The splint should then be removed, the hand should be heated, and active and passive movements of the joints carried out. The actual gain from day to day may be very small, but excellent results can generally be achieved if the treatment is persisted in. For the treatment of contracted conditions of the flexors of the forearm several methods of applying continuous traction are available. Splints with springs or elastic accumulators applied to the posterior aspect of the limb are, on the whole, rather unsatisfactory. The plan of tying weights to the forearm may be of some effect, but it does not commend itself to the patient.

The best results are obtained by placing the patient on his back on an ordinary massage couch. His shoulder and chest are fixed to the couch by adjustable strappings. A firm pad is placed under the flexed elbow, and traction is applied in the line of the arm by attaching a strong cord to the wrist, passing it over a pulley at the bottom of the couch, and fastening it below. After five or ten minutes the cord becomes noticeably slack as the flexion yields, and it requires to be tightened up at intervals. Cases steadily improve if this treatment is carried out for periods of an hour twice a day. The pectoral muscles can be stretched in similar fashion by tying the extended arm back to some object in the room, the weight of the limb being sustained by a small table placed under the forearm.

The Zander system provides an excellent method for the exercise of both passive and active movements. The machines can be adjusted, either passively to stretch contracted tissues or to provide a resistance against which the muscles are encouraged to contract. The action is a rhythmical one, and its value lies in the fact that the force is evenly exerted without sudden jar or strain; this is effected by an adjustable system of counterpoise, the action of which resembles in some measure the steadying and controlling effect exercised by antagonistic muscles during the contraction of their opponents. The Zander machines are expensive, but where large numbers of cases are treated they very soon repay their cost.

Whatever line of treatment is adopted, restoration of function and voluntary exercise of the affected limb should be encouraged from the earliest possible moment; and interference with the function of the muscles concerned should be as limited as is consistent with the treatment being carried out.

I am obliged to Colonel T. Lucas, C.B., for his kind permission to publish this paper.

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Lectures .

ON

DISEASES OF THE MALE URETHRA.

BY

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LECTURE III.—COMMON METHODS OF EXAMINATION AND TREATMENT (continued).

MASSAGE OF THE PROSTATE.

INSERT a gloved finger into the rectum. The prostate may be felt to be swollen, hot, and tender, or its outline may be lost and nothing be felt but a large smooth projecting abscess. If it is too tender, no further examination should be made, but if not, make gentle pressure with the finger from the outer limits of the swelling forwards and inwards towards the urethra. After a certain number of such squeezings, it will be found that a drop or more of purulent or opalescent fluid has appeared at the meatus. This is prostatic fluid. If needed for examination, it is caught on a microscopic slide, spread out as a film, fixed

by gentle heat, stained with methylene blue, washed, dried, covered with cedar oil, and inspected with a $\frac{1}{2}$ in. oil immersion lens.

Healthy prostatic fluid consists of little else but droplets of fat (lecithin) suspended in a clear fluid. These are seen in the film as blue amorphous particles of varying sizes. Here and there an epithelial cell may be seen, but pus cells are remarkable by their absence. In prostatitis the film of prostatic fluid contains a large number of pus cells. This is the diagnostic feature. It is uncommon to find either gonococci or other bacteria in a stained film unless the examination be made as the acute stage is coming to an end, and it is usually only possible to isolate the bacteria by special stains or by culture on suitable media.

I cannot too emphatically warn you to use only the greatest gentleness in this procedure. The process is one of "peaceful persuasion." A heavy hand is not needed. If too great force is used the rectal mucous membrane may be torn, which will cause a fissure *in ano* and even ischio-rectal abscess. I have never seen this in my own practice, but cases have been brought to my notice with these sequelae in which too great force has been used, the operator not having realized that great force is not required. Again, there is the risk of setting up epididymitis if force is used. The process should only last one or two minutes, and the object has been obtained if a drop or two of fluid can be seen exuding from the meatus. Cure attends gentle methods.

By thus emptying the prostate not only do you remove some of the infected contents, but you open up also the blocked ducts, so that drainage is improved. You also ensure that fresh fluid from the blood vessels enters the prostatic tubules ("Nature's antiseptic fluid"), and probably you liberate a certain amount of gonococcal endotoxin, and produce an autovaccination of the patient with his own vaccine from his own germ as it lives in the tissues.

As a general rule prostatic massage should not be carried out more than every fourth or fifth day, and in many cases once a week is enough, or even once a fortnight. In chronic cases give a course of prostatic massage every fourth or fifth day for four weeks. Then give the parts a rest, and if possible get the patient away to the seaside. After a rest of two or three weeks test the fluid microscopically, and if not yet healthy institute another course of some weeks' duration. It is a great mistake to go on too long without a period of rest.

Indications for Prostatic Massage.

1. As a diagnostic measure in subacute or chronic cases, to obtain a specimen of fluid for microscopic examination.
2. In subacute cases every second or third day, to secure the subsidence of the swelling, and drainage of the glandular tissue.
3. In chronic cases every fourth or fifth day to secure drainage and autoinoculation.
4. In acute cases never except under two conditions—first, when there is retention of urine, to secure rupture of an abscess into the deep urethra; secondly, in joint cases, to empty the blocked vesiculae and prevent further absorption of gonococci into the circulation.

LUBRICANTS.

The ideal lubricant is one soluble in water that contains no oil or fat, that is strongly antiseptic, non-irritating, and always ready for use.

The objection to oily lubricants sterilized by heat is not that they are not sterile, but that they coat instruments and the urethra with a film of fat. A film of oil makes it more difficult to cleanse the surface of an instrument, and prevents formaline vapour from acting efficiently as a sterilizing agent on the surface of an instrument. Again, a urethra coated with oil cannot benefit from lavage by antiseptic fluids. I have abolished all oily lubricants from my clinic, as there is no need for them.

The ideal lubricant consists of sterilized glycerine 20 parts, tragacanth 2 parts, oxycyanide of mercury $\frac{1}{4}$ part, sterilized distilled water 100 parts. This formula we owe to Casper of Berlin, and it has been widely copied as the K.Y. lubricant, or as Lubrifax by Burroughs and Wellcome. It is put up in tin squeezer tubes with a screw top, and is thus portable and always ready for use. It is sterile and antiseptic, is a good lubricant, is transparent enough for cystoscopic use, and is soluble in water.

HOW TO ANAESTHETIZE THE URETHRA.

The best drugs are stovaine 4 per cent. or novocain nitrate 4 per cent. in sterilized distilled water. Cocaine should never, on any pretence whatever, be used in the urethra. Cases of death from this practice have actually been reported in the literature, but far more deaths have occurred which have not been reported. One half a grain of cocaine placed in the deep urethra is more than likely to kill a patient. Be wise, then, and do not permit any cocaine in the clinic. Otherwise you will be tempted to use it, and afterwards have cause for regret.

Novocain and stovaine are ten times less toxic than cocaine, and nearly as powerful analgesics. Their solutions can be sterilized by heat. There is no need to add adrenalin. Three to four drachms of a 4 per cent. solution of these drugs can be used with safety. In practice less than a drachm usually suffices, and as the solutions are expensive they should be used sparingly.

How to anaesthetize the anterior urethra: Suck up a drachm of 4 per cent. stovaine solution into a boiled stylo filler. Inject this into the urethra, and get the patient to hold it for some minutes by grasping the penis behind the glands with the thumb and forefinger.

How to anaesthetize the deep urethra: Suck up a drachm of 4 per cent. stovaine solution into an Ultzmann's syringe and catheter, lubricate and pass the catheter into the deep urethra. Press home the piston and withdraw the instrument. You can tell exactly when your catheter enters the deep urethra, as you can feel the tip ride through the resistance of the compressor urethrac muscle.

ULTZMANN'S SYRINGE.

This consists of a curved metal catheter with a very small central bore, to which can be attached a small syringe. Fill the syringe with silver nitrate solution, one, five, ten, fifteen, or twenty grains to the ounce of distilled water. Attach the syringe to the catheter, lubricate, pass into the urethra until the catheter is felt to pass through the resistance of the compressor urethrac muscle. Inject the contents of the syringe, so that they fall into the deep urethra. Remove the catheter. After a few minutes ask the patient to pass water. Warn him that this will cause an intense burning sensation and that he will experience this for some hours after. If this is very severe, let him sit in a hot bath for relief.

Indications.—This method of treatment is of great value in the last stages of the disease, when there is simply a clear urine, with a few threads and a moderate amount of pus in the prostatic secretion. Start with the lowest strength and work up to the highest strength. Never use these injections more than once or twice a week. Copper sulphate 4 per cent. in glycerine can be used as a useful variant on these silver preparations, especially in cases where silver is found to irritate. Some patients have an idiosyncrasy against silver.

Warning.—Use the Ultzmann pattern of catheter, as it can be boiled and is easily passed. Do not use the fashionable Guyon syringe and acorn-headed gum elastic catheter. The latter cannot be boiled, and is therefore an undesirable possession. Only the Ultzmann catheter need be boiled. The syringe should be kept in weak lysol solution. The piston will need renewal from time to time. When it is desired to anaesthetize the deep urethra prior to cystoscopy or deep urethroscopy the ideal method is to inject one drachm of 4 per cent. stovaine solution into the deep urethra with the Ultzmann syringe.

URETHRAL INSTRUMENTS: BOUGIES, CATHETERS, AND DILATORS.

Instrumentation.

In this connexion a complete revolution of method has taken place in the last ten years. The normal urethra swarms with bacteria in its first inch or so, but higher up it is sterile. It has been proved that it is quite possible to sterilize the urethra for a short time by means of antiseptic washes. If this is not done before instrumentation, bacteria will be pushed up by the instrument and planted in the deep urethra and bladder. It may therefore be laid down as an absolute rule of practice that no instrument should be passed up the urethra until the anterior urethra has been well flushed with an antiseptic lotion.* The best

antiseptic wash is oxycyanide of mercury 1 part in 4,000 of water, but if that cannot be obtained boracic lotion or lysol 1 drachm to the pint of water may be used. The wash is made up in a douche tin or bag and suspended three to four feet above the level of the patient's urethra. To the tubing of the douche tin is attached a urethral nozzle and shield. A pint or more of the wash is allowed to flow into the urethra through the nozzle up against the compressor urethrac, whence it rushes back again and out around the mouth of the nozzle, which is not allowed to block the urethra completely. The hands of the operator must also be cleansed with soap and water, and the meatus and the glans penis cleansed with the irrigating lotion.

All urethral instruments will withstand sterilization by heat except those made of gum-elastic. Modern gum-elastic instruments will however withstand boiling water for a time, so that in emergency the practitioner is advised always to boil his instruments.

Bougies.

In the treatment of chronic urethritis bougies are indispensable.

Metal Bougies.

Nickel or nickel-plated metal bougies should entirely replace the old-fashioned steel bougies, which get rusty and blackened so quickly. The nickel bougies will need replating from time to time, but do not rust. The most useful nickel bougies are those made for me by Montague. They possess the Boniqué curve, and they run on the Charrière scale from 14 to 24. The Boniqué curve is the natural curve of the urethra. These bougies are especially useful under two conditions:

1. *In cases of chronic prostatitis and vesiculitis.* Fill up the bladder with 1 in 5,000 silver nitrate solution. Lubricate and pass a No. 24 bougie, and leave it in place for some minutes. Remove the bougie and massage the prostate and vesicles. The bougie opens up the ducts for drainage, producing also by its weight internal massage of the ducts.

2. *In cases of stricture, both soft and hard,* to prepare the way for Kollmann's dilators, and accustom the urethra to the use of instruments.

Gum-elastic Bougies.

These are made of plaited linen, cotton, or silk thread, into which is worked the special form of shellac varnish known as "gum-elastic." Different pigments are mixed with the shellac so as to produce different degrees of hardness—for instance, there are yellow, brown, red, black, and white gum-elastic bougies. In former days gum-elastic bougies would not withstand boiling. Those now made will usually withstand boiling, provided they are picked out of the boiling water and placed separately on a sterile towel so as to let the heated varnish cool and harden before being rubbed in any way. The white gum-elastic instruments withstand boiling best of all. For occasional use it is always wise to boil a gum-elastic bougie for two minutes. In large clinics the sterilization can be carried out by means of formalin vapour, as described below. One or more complete sets of olive-tipped gum-elastic bougies will be required running from No. 1 Charrière up to No. 18 Charrière. These are used in dilating fibrous strictures of fine calibre after the diagnosis has been made with the urethroscope.

It is always well to possess two or three Harrison whip bougies for use in difficult strictures. As regards the bougies, the best method is to have six, twelve, or eighteen complete sets of these, depending on the size of the clinic and the number of stricture cases likely to come up for treatment at each session. A large oblong case can be manufactured containing a series of sliding trays or drawers, and with a door at one end. Each drawer is divided longitudinally into three parts, and marked with a number. Six drawers are required and eighteen numbered compartments. All the No. 1 Charrière go into compartment one, No. 2 Charrière into compartment two, and so on up to 18 Charrière. At the bottom of the case should be placed two glass capsules. One contains three or four "paraform" tabloids (Burroughs and Wellcome) which give off formalin vapour. The other contains calcium chloride, which sucks up superfluous moisture, and so allows the formalin vapour to get at the dried surface of the instruments. The door must be air tight, and should now be closed. At the end of twenty-four hours the instruments are sterile and ready for use.

*The only exception is the urethroscopic tube. Lavage before urethroscopy may spoil the pathological picture. Always give a thorough irrigation of oxycyanide of mercury after urethroscopy.

When a case of stricture comes on the table the door is opened and a suitable bougie picked out, lubricated, and passed, and is then placed in a three-pint enamel jug, containing three drachms of lysol and three pints of cold water. The bougie is used no more that day. At the end of the day's work all the bougies that have been used are removed in this jug to a sink, and left under a running stream of water for ten minutes. At the end of that time the instrument man puts on a pair of rubber gloves, and with a sterile towel wipes the bougies dry, and places them on a second sterile towel. When all are dry he sorts them out into their proper trays, using the metal gauge. He then boils the gauge, removes his gloves, and closes the door of the sterilizer. Next day the instruments are again sterile and ready for use. On no pretence whatever should he be allowed to do this without gloves on, as the instruments are still septic when he dries them. It is extraordinary the prejudice against rubber gloves and the difficulty in persuading an assistant to use them. Yet it is surgical common sense to employ gloves for handling the infected instruments rather than soil the hands with germs and so go about infecting the whole clinic.

Hot formalin vapour is even more potent than cold vapour, and sterilizes in half an hour. It is perhaps more perfect to use hot vapour, but a suitable sterilizer is more expensive and more difficult to manage.

Montague has made for my clinic a metal sterilizer with trays, in which hot formalin vapour is used, and in which an air-pump is employed to pump away the excess vapour after use.

Catheters.

It is well to possess some gum-elastic catheters—say a few No. 4, 8, 9, and 10 on the English scale. The most satisfactory pattern is the "Marshall," either the yellow or the black. These are better even than *coudé* catheters, though it is well that the outfit should also include a few *coudé* black or white catheters and a few conical-ended red gum-elastic catheters provided with a stylet. A few india-rubber catheters are useful—say Nos. 8, 9, and 10 on the English scale.

A long metal stylet is supplied by Montague for threading into gum-elastic and rubber catheters, and is a most useful weapon in emergencies. Finally, never be without two silver catheters, one a No. 10 English of ordinary length, and one a No. 10 English with the long prostatic curve. Metal catheters are sterilized in boiling water.

Gum-elastic catheters are rinsed under the tap, dropped into the boiling sterilizer for one minute, picked out with forceps and laid separately on a sterile towel to cool. The assistant then wipes them dry, and places them upright for twenty minutes to allow the interiors to drain and dry out. (If a hot air cupboard is available they can be placed in that.) When dry the catheters should be placed in a tray of the formalin sterilizer, when they will be found ready sterilized for use when needed.

Dilators.

No up-to-date urethral clinic can afford to be without some form of Kollmann's irrigating dilators. They are absolutely indispensable, and many chronic cases cannot be cured without them. They are shortly to be manufactured in England by John Weiss, Oxford Street, London, and can also be obtained of Gentil of Paris. They are used:

1. For dilating soft submucous infiltrations, or early soft strictures.
2. For finishing off by means of over-dilatation cases of fibrous stricture.

The only way of determining when Kollmann's dilators are required is by means of the aero-urethroscope. This is one of the reasons why I maintain that the urethroscope is indispensable. With this instrument you can blow out the walls of the canal, and with a practised eye can at once determine if any part of the canal is not dilating properly (soft or hard stricture). You can then institute treatment with the dilators and can follow the progress to complete health, controlling your treatment with observation by the urethroscope. In this way a portion of the canal that if left alone would keep up a gleet for a long time and would eventually end in a fibrous stricture, can be detected and treated in the early stages when soft and dilatable. Two objects are thus gained: the cure of the gleet, and the prevention of fibrous stricture. I should

be ashamed if any case passed by me as cured were ever to develop stricture in after-life. Into the beds of the London Hospital in ten years came 859 cases of fibrous stricture, which illustrates the importance of this matter. By means of Kollmann's dilators fibrous strictures can be overdilated until they are tired out altogether and cease to recur. At least four out of every five cases of old fibrous stricture that come under my care are thus permanently cured, and in this way the old need for the regular passage of bougies from year to year is done away with—a great boon to many a weary sufferer.

The Kollmann's dilators which I recommend are of two kinds: (1) The straight Kollmann, four branch, irrigating; (2) the curved Kollmann, three branch, irrigating.

They should be nickel-plated or made throughout of nickel. They possess dials marked with the millimetre scale from 22 Charrière up to 45 Charrière. They can be sterilized in boiling water. The *raison d'être* of the Kollmann's dilators lies in the fact that the meatus is the narrowest part of the canal (24 Charrière). It is impossible, therefore, to dilate the penile urethra (28–30 Charrière) and the bulbous urethra (40–45 Charrière) up to the proper calibre by means of ordinary bougies passed through the meatus. The Kollmann can be passed through the meatus, and when in place (straight for the penile urethra, curved for the bulbous) can be screwed up gradually until the calibre proper for this portion of the canal is obtained. After this has been effected the stricture seldom recurs.

In using Kollmann's dilators never employ a local anaesthetic, otherwise you will tear the canal, the patient's sensations being numbed. You do not want to tear the stricture or you will do harm. Your object is to tire out the stricture as rubber or elastic is tired by gradual stretching. Never dilate beyond a slight feeling of stretching and discomfort on the part of the patient. If you cause him intense pain you are overdoing it and defeating your own object. If you cause more than a slight bleeding you are overdoing it. Try to cause no bleeding at all. Bleeding means tearing. Tearing defeats your object.

The treatment always causes an increase of discharge for a day or two and may cause pain on micturition. Warn the patient of this. Do not carry out treatment with the Kollmann on any given case until you have been able to pass at a previous sitting a No. 24 Charrière-Béniqué nickel bougie with ease. Do not use the Kollmann unless the urine is clear of purulent haze. Do not employ Kollmann's dilators more than every fifth day. Often every tenth day, or even once a fortnight, is enough. In between the treatments resolution of the stricture appears to take place. The treatment causes some peculiar irritation around the fibrous tissue, so that it becomes absorbed gradually and is replaced by more supple tissues.

As an irrigating fluid for the Kollmann's, use mercury oxycyanide 1 in 4,000 or silver nitrate 1 in 5,000. Never use permanganate. This dries up the mucous membrane and makes the removal of the Kollmann difficult. Always be careful to unscrew and remove the Kollmann while the irrigating fluid is still running through the instrument, so as to prevent nipping or tearing of the walls of the urethra.

Description of Treatment by Kollmann's Dilators.

Have an irrigator ready with two pints of mercury oxycyanide 1 in 4,000 and place a piece of rubber tubing on the end of the irrigating nozzle. Place the patient on a couch with a pot between his legs. Lubricate the Kollmann, and pass it closed until it is snugly in position (straight for the penile, curved for the bulbous urethra). Attach the rubber tubing running from the irrigator and turn on the flow of fluid by releasing the clip. Gradually screw up the handle of the Kollmann until the patient begins to complain of stretching and slight discomfort, or until you can feel resistance against your screwing motion. Note the number on the dial, and then leave the instrument in place for five minutes while the fluid continues to flow. At the end of that time, while the fluid is still flowing, slowly unscrew the handle to the lowest number on the scale, and then gently withdraw the instrument. Just as you take it out you can stop the flow of the fluid by catching hold of the rubber tube running from the irrigator. At the next sitting try and go up one or two

millimetres—seldom, if ever, more. You will obtain much better results by going slowly and by tiring out the stricture gradually.

In the bulbous urethra you can generally screw up at the final sitting to 45 Charrière. In the penile portion in some narrow urethras you may never get beyond 30 Charrière, in average urethras 35 Charrière. Never screw beyond 35 Charrière in the penile unless you are dealing with a very large urethra.

Never use Kollmann's dilators in the acute stage (five to eight weeks). Reserve them for the chronic stage, and never use them unless you have previously examined with the urethroscope and have also passed a nickel bougie on a previous occasion (No. 24 Charrière). As a general rule, do not use the Kollmann until the urine is clear of purulent haze. I advise you never to use Kollmann's dilators in the deep urethra. Only under the most exceptional circumstances does it do good in that situation, and you are likely to do much mischief with it. I know this is in direct contradiction with the teaching of many foreign authorities. All the same, I advise you to make it a general rule to which there are few exceptions.

Care of the Kollmann Dilators.

Irrigating Kollmann's dilators can be boiled after use and kept in a jar of lysol and distilled water, which prevents rusting. At the end of a session they ought to be boiled, dried out of methylated spirit, then dried in an oven, or by means of hot air, or with a "Fon." Finally, they should have sterile vaseline or paroline worked into each of their joints before being put away.

NERVE GRAFTING AS A MEANS OF RESTORING FUNCTION IN LIMBS PARALYSED BY GUNSHOT OR OTHER INJURIES.

BY

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At the present time among the wounded returning from the battlefields are large numbers of cases of paralysed limbs due to more or less serious injuries to nerves.

In many of these cases the nerves are simply contused, and recovery is brought about by Nature's efforts in course of time, but in others, where there is complete destruction of a considerable section of the chief nerve trunks, recovery is impossible without operation. I hope it will not be considered out of place if I draw attention to work which I performed on this subject so far back as 1888.

In February, 1889, I read a paper before the Clinical Society of London on a case of nerve grafting, which was, I believe, the first in which such an operation had been performed in this country on the human subject.

The patient was a girl, aged 14, whose hand was paralysed after the removal of a tumour from the forearm which had involved taking away over two inches of the median nerve. Repair was effected by grafting 2½ in. of the posterior tibial nerve from an amputated leg of another patient, the transfer being effected within a few minutes of the removal of the nerve from the amputated limb. The patient was shown at the Clinical Society, Mr. Christopher Heath being in the chair. A discussion followed, in which Mr. Anthony Bowlby (now Sir Anthony Bowlby, K.C.M.G.) and Mr. Bland-Sutton (now Sir John Bland-Sutton), Mr. Bryant, and the President took part.

Sensation returned within thirty-six hours of the operation, and motion in the paralysed muscles returned gradually. When the patient was shown at the Clinical Society Mr. Bowlby remarked that it was the first recorded case of nerve grafting in this country. I had the opportunity of seeing this patient three years subsequently, when recovery was perfect in every respect.

In July, 1890, my late colleague, Mr. Atkinson, described two cases of his own, two cases of mine, and one case of Mr. Ward's, all of which were, at the time of being reported, progressing satisfactorily or had completely recovered.

The following case is still more important, as it shows that in the absence of recently removed nerve, such a structure as the spinal cord of a rabbit may be successfully used as a graft.

W. R., aged 29, a gardener, was admitted to the Leeds Infirmary under my care on January 18th, 1890, having been sent to me by Dr. Mackay of Hornby. He gave the history of having, seven months before, fallen on a scythe, which had produced a deep incision on the lower and inner part of the upper arm, the brachial artery being divided. At the time of injury a surgeon ligatured the artery, and the two ends of a divided nerve were sutured. The wound healed slowly by granulation.

Condition Before Operation.

On admission to the infirmary the patient was in robust health. There was a scar on the inner aspect of the right arm, extending from a point 2 in. above and to the inner side of the olecranon process, obliquely upwards and forwards for about 3 in. to the inner side of the prominence of the biceps. The circumference of the right forearm was two-thirds of an inch less than that of the left, that of the wrist half an inch less. The hypothenar eminence was absent, the thenar eminence was much atrophied, and the interossei muscles were very much wasted. He had entirely lost the power of grasping, though he could flex the metacarpo-phalangeal articulations to a right angle. Extension of the wrist was possible, apparently with considerable exertion, but flexion of the wrist was impossible against gravity. The thumb could not be adducted nor the fingers separated or approximated. All the muscles acting on the wrist and hand which had their nerve supply from the median and ulnar nerves were paralysed, while those supplied by the musculospiral were capable of acting.

Sensation was absent along a narrow line extending over the inner and anterior aspect of the ulnar border of the forearm from the elbow to the wrist. In the palm, sensation was absent except over the thenar eminence and part of the proximal phalanx of the thumb. On the back of the hand it was absent internal to a line drawn backward from the cleft of the middle and ring fingers, also over the whole of the back of the little and ring fingers, as well as over the distal one and a half phalanges of the index and middle fingers. The extensors reacted to faradism; the flexors showed no reaction. To a current of 10 milliamperes the C.C.C. was greater than the A.C.C. both in the flexors and extensors.

It was manifest that there had been a complete division of the median, ulnar, and internal cutaneous nerves, and it was clearly useless to attempt anything short of operative interference.

Operation.

On January 30th, 1890, the limb having been previously aseptically ether was administered, and an incision made along the line of the cicatrix; it was prolonged some distance upwards and downwards, and supplemented by a transverse incision about an inch above the elbow. The ulnar nerve was soon exposed above the internal condyle; it was firmly fixed in fibrous tissue. The lower end of the upper segment, which was bulbous, was connected by fibrous tissue with the upper end of the lower segment. A long search was then made for the median nerve, as the large cicatrix had altered the normal anatomy of the parts. A small nerve was discovered at the upper part of the wound, which proved to be the internal cutaneous. The lower end of this nerve was discovered later, and united to the upper by a catgut suture. The internal intermuscular septum was divided 1½ in. above the internal condyle, and the atrophied remains of the brachial artery defined. At last, about the middle of the upper arm, the bulbous lower end of the upper segment of the median nerve was discovered well under, and concealed by, the belly of the biceps. Later the upper end of the lower segment was found just above the bend of the elbow. This extremity was expanded, and sent ramifications into the cicatrix. The fibrous tissue between the ends of the ulnar nerve was excised, and the two healthy portions were united by grafting strands of the sciatic nerve of a rabbit so as to fill up the gap and produce continuity. It was quite impossible to bring the divided ends of the median nerve nearer than 2½ in. All the nerve tissue at my disposal having been exhausted in uniting the ulnar nerve, Mr. Littlewood, who was assisting me, dissected out the spinal cord of a rabbit just killed, and this was used as a graft to connect the ends of the median nerve, the inserted cord lying loose and quite free from tension when finally placed in position. Fine catgut sutures were used throughout. The edges of the wound were brought together and the usual dressings applied, the arm being fixed on a rectangular splint. Healing occurred by first intention, and there was an entire absence of fever or pain.

Early After-History.

On February 10th the patient could feel the scratch of a pin on the flexor aspect of the first phalanx of the thumb, as well as at the root of the index finger. He could tell when the hairs on the back of the first phalanges of the ring and little fingers were pulled, but could not feel the scratch of a pin in that position.

On February 17th sensation had returned over the whole of the palmar surface of the thumb and the proximate phalanx of the index finger.

On March 4th sensation seemed to be creeping slowly along the first finger, and to be present over the whole of the palmar area supplied by the median nerve, and extending as far down as the web of the fingers, and a short distance along the middle finger. As yet there was no marked improvement in the ulnar distribution.

On March 6th electrical reaction to faradism was absent in the muscles. C.C. 15 milliamperes, C.C.C. equal to A.C.C. in flexors; C.C.C. greater than A.C.C. in extensors. The muscles were