

usually found that the smallest boys' urethrae would admit a 6 to 8 lithotrite and a No. 7 cannula. But for a stone over 30 grs. this was slow work. I always tried to pass a full-sized No. 8 lithotrite, and this instrument crushed nearly all the larger stones in boys. In boys over 14 a full-sized lithotrite would generally pass. To be efficient, a lithotrite should have a large eye in the female blade.

In female patients there was no difficulty except that the bladder sometimes refused to retain fluid. A raised pelvis and a finger pressing the meatus upwards helped to obviate this, and of course greater care was necessary to avoid nipping the vesical wall.

LITHOTOMY.

I only performed lithotomy when the crushing operation was impossible or inadvisable. Naturally the mortality was higher in proportion—3 out of 36 cases as against 3 out of 161 cases of lithotripsy. Very many of our cases were unfavourable from debility, cystitis, malaria, etc. Two of the 6 deaths were only fatal indirectly. One old man contracted bronchitis, and died a fortnight after lateral lithotomy had been performed for prostatic calculi; and another old man died from diarrhoea some days after I had easily crushed a 15 drachm stone. He also probably caught a chill. The four deaths more directly attributable to the operation were chiefly from exhaustion. In fact, all were nearly hopeless before the operation. But I consider the removal of a stone imperative where there is any hope of recovery, and especially in boys. In bad cases we always insist on a period of preliminary treatment and rest. Thus many very bad cases are saved. The first of the four was an old man of 70, who succumbed on the third day after lithotripsy for a stone weighing 9 drachms. The second was a boy aged 7, with kidney disease. His urine was loaded with albumen, and its specific gravity was only 1007. He died the third day after I removed, by lateral lithotomy, a stone weighing half an ounce. The third was also a case of lithotomy in a small wizened child of 3. He was unfit for operation, but his friends had brought him a long way, and implored me to operate. The stone was small, but he died next morning from shock. The last case was the lithotripsy case in a boy of 3½, already mentioned. Malarial fever followed the operation, and he died on the fourth day. In this case lithotomy might have been better, as the crushing took a long time.

I do not see that any advantage would have been gained by the suprapubic operation in the cases where lithotomy was indicated, except possibly in one or two cases of old men with large smooth stones. Extraction through the perineum was difficult and healing of the wound slow. But not one of the deaths was likely to have been averted by the upper operation, and I consider the risks greater on account of the aseptic conditions necessary. These are very difficult to obtain under the conditions in which we so often have to work in India. In lateral lithotomy I find a probe introduced along the staff into the bladder from the wound a useful guide to the finger when the staff is withdrawn. Hæmorrhage from the prestatic veins was sometimes considerable, but we never had any recurrence or untoward symptoms from this cause. Hot-water injections always controlled it, and as a routine we always put in a small plug of lint soaked in compound tincture of benzoin for twelve or twenty-four hours after the operation.

URETHRAL CALCULUS.

Two of the cases of urethral calculus are noteworthy. The case for which penile urethrotomy was necessary healed by first intention after I sewed it up. Another case is a warning. A small boy was brought to my house, and I sounded a small stone in his bladder. I had no lithotrite at hand, so arranged for the operation next morning. When he came, I found the stone impacted about midway in his urethra. It would not go back, and with great difficulty I extracted it by the meatus. Twelve hours later I was called to see him, and found great œdema of the penis, especially of the prepuce, together with retention. I circumcised the boy and passed a catheter. The acute symptoms subsided, but a scrotal abscess and fistula followed. All subsequently healed up, but in this external urethrotomy would have been preferable. For extracting a stone through the meatus the different patterns of urethral forceps are useless. I always find Lister's ear-scoop most

efficient. If its rigidity would not be impaired it might be lengthened for the urethra.

The following is a brief table of the cases:

Urethral calculi extracted through the meatus	...	4
" with incision of the meatus	...	1
" by external urethrotomy (1 perineal, 1 penile)	...	2
Vesical calculi removed by lithotripsy (male 153, female 8)	...	161
" perineal lithotomy (3 median, 33 lateral)	...	36

Three cases of lithotripsy died and 3 cases of lithotomy. Total deaths, 6.

153 Lithotrities in Males. Relative Ages and Weights.

No. of Cases.	Age (Years).	Average Weight of Stones.	Weight of Largest Stone.	Deaths.
2	1½	11½ grs.	15 grs.	
13	2-3	31 grs.	2 drs. 45 grs.	
9	3-4	76 grs.	7 drs.	1
7	4-5	64 grs.	13 drs.	
17	5-10	18 drs.	5 drs. 10 grs.	
11	10-15	2 drs. 22 grs.	1 oz. 1½ dr.	
7	15-20	2 drs. 20 grs.	4 drs. 12 grs.	
19	30-40	4 drs. 39 grs.	2 ozs. 2 drs.	
15	40-50	3 drs. 45 grs.	1 oz. 5 drs.	
14	50-60	5 drs. 10 grs.	2 ozs.	
19	60-70	4 drs. 26 grs.	2 ozs.	1
1	70-80	1 oz. 1½ dr.	2 ozs. 6 drs.	1
9*	Over 80.	2½ ozs.		
153				3

* Unrecorded. All recovered.

Eight of the above were over 2 ozs. in weight with no death, and 15 between 1 and 2 ozs. with 1 death.

36 Perineal Lithotomies. Relative Ages and Weights.

No. of Cases.	Age (Years).	Average Weight of Stones.	Weight of Largest Stone.	Deaths.
2	Under 3	70 grs.	1 dr. 40 grs.	
2	3-4	94 grs.	2 drs. 41 grs.	
7	4-5	78 grs.	2 drs. 10 grs.	1
12	5-10	2 drs. 28 grs.	4½ drs.	
3	10-15	2 drs. 11 grs.	4 drs. 10 grs.	
1	15	2 drs. 5 grs.		
1	45	2½ ozs.		
1	56	2 drs.		
3	60-70	2½ ozs.	4½ ozs.	1
1	75	4 ozs.		1
3*		—		
36				3

* Unrecorded.

Two cases were over 4 ozs. in weight, 3 between 2 and 4 ozs. These all recovered; but 1 case, in which the stone weighed 15 drs., died. The composition of the stones was as follows:—Uric acid 144, oxalate of lime 14, phosphates 5, mixed uric acid and oxalate 18, mixed uric acid and phosphates 11, mixed oxalate and phosphates 1, and cystine 1. The composition of 12 is unrecorded.

A METHOD OF STERILISING SOFT CATHETERS.

By HERBERT T. HERRING, M.B., B.S.,

I PROPOSE to deal with the sterilisation of soft catheters and their lubricants, considering first the various methods now commonly adopted, and then describing a process I venture to think more efficient. Whatever plan is selected, it should be rapid and easy of performance, and the catheter when prepared should be uninjured and free from chemical irritants. If in addition to these essential points it is possible to lubricate the instrument at that time, and afterwards to preserve it for future use, many sources of infection would be abolished.

Among the many systems, the one most generally employed is to plunge or keep the instruments in some antiseptic fluid, as in solutions of carbolic acid, mercury perchloride, or potassium permanganate. A more recent method is to expose them to the continuous action of antiseptic

vapours, as of formalin, and a third is to apply heat by means of steam to the lumen of the catheter. None of these methods appear to fulfil the necessary requirements. When chemical antiseptics are employed, no matter of what kind, the patient almost invariably complains of discomfort after passing an instrument, for it introduces an appreciable quantity of the irritant into the urethra. Prolonged immersion quickly destroys instruments, rendering them rough, cracked, and unfit for use. While a preparation which consists in thoroughly washing and syringing the catheter with soap and warm water and then placing it in a 40 solution of carbolic for 10 minutes, and finally rinsing it in boric lotion before use, is certainly tedious, and the object, namely sterility, is in no way assured; for in addition to the extra handling these steps necessitate, boric acid solution is only a weak inhibitor and not a disinfectant. Sterilisation by steam is, in my opinion, undoubtedly the best, but the apparatus is large and heavy, and as no provision is made for keeping the catheters for after-use, steam has to be raised whenever an instrument is required.

Lubrication is, as far as I am aware, invariably performed at the time of instrumentation, and the only precaution taken against sepsis is the addition of some agent to the lubricant. Among those in general use are carbolic acid or eucalyptus dissolved in oil or vaseline, boric acid vaseline, Lund's oil with or without phenol, and similar preparations often containing large quantities of cocaine. Those made with vegetable oils easily undergo decomposition. None are aseptic or antiseptic, except strong freshly-made preparations of phenol, and they have the disadvantage of soon losing their antiseptic properties when exposed, and also of causing irritation in the urethra by the formation of an aqueous solution in the presence of moisture. The lubricant is generally kept in an open jar or bottle, and the patient applies it by dipping the point of the instrument into the vessel, often smearing it over the remaining surface with his finger and thumb.

For the above reasons I have for some years given up the use of all chemical antiseptics, and have entirely relied on heat applied by means of water as the best agent to produce an aseptic condition in both instruments and lubricant. In relation to the question of what temperature of water will sterilise soft catheters, I will quote from the report of Dr. William G. Savage, Assistant to the Professor of Pathology at University College, London, who conducted a series of experiments for me to establish this point in 1899.

In the following experiments catheters were soaked in a mixture of *B. coli* and *staph. pyogenes aureus*. They were then put into water at the required temperature for the time given. These inoculations were made from their interior on to agar smears which were cultivated at 37° C.

Before each batch of experiments controls were made by cultivating from the catheter immediately before it was put in the hot water. In every one of these cases copious growth resulted.

Water at 150° F. (65.5° C.).

No. 1. Left in 20 minutes	...	...	...	Sterile.
No. 2. Left in 5 minutes	...	...	...	Sterile.
No. 3. Left in 1 minute	...	...	...	Sterile.
No. 4. Left in 2 minutes	...	...	...	Sterile.
No. 5. Left in ½ minute	...	...	...	Sterile.
No. 6. Left in ¼ minute	...	...	...	Sterile.

Water at 150° F., even for half a minute, is a reliable steriliser of catheters for ordinary work (that is, it would not in this time kill bacteria with spores, but these are not likely to be met with).

Notwithstanding this conclusion I prefer to expose instruments to boiling water, although it is frequently stated that soft gum catheters are destroyed by this temperature. This is certainly not my experience, nor, I believe, that of others who have tested it. Such instruments after repeated boilings do occasionally blister and crack, especially if they are bent or twisted during the process, but they do not wear out more quickly than those rendered aseptic in any other way. India-rubber catheters are the most easily affected, probably on account of the action of the oil, they swell, lose their polish, becoming sticky, and then easily break.

The apparatus by which I have endeavoured to attain the object in view—that is to say, the easy and rapid sterilisation of instrument and lubricant, both to be free from irritating chemical antiseptics, the latter to be well applied to the instrument, which may then be preserved if desired for subsequent use—consists of:

1. A series of metal tubes,¹ nickel plated on the inside as well as on the outside, 14 inches long and $\frac{1}{8}$ of an inch in diameter. The central portion is covered with an insulator,

and the ends are fitted with rubber stoppers shaped like champagne corks. Each tube, which serves the purpose of a case, contains a catheter, and is marked at one end with transverse lines to indicate the top, the point of the catheter being towards the bottom when in position.

2. A small funnel, with a short tapered neck which will fit easily, though firmly, into the top of a tube. The funnel is furnished with a loosely-closing hinged lid, and inside near the bottom is a diaphragm made of wire gauze, in which are two circular holes to receive the rubber corks.

3. A watch-shaped flask of 6 drachms capacity. The bottom is slightly concave, but the top is flat, and attached to its centre by a screw joint is a neck similar in construction to that of the funnel, which can be readily joined to the bottom of the tube. Stretched across the lumen of the neck, at its upper end is a wire to prevent any instrument passing into the flask.

The apparatus is used by first putting a drachm of liquid paraffin (*B.P.*) into the flask and then filling it with water. A tube is held in the right hand, by the insulated portion, and likewise the funnel with the lid open. The cork from the top is withdrawn with the finger and thumb of the left hand and lightly placed in one of the holes in the diaphragm, and the funnel is connected with that end. Similarly the cork from the bottom of the tube is placed near the first, and the flask is firmly attached. (A lubricated catheter will not slip out when the cork is removed from the tube.) The lid of the funnel is then closed. The whole apparatus is held perpendicularly by the insulator, so that the bottom of the flask may come over a spirit or gas flame. In a short time the water boils, and some is forced up the tube into the funnel, there covering the corks. As soon as it boils rapidly in the latter the apparatus is removed and allowed to stand, to permit the water to return. The flask is grasped with a piece of felt or a cloth, and the tube is detached by a rotatory movement. The lid is opened and the corks are taken out and pushed, one well into the bottom, the other, after the funnel is removed, into the top of the tube. Thus the inside of the tube, the corks, the catheter, and the lubricant, which is well applied, have all been rendered sterile and will remain so, without harm to the instrument, for a considerable period. The sterilisation of the next catheter is then proceeded with, though the time taken will be less, as the water is already near boiling point. Twelve catheters—a store sufficient to last most patients at least forty-eight hours—may be treated in twenty minutes. A drachm of liquid paraffin will lubricate six catheters; afterwards the same amount should be added, and also a little water to keep the flask full. When a catheter is required the top cork is removed, and the instrument is shaken to that end, by giving the tube one or two smart taps, until sufficient appears to allow of its being withdrawn. After use it is simply returned to the case for sterilisation at a convenient time.

I tender my best thanks to my friend Mr. George Lenthal Cheatle for testing the apparatus bacteriologically, and I herewith append his report:

There can be no doubt that this method sterilises catheters, and in being sterilised by this method they suffer no appreciable harm.

To test these statements I performed the following experiments:

Catheters were infected by bouillon cultures of *staphylococcus pyogenes aureus* and *bacterium coli commune* in pure and in mixed cultures. Infection was made by filling the tube of the apparatus and the catheter within it with the infected medium, so that by shaking the whole the contained catheter became thoroughly septic. The culture was then poured off, and the tube with its contained, now septic, catheter was attached to the flask, and boiled as directed for fifteen seconds.

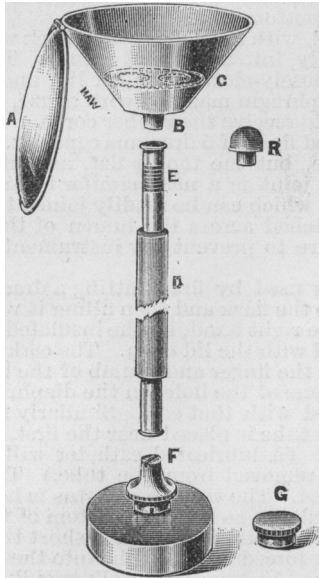
After the subsidence of the boiling fluid, the tube with the catheter was allowed to cool. Now the tube was converted into a test culture tube by pouring into it sterilised germ-free bouillon, which was kept from leaking by dipping the rubber-plugged ends of the tube into a paraffin which melted at 52° C., and which upon cooling formed a film over all possible means of exit.

Catheters were kept up to three weeks in this fluid, and, as no infection of it occurred, I presumed the instruments were sterile. The rubber plugs were subjected to the same tests, and successfully survived the ordeal. Every now and then a failure would occur, probably due to an error in bacteriology.

At first I tested excised segments of the sterilised catheters, and plunged them into the ordinary test tubes for media. Then failures repeatedly occurred. Exposure to the air during the excision of the segments was the source of infection, in spite of careful preparations to prevent it. However, the adoption of the tube in which the catheter was sterilised first as an infecting chamber, then as a sterilising chamber, and finally as the medium's test tube, was a more accurate conception of testing the efficiency of the apparatus.

And, finally, I am indebted to Dr. Maw (of Messrs. S. Maw,

Son and Sons, Aldersgate Street, who have made the apparatus) for supervising many trials and experiments which have been made in carrying out my ideas.



A, B, C, funnel, with lid, neck, and diaphragm. D, E, the tube shortened in the diagram, the central portion covered with felt. R, one of the rubber corks. F, the flask. G, the cap to fit over the neck of the flask when not in use.

NOTE.

¹ Glass or flexible tubes to contain metal instruments may be substituted, but to use the former some modification of the connections is necessary.

A CASE OF ALMOST UNIVERSAL ANKYLOSIS.

By T. K. MONRO, M.A., M.D.,
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FROM the time when the patient came more closely under my observation, about nine years ago, until his death in January, 1900, the condition of his joints underwent but little change. He had had whooping-cough, measles, and scarlatina in childhood, and also, it would appear, typhus at the age of 10 or 11 years. Otherwise he had enjoyed very good health in his earlier days. He was an iron turner by occupation when the articular affection set in at the age of 18. He would not wear flannels, and often got wet when going to and from his work. The first symptom was extreme pain in the left hip, but for a time this did not keep him from his work. When he rose in the morning he would have the part rubbed, and after walking about in his room for a little he felt able to go out for the day. From the first, severe shooting pains would run down the left leg from the affected joint. After a couple of years he had to give up work (at the age of 20) because the pain had come to involve almost all the joints of the lower limbs (including the right hip), as well as the back, and very specially the back of the neck. Speaking generally, the disease in each joint began with pain, which was soon followed by swelling and ultimately by fixation. The pain was greatest in the case of the knees. The hip-joints, however, were not swollen, and there was no considerable pain in the wrists or elbows. For about eighteen months after stopping work he was able, with assistance, to move about in the house, but from the age of 22 till his death at 46 he was completely confined to bed. Loss of flesh was noticed after he took to bed. For the first year or two thereafter, and before his legs were permanently drawn up, these limbs jerked terribly; the "sinews started suddenly," he said; so much so that he once fell out of bed. This starting was apt to be worst just as he was falling asleep, and greatly aggravated the pain in the joints that were affected at the time. He found most ease when the

legs were drawn up, but the limbs did not of themselves tend to be drawn up towards the abdomen. In the early stages of his illness, while the disease was active, patient sweated profusely, though not constantly, but he had no pyrexia at that time.

Thus, after a time, the articular disease became almost universal. As a rule, a joint ceased to be painful only after its fixation was complete. The pain was aggravated by the slightest movement, but friction of the overlying surface with oil was tolerated, and perhaps gave some relief. On one occasion in the course of the disease the right knee (the next joint to be affected after the left hip) was, it is said, dislocated by a movement of the body. Agonising pain ensued for several days. His doctor reduced the dislocation and put up the joint in a stiff bandage, under which circumstances ankylosis took place. The lower limbs became fixed years before the upper limbs. The right arm was the last limb to be disabled. Till this happened—about sixteen years before he died—he could feed himself, and at that time he could still open his mouth for about half an inch. After he became a prisoner in bed, he noticed that his mouth would not open so wide as formerly. After he lost the power of feeding himself, through the disease affecting the right upper limb, the jaws became quite locked. But by this time a gap had already become available for feeding purposes through the spontaneous falling out (or breaking at their necks) of two teeth on the left side, one above and the other below, at corresponding places. At one time, patient suffered a good deal from toothache, but not more, he thought, than other people. After the jaw became fixed, however, he had little or no such pain. Other teeth gave way, but his mother (his devoted nurse, who still survives him) continued to supply him with the solid part of his diet through the aperture just described. Though toothache ceased to trouble him, he once had an abscess in the roof of his mouth, which caused him much pain. Shortly after this evacuated itself, the right eye became the seat of intermittent but severe pain with redness, followed by dimness, and ultimately loss of vision, and shrinking of the globe. Dr. George Hunter, who saw him at that time, informs me that the condition was an acute iridocyclitis which rapidly went on to atrophy of the globe, with subsequent ossification of the choroid. In the autumn of 1891 (at the age of 37) he had less acute pain in the left eye, which was blind for a day and a-half but afterwards regained its normal condition. In July, 1892, he had severe pain in the left eye, with photophobia and lachrymation, for two hours only. In May, 1897, he had pain for two days over the right eyebrow, with tenderness of the eyeball—a slight reminder of what he had suffered in those parts long before.

When a detailed examination of the joints was made some years ago, there was still considerable mobility (including some voluntary movement) at the right shoulder. The joints at the right elbow were quite fixed. The right wrist was almost if not absolutely rigid. The right middle finger was rigid at all its joints; but the metacarpo-phalangeal joints of the four remaining digits of the right hand were free; and, indeed, patient was able to hold a piece of stick between the thumb and forefinger. The nails were exceedingly long and thick, and one or two of them were twisted. Patient would not allow them to be cut, but pieces would break off spontaneously. Every joint of the left upper limb was completely ankylosed. The lower limbs also were quite rigid. Patient lay on his back with the knees drawn up. The head was absolutely fixed. The fixity of the vertebral column was illustrated at one time in a curious way. In summer, 1898, the skin at the back of the head felt sore, and the pillow was therefore withdrawn for a time. When the latter was replaced, the head did not touch it, and patient considered that a month elapsed before the two came in contact. He fed and slept quite comfortably in that unusual attitude. Breathing was chiefly abdominal, but the lower part of the chest wall moved in respiration. Sensation was unaffected. There was no ataxy in the early stages. With the exception of retention of urine, which troubled him shortly before his death, there was no disorder of micturition. Many years ago he had occasional slight attacks of diarrhoea, but he never lost control of the bowel. At a later period, the bowels were moved once a week without difficulty by colocynth, which, given at night in pill, induced a motion about six hours afterwards. The skin re-