paramedian incision, below the level of the umbilicus. The ureter was found to be inflamed, thickened, and indurated, the diameter being approximately three-quarters of an inch. An impacted calculus was palpated just below the pelvic brim and was removed by an incision in the axis of the ureter. The patency of the ureter was confirmed, and the ureteric opening was closed by interrupted sutures. The abdominal wound was closed, with drainage. Convalescence was uneventful.

Case VI

This case was that of a man aged 57 who was admitted to hospital with severe left-sided renal colic. There was a doubtful history of vague backache in the loin on the same side for some months, but there were no urinary symptoms. X-ray films of the urinary tract were negative, and while a uroselectan examination showed the right renal pelvis and ureter normal in appearance and the kidney functioning normally, no dye was excreted by the left side. The urine contained a trace of albumin and a few red blood corpuscles. Two days elapsed between the uroselectan examination and the cystoscopy, and during this time a severe bout of colic was experienced. At cystoscopy a small brownish stone about 0.5 cm. in diameter was found in the bladder, and the left ureteric orifice was swollen, oedematous, and surrounded by ecchymosis. After intravenous injection of indigo-carmin, the dye was excreted well from both sides within five minutes of injection, and a ureteric catheter passed readily up to the left kidney. A subsequent pyelogram was normal, and several ounces of urine were passed through the ureteric catheter during a period of twelve hours. The stone was grasped by cystoscopic forceps and withdrawn from the bladder as the cystoscope was removed. The sequence of events in this most instructive case is clear. The non-opaque stone while still in the ureter caused colic and reflex inhibition of secretion on the occasion when the uroselectan examination was carried out. The stone was passed the day after this examination and was in the bladder at cystoscopy. By this time the left kidney had completely recovered its function, as was demonstrated not only by the normal excretion of indigo-carmin but also by the profuse flow of urine obtained by the ureteric catheter.

Summary and Conclusions

A certain percentage of cases of otherwise unexplained renal colic are due to non-opaque urinary calculi.

The proportion of non-opaque stones given by different authorities varies from 2 to 30 per cent. Probably 2 to 5 per cent. is the correct figure for this country.

The difficulties of making the diagnosis and the various diagnostic procedures advocated are described. The uretero-pyelogram appears to be the most logical method and to promise the most reliable results.

It would seem advisable to carry out a uretero-pyelogram in any case of otherwise unexplained renal colic.

The complications liable to be encountered in neglected or overlooked cases are indicated.

Operative treatment, without the usual preliminary period of conservatism, is probably safer in suspected cases. The clinical histories of six cases of the condition are reported.

I am indebted to Dr. R. E. Roberts and Dr. P. H. Whitaker for the various x-ray investigations.

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AETIOLOGY AND TREATMENT OF SPASMODIC FLAT-FOOT*

BY

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Let me say at the outset that I have not solved the problem of acute spasmodic valgus. That condition is now well defined and well recognized, but its cause is as obscure as ever, and the most I can hope to do is to give a concise summary of the present state of our ignorance. Its clinical characteristics are striking and fairly uniform. They differ only in intensity; consequently the condition is easily recognizable clinically, and it is so sharply defined and so different from all other forms of flat-foot that it may properly be regarded as a *clinical* entity. I do not think, however, that it is entitled to be regarded as a pathological entity. On the contrary, I believe that consideration of all the known facts will lead us to the conclusion that acute spasmodic valgus arises, in certain circumstances, out of various orthopaedic diseases of known pathology, and that it has not a distinct pathology of its own.

Incidence of Spasmodic Flat-foot

In London, among 1,000 patients seen at an ordinary general hospital orthopaedic out-patient clinic, there were 141 cases of flat-foot of all kinds, and eight of these were indexed as cases of acute spasmodic valgus—that is to say, they formed 5.7 per cent. of all cases of flat-foot. The sexes were affected in approximately equal numbers, and the average age of the male patients was 18 years and that of the female patients 15½ years. It was noticeable that in a number of the cases the patients had left school recently or early, and had undertaken somewhat arduous forms of work, in which they would be on their feet for many hours. Boys, for example, were found to have become errand boys to an ironmonger, or to be working in a foundry or a quarry; the girls, while still at the age of puberty or hardly past it, had become waitresses, laundry workers, etc.

* Read in opening a discussion in the Section of Orthopaedics and Fractures at the Annual Meeting of the British Medical Association, Aberdeen, 1939.

In about a quarter of the cases there was a history of some recent sprain or twist of the affected foot. In those which gave a history of injury the condition was nearly always unilateral; and when it was due to what might be called general or constitutional causes it was sometimes bilateral, but even then one foot was affected more severely than the other. Taking all the cases together, it was found that the left foot was affected more often than the right.

Definition of the Condition

A precise scientific definition is, I think, impossible; but it is easy to give a word-picture of what is meant by the term "acute spasmodic valgus." We mean a case in which the foot is strongly everted by the action of the

peronei and of the extensor communis digitorum muscles. The foot is held rigidly in that position, and the slightest attempt to adduct or invert it passively causes intense pain, and to do so is, in fact, quite impossible; but in sleep, or when muscular relaxation is induced by full anaesthesia, the rigidity disappears entirely, and the foot can be moved easily into any desired position without the slightest obstacle being encountered, even momentarily. In particular, in a recent case one never notices the slightest suggestion of the giving way of any adhesions, or any other physical obstacle to the restoration of the normal position of the foot. This is important. The condition seems to be one of acute spasm, and of nothing more than spasm. Even after many weeks full anaesthesia often reveals that the deformity is still entirely caused by spasm, though in a few cases (presumably those in which some inflammatory but not necessarily infective cause was the exciting condition) adhesions may ultimately appear. The foot is exceedingly painful; the patient can walk for a very short distance only, and his gait lacks all spring, whilst running, games, and dancing are quite out of the question.

Those cases which originate in a sprain of the ankle or of the foot are invariably found to have had little or no early treatment: acute spasmodic valgus does not appear as a complication of fractures or of dislocations at the ankle, or even of a sprain which is severe enough to send the patient of necessity to bed and keep him there. The history invariably is that the injury was regarded as being "just a mere sprain." The patient walked about much as usual; pain and disability appeared later and gradually became more and more severe, until at the time of examination the foot presented the characteristic fixed everted appearance, with the peroneal and common extensor tendons standing out beneath the skin as tense as they could possibly be.