and overhanging, as in rheumatoid disease; the articular cartilage was thin, frayed and in places, especially on the inner condyle, grooved antero-posteriorly, but the articular plate of bone was nowhere exposed; thus eburnation, so characteristic of rheumatoid disease, was absent. Further, the synovial membrane that covers the outer sides of the condyles for about half an inch from the articular margin was covered, just as that immediately above the patella, by innumerable slender and delicate polypi. The chief changes in the articular end of the femur are well shown in Fig. 3.

Fig. 3.—Lower end of femur, showing lipping of articular margins and grooving of articular cartilage. Natural size.

III. In the articular end of the tibia similar changes were observed, but there was in addition, in the middle of the upper surface of the inner tuberosity, a small, soft, or carious area of the bone, about the size of a pea, over which the cartilage had disappeared. This was the only spot in the bones where the hard tissue was replaced by soft. Under the microscope this soft area was seen to be composed of vascular and cellular connective tissue, resembling granulation tissue, the surrounding bone being in a state of rarefaction, the cancelli large, and occupied by small round cells. In the soft tissue there were no giant-cell systems nor any other indication of the tuberculous process, but where the bone was undergoing absorption the giant cells peculiar to bone, osteoclasts, were seen. The articular cartilage covering both tibia and femur showed the usual changes—namely, proliferation of cells with fibrillation of matrix, seen in rheumatoid disease.

To recapitulate: the formation of bony plates in the synovial pouch above the knee was found associated with (1) lipping of the articular margins; (2) fibrillation and thinning of the articular cartilage; (3) grooving of the same; (4) innumerable polypi on the inner surface of the synovial membrane; (5) a small area of softening, or caries in the inner tuberosity of the tibia; and (6) much pulpy substance at the back of the joint, removed at the operation, and unfortunately not kept for microscopic investigation.

The cause or causes which gave rise to this unique condition of the synovial membrane must at present remain unknown. Some of the changes, such as the lipping of the articular margins, fibrillation and grooving of the cartilage, favour the view that the condition is of the same nature as rheumatoid disease; but the age of the patient (26 years), the onset of the malady after injury when 14 years of age, the existence of a soft or carious area in the inner tuberosity of the tibia, and the presence of soft pulpy tissue at the back of the joint taken together make us incline to the view that the condition is of the nature of a chronic tuberculous disease; and that during the retrogression (return to quiescence) of the disease the connective tissue cells in the altered and thickened synovial membrane of the suprapatellar (sub-crural) pouch were induced from some cause or other to form bone.

The lipping of the articular margins, the formation of polypoid growths from the inner surface of the synovial membrane, fibrillation and grooving of the articular cartilage, and indeed even well marked eburnation of the articular ends are not unknown in chronic tuberculous disease of joints. One of us met with an example of lipping and eburnation a few

years ago in a young woman, aged 28, who suffered from a chronic affection of the bones of the knee-joint. Excision was performed, and good recovery followed. Not many months after chronic tuberculous disease of the shaft of the femur began, and this has continued with more or less suppuration up to the present.

We, therefore, suppose that after the injury to the knee, at the age of 14 years, there developed the usual form of tuberculous disease of the synovial membrane, the bones becoming to some extent implicated. This was never very active, and, after a time, became quiescent, the swelling being present five years after (at 19 years), and noticed before the onset of the attack of rheumatic fever. It is probable that during these five years from the receipt of the injury, the thickened synovial membrane becoming less vascular, the connective tissue cells formed bone instead of the ordinary dense fibrous tissue. So long as the joint was kept fairly quiet it gave rise to no trouble, but when used vigorously, as must be the case in cycling, then the old inflammatory changes were set going, and the joint became painful.

Such a change in the connective tissue is comparable to the change that takes place when a tendon becomes transformed into bone, and also when the interstitial connective tissue of muscle becomes likewise converted into bone (myositis ossificans).

This case, then, is merely an example—a rare one, it is true—of the transformation of fibrous connective tissue into bone. The exact nature of the process which leads to the formation of the bone, as above stated, remains at present unknown.

THE COMPARATIVE SAFETY OF SUPRAPUBIC LITHOTOMY, OF LATERAL LITHOTOMY, AND OF LITHOLAPAXY IN YOUNG MALES.¹

By GILBERT BARLING, B.S., F.R.C.S.,

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BRIGADE-SURGEON-LIEUTENANT-COLONEL KEEGAN has published a paper² on litholapaxy in male children, in which he makes some very objectionable remarks on the truthfulness of statistics by English surgeons. Whilst it is impossible here to discuss his insinuations, it is equally impossible to pass them over in silence, lest this might be construed as implying acquiescence in them. I simply content myself with saying that his attack was quite unjustifiable and uncalled-for.

To return now to the main purpose of his paper, which was to show the safety of litholapaxy in young males. The statistics he presented showed that the litholapaxies performed by eight surgeons in various parts of India numbered 663, with a mortality of 2.71 per cent. The author asks, "Can the advocates of the suprapubic operation show such results as these?" and says rightly that it is incumbent on those who practise this as a routine operation in children to show that it is a procedure not more dangerous than lateral lithotomy or litholapaxy.

In the Cavendish Lecture by Mr. Henry Morris³ on Diseases of the Urinary Organs, the surgery of the genito-urinary tract was reviewed. The part of this paper to which I now wish to refer is that which deals with the suprapubic operation for stone. Although I place a much higher value on the suprapubic operation for many purposes than Mr. Morris does—notably for removal of tumours, of stone in adults not suitable for crushing, and for prostatectomy—yet my inquiry goes far to prove that he is right when he says that lateral lithotomy in boys is a safer operation than the suprapubic.

The two papers to which I have referred induced me to look into the question of the relative safety of the various operations practised for vesical stone in children, and to gather statistics from the records of public institutions.

I do not propose to contrast the mortality of operations for

¹ Read at a meeting of the Birmingham and Midland Counties Branch of the British Medical Association on March 8th, 1894.

² *Lancet*, May 27th, 1893.

³ *Ibid.*, July 17th, 1893.

stone in England with that obtained by surgeons practising in India. Their statistics show better results than ours, and for this there may be several reasons. Surgeons in India have such unusual opportunities of repeatedly operating for stone that they gain a facility both in cutting and crushing operations which very few surgeons in England can hope to emulate. Further, the races they operate on may bear operations on the genito-urinary tract better than English people do, the consistence of the stones may render them more suitable for crushing than is the case in England, and there may be less tendency to fibrosis of the kidneys in natives of India than is the case in English people owing to differences in diet and climate.

My chief purpose, then, is to bring forward statistics showing the mortality in English hospitals of the various operations performed for stone in young males.

To hold the balance fairly between the three operations it is essential that an inquiry shall not go back more than a few years, seeing that the suprapubic section, and especially litholapaxy in boys, have only been established as routine procedures for a comparatively short time. I therefore limited my inquiries to the five years 1888 to 1892 inclusive of both. Some hospitals do not publish statistics, others do so in such an incomplete manner that the figures are of no use for my purpose. The inquiry was therefore limited to six hospitals in London and six in the provinces, the majority being medical schools. The results are shown in the accompanying table.

TABLE.

Suprapubic Lithotomy (Males).

Under 10 Years.			10 to 20 Years.		
Total.	Recovered.	Died.	Total.	Recovered.	Died.
44	34	10	28	23	5

Total under 20 = 72 cases with 15 deaths. Deducting 3 deaths, this leaves 69 cases with 12 deaths, a mortality of 17.4 per cent. The reason for this deduction is given in the text.

Lateral Lithotomy.

Under 10 Years.			10 to 20 Years.		
Total.	Recovered.	Died.	Total.	Recovered.	Died.
39	37	2	20	20	0

Total under 20 = 59 cases with 2 deaths. Add 1 death from suprapubic operation after uncompleted lateral = 60 cases with 3 deaths, a mortality of 5 per cent.

Litholapaxy (Males).

Under 10 Years.			10 to 20 Years.		
Total.	Recovered.	Died.	Total.	Recovered.	Died.
43	42	1	16	16	0

Total under 20 = 59 cases with 1 death. Add 2 deaths from suprapubic operation after uncompleted litholapaxy = 61 cases with 3 deaths, a mortality of 5 per cent.

The number of cases is not as large as I could have wished, but it serves the main purpose I had in view in my inquiry, which was to show the relative risk of the three operations performed under similar conditions. I am bound to say it disappointed me that the high operation should show such a high rate of mortality as 17.4 per cent. This is after deducting 3 deaths, 2 of which were in patients subjected to litholapaxy, the suprapubic operation having been performed after crushing failed, so in the tables it will be seen that I have credited the crushing operation with these two deaths. Similarly the third was in a patient on whom lateral lithotomy was attempted but failed, owing to the size of the stone, and this I have placed to the discredit of the lateral

operation. Even after this correction contrast the mortality of 17.4 per cent. with that after lateral lithotomy, which is 5 per cent., and for litholapaxy barely 5 per cent.

It is interesting to see what were the causes of death after the suprapubic operation to explain a mortality which, to me, is surprising. The list is as follows:—Four deaths were due to shock, 1 of the 4 being in a case of uncompleted lateral operation and 1 in an uncompleted litholapaxy. Two were due to infiltration around the bladder, but 1 of these followed an incomplete litholapaxy: 3 were due to various conditions in the kidney, pyonephrosis, hydronephrosis, and calculus. Two patients died from peritonitis, and 1 each from pyæmia, septicæmia, bronchitis, and pneumonia.

Not unfairly it may be suggested that patients with the largest calculi are submitted to the suprapubic operation, and in such the mortality is sure to be higher than in the case of small stones removed by the other methods. This argument must be allowed some weight, but there is nothing to show that the calculi removed were of excessive size in a large majority of the cases; and, by subtracting the deaths after incomplete litholapaxy and lateral lithotomy, I have to some extent made allowance for the cases of unusually large stone.

As confirming the figures which go to show that the mortality after the suprapubic operation in children is greater than after the lateral, I may quote the remarkable experience of one children's hospital. I have a record of the stone operations in this institution for a number of years. From 1870 to 1887, inclusive of both, all cases of stone were submitted to the lateral operation, and of 70 cases only 2 died, a mortality of 2.8 per cent. over the eighteen years. At the same hospital, from 1888 to 1893, inclusive of both, 22 cases were operated upon, 15 by the lateral and 7 by the high operation. All the lateral operations were followed by recovery, whilst four of the high operations ended fatally. One of these four followed an incomplete lateral operation, as previously mentioned. Allowing for this, though, the result is to give in the last six years 22 operations, with 4 deaths, against 70 operations with 2 deaths in the previous eighteen years, when wound treatment was not as satisfactory as it is now, and when the mortality after all operations was greater.

I do not pretend that the figures I have produced represent the absolute mortality which ought to follow either of the operations. On the contrary, I believe the mortality for the suprapubic operation is much too high, but they do show a relatively high mortality for the suprapubic operation difficult to explain away. This being so, it seems to me clear that the operation of election in young males is either the lateral or litholapaxy. Of the advantages of Cheselden's operation not a word need be said here. The position and advantages of litholapaxy in children is not so clear, but it must be conceded that the splendid results it has given in India strongly commend it to us here. Personally I have only thrice performed this operation on boys, all of them during last year. With suitable instruments, and with a pillow under the buttocks to throw the stone away from the trigone to the posterior part of the floor, nothing is easier than to pick up the stone time after time; the mere manipulation is easier than in the adult bladder. The instruments used are so fine, however, that the operation is a tedious one; and if the stone is of considerable size and hard, by the time it is pulverised—for this is the condition to which it has to be reduced—and the bladder is empty of fragments, the patient will have been anæsthetised a long time, and much instrumentation will have been performed, making the operation quite a formidable one. The patients in my cases were all under 10, in each the stone was small, and all recovered. In two the recovery was uneventful, but the third gave cause for much anxiety. The stone was of very hard uric acid. When the lithotrite first broke it I had to use much force to screw it home, and as the stone broke it produced a noise like a small pistol shot; so remarkable was it that I thought the blades of the lithotrite must have broken. This was disproved, however, by my being able to pick up and crush the fragments. When all appeared pulverised the lithotrite was withdrawn, and as soon as it engaged in the urethra it was evident that something was wrong with it. With some force it had to be pulled out, when it was found that the male blade, at its distal part, had bent away from

the female, and though the heel closed the beak would not. In the withdrawal the lithrotome must have lacerated the urethra all along. For a few days there was sharp constitutional disturbance, and on this subsiding the boy was sounded to see if any fragments remained. None were found, but the sounding, probably by tearing open the healing laceration of the urethra, set up a fresh feverish condition, from which the boy escaped by the skin of his teeth, and only after an abscess had formed over his sternoclavicular joint. The boy is now well as the others are. Notwithstanding this *contretemps*, I regard litholapaxy for small stones in boys as a very facile and attractive operation. If time should show that there is no great tendency to recurrence of stone, after this operation, owing to fragments left unremoved, it will run the lateral operation hard as the routine operation for young males. The high operation will be reserved probably for large stones unsuitable for removal by the other methods.

My remarks have been confined to the treatment of stone in children. Later I hope to have extended statistics of recent operations at all ages, when I believe it will be found that the operation which gives the best results at one age does not necessarily do so at another, and that it is chiefly in elderly people that the suprapubic operation gives results superior to the lateral.

TOTAL SUPPRESSION OF URINE DUE TO IMPACTED CALCULUS, WITH ATROPHY OF THE OTHER KIDNEY FROM A PREVIOUS SIMILAR CONDITION.

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I was sent for on the afternoon of January 2nd, 1894, to see a gentleman who had been under my care for some years for chronic rheumatic arthritis and acute gout, but whose condition had so improved during the last twelve months that he had been able to take several long railway journeys and to attend regularly to his business. He told me that he had been to a neighbouring town on business and there had suddenly become unwell, with vague backache and a general feeling of *malaise*. I could, however, find no objective symptoms, and prescribed sinapisms and a diaphoretic, thinking that, although there was no rise of temperature, the symptoms might indicate a chill. About 9 p.m. he desired to pass water, and made a pint, during the passage of which a round, smooth, faceted uric acid calculus was passed. He then felt much relieved, and went to bed.

Next morning he expressed himself as better, but I learned that he had passed no water since the previous night. He said that he had a desire to do so, but was not able. I passed a catheter and found the bladder absolutely empty. I therefore diagnosed that one kidney was blocked by a calculus, and that probably this condition had occurred passively in the other some time previously, but beyond the fact that when asked as to the position of the uneasiness he seemed to favour the right side, there was no guide to a conclusion as to which was the kidney which was just freshly blocked. I ordered diuretics, hoping to increase urinary pressure, and on the night of January 3rd about 4 ounces of urine were voided. The bowels were kept active by enemata, and a light diet ordered.

On the third day I gave oleum terebinthinæ in πx doses in capsules, the late Dr. Moxon having met with success in a similar case, but nothing at all passed from the bladder except a little blood-stained mucus. Absolutely no other symptoms intervened for six days, when I expressed my opinion that it would be desirable to operate, and on January 9th called in Mr. Henry Morris, of London, and Mr. Spanton, of Hanley (the latter gentleman had seen the patient with me for two days previously), who agreed to the proposition, and the former expressed his opinion that there was a sensation of greater volume in the right kidney region than in the left. I then, the patient being anæsthetised by

chloroform, cut down to the kidney by the usual incision in the loin, and freed it from its fat; the kidney was very large, and perfectly healthy. I was then able to feel in the top of the ureter some hard substance about the size of a small bean, on which I cut down, and removed a flattened calculus by manipulation between my thumb and finger, which had its smoothness eroded by contact with the mucous membrane. It weighed 6 grains, and measured half an inch across by one-sixteenth of an inch deep.

The stone was situated at the point where the dilated upper part of the ureter contracts to the normal calibre. Higher up in the pelvis of the kidney I felt a number of small stones, eight of which I passed down into the ureter, and removed them by the incision I had made for the impacted stone. Nothing more then could be felt in the pelvis of the kidney, and the wound became distinctly moist from the secretion of urine. Mr. Morris, however, who kindly gave me his valuable advice and assistance, advised that the kidney should be freed, brought into the wound, and incised. As I could not reach the upper end, and was not aware of the precise amount of force which might be used, he kindly brought the kidney into the wound. I then incised the convex border for one inch, and removed a triangular stone, weighing 36 grains, in which was an oval facet in which one of the other stones had lodged. There was little or no bleeding. The kidney was then returned, and the wound united for the greater part by superficial and deep sutures.

No sutures were used either for the incisions in the kidney or ureter. Before removal from the operating table a small amount of urine passed from the bladder, and the first act of the patient on recovering consciousness from the anæsthetic was to demand a urinal, but the water was passed into a napkin, and was very little stained with blood.

The patient rallied well, and passed urine freely from the wound and by the bladder; the precise amount by the latter could not be determined, owing to the fact that much was passed into a napkin.

Twenty-four hours after the operation there was not an unfavourable symptom. Some bromide of potassium had been given by the rectum to induce sleep. The temperature was 97°.

Forty-eight hours after operation the heart began to fail, the pulse becoming weak but not rapid. The temperature was subnormal. The flow of urine was very satisfactory, some collected was only slightly blood-stained, specific gravity 1016; albumen about $\frac{1}{2}$. The heart slowly got worse, and the patient sank in spite of the free exhibition of stimulants, 58 hours after the operation.

I was permitted to make a slight examination of the condition *post mortem*. I found that the kidney was becoming adherent to the perirenal fat by lymph. The incision in its free border was looking well, and commencing to heal. There was no peritonitis. The left kidney was represented by a mere shell, enclosing a mass of calculous deposit weighing 360 grains.

In addition to the fact that such a case as I have just recorded is very rare, there are several interesting facts which call for remark. In the first place the patient had been under constant medical supervision for the last twenty years for gouty conditions, with which were associated a tendency to bronchitis, and a weak, flabby heart; and during the whole of this period he had not had a symptom which had led any of the medical men he had consulted at various times to suspect renal calculus.

For the last three years I had at intervals of every few weeks examined his urine, always finding it loaded with uric acid crystals, and giving a trace of albumen, but I never on any occasion noticed any blood in it, nor did his attendants at home, who constantly watched the colour of the secretion.

So that here we have a case of advanced renal calculus without either of the clinical symptoms considered diagnostic even going on to the plugging of a ureter and complete atrophy of the left kidney without a single recognisable sign. To such an extent were we in the dark as to which side to attack first, that the question of a preliminary abdominal section was discussed, but negatived on account of the weak state of the patient's general health.

The rapidity with which the urinary secretion was estab-