such cases have improved on arsenic and iodide, cataphoresis, and strapping the elbow with Scott's dressing. The latter treatment combined with the drugs has given the most satisfactory solution in this series. Another complication to be feared, and, I think, an unavoidable one, is the formation of new bone in the substance of the brachialis anticus muscle near its attachment, the so-called myositis ossificans traumatica. It has occurred in three of this series, and I know of no treatment that will cure it. If the new bone is removed it has been my experience to see it recur, and to recur in greater quantity than was present originally. In these cases flexion is limited to a right angle or less.

The last complication not to be forgotten, and one which again indicates painless treatment and early rest, is that these joints, after such an injury, are prone to infection. I have seen one case of tubercle follow such an injury in a child and one of gonorrhoea in an adult.

Treatment by full flexion applies to all fractures in the neighbourhood of the elbow-joint, except fractures of the olecranon process, and most cases of fracture of the head of the radius. In these two latter open operation is preferable—namely, wiring the olecranon and often excision of the head of the radius.

In adults movements may be practised by the surgeon, though such movements should not cause pain. Extension and flexion return more quickly in an adult than in a child, and suspension from a trapeze may be started between the third and fourth weeks.

Open operation for fractures about the elbow-joint, except for the two varieties mentioned above, has, I think, nothing to recommend it, and usually ends in bad results, especially in young children. If operation for deformity from faulty position some time after the injury is necessary, it is, I think, wiser to wait. A condition which seems hopeless at first can often be greatly improved by careful manipulation under an anaesthetic and after-treatment. Should these measures fail, it would seem wise to wait until the bones have stopped growing, and then plan some form of osteotomy. Open operation, however, should be the very last resort.

Knee-joint.

Of injuries in the neighbourhood of the knee-joint, only those involving separation of the lower epiphysis of the femur and fracture of the shaft in the neighbourhood of the condyles not involving the joint will be considered. The displacement here is reduced under an anaesthetic, and the knee is put in a condition of full flexion. It is strapped in this position just as in the treatment of the elbow-joint. Evaporating lotion is applied and a straight splint fixed on either side of the limb at the level of the strapping with buckle and straps. The knee is kept fully flexed for ten days or a fortnight and then is brought down to full extension and put up on a Liston's long splint with extension below the knee. If there is any bending of the limb laterally at the site of the fracture, it can at this stage be easily straightened under an anaesthetic. An x-ray picture should be taken after the limb is put up to see that the position of the lower fragment is satisfactory. At the end of five weeks, or often between the fourth and fifth weeks, passive movements should be started, and massage earlier, while the limb is still on the splint. The splint should be replaced after the passive movements and discontinued at the end of the sixth week.

These fractures are very troublesome to treat by other means, as the lower fragment shows a constant tendency to slip, and it is extremely difficult to fix it otherwise. Mr. Robert Jones advises full extension in these cases from the beginning. He says that surgeons, after performing femoral osteotomy for conditions such as genu-valgum, do not put up the limb in full flexion. I think there are one or two points he may have omitted to take into consideration. In an osteotomy the same kind of force has not been exercised to produce the fracture. Here the bone only is cleanly divided, and frequently only partially divided, without the laceration of muscles and forcible displacement that usually occurs in one of these fractures. I have tried the full extension method for this type of fracture and can only say that it has proved a failure, whereas full flexion has given the most satisfactory results.

Open operation for these fractures has, as a rule, nothing to recommend it.

THE USE OF IONIC MEDICATION IN THE TREATMENT OF CERTAIN VENEREAL DISEASES.

By R. CONNELL, M.B., B.Ch., SURGEON R.N.

I HAVE lately had an opportunity of trying the effect of ionic medication in cases of primary syphilis, secondary syphilitic ulcerations, gummata, soft sores, septic buboes after operation, and gonorrhoeal rheumatism. Instances of successful treatment of the last mentioned have already been reported, but, so far as I am aware, no cases of primary syphilis treated by mercury ionization have been published.

Treatment by ionic medication gave very satisfactory results in most of the above-mentioned diseases, but the results obtained by using the mercuric ion in syphilitic lesions are specially worthy of mention. The best results were obtained in those cases of syphilis in which there was no evidence of a mixed infection. In these the *Spirochaeta pallida* alone was the cause of the lesion, and the results were equally good whether the sore were an early primary chancre or an old chancre which had resisted treatment for some time.

If a mixed infection existed the healing was not so rapid; there was great improvement at first, probably due to destruction of the spirochaetes, but later on delay occurred; the ulcer remained clean but had a chronic appearance. As the secondary infecting organism may be of many varieties, it is impossible to lay down a rule as to the ion to use when the mercury has done its work. Probably the best results are obtained from the iodide or zinc ion. The worst results of all were in soft sores.

It is a common error to think that all sores occurring in a syphilitic patient, either in the early stages when primary and secondary signs are present, or later, when the early secondary manifestations have disappeared, are due to the syphilitic virus. Quite frequently a patient has both hard and soft sores at once, and in many cases a fresh infection of soft sores occurs while the patient is still under treatment for syphilis. Should this occur, it is very liable to be ascribed to renewed activity of the syphilitic virus and lead to renewed use of anti-syphilitic remedies. Such a sore as this heals very slowly and is disappointing to the surgeon, largely because of unsuitable treatment due to the mistake in diagnosis. Such a sore also causes disappointment in ionization if treatment with the mercury ion be persisted in. If the response to the mercury ion be not early and striking, the case should be regarded as probably non-syphilitic and treated by ordinary antiseptics, the ions of zinc, chlorine, or iodine being given a trial.

There is another class of case in which a healed primary syphilitic sore breaks down again. This may occur in spite of treatment by salvarsan and continuous mercury. These sores are very resistant to ordinary treatment, but readily respond to ionic medication with the mercury ion.

In the Royal Naval Hospital, Plymouth, it has been the practice to give internal antisyphilitic treatment as soon as the diagnosis is confirmed. This consists of grey powder gr.ij thrice daily, and to the majority of cases three injections of neo-salvarsan are given in addition. The first injection is given as a rule within a week after admission.

It may therefore be objected that the results shown below were really due to the neo-salvarsan or the mercury rather than the ionization, but several of the cases to be mentioned were almost completely healed before the first dose of neo-salvarsan was given, and the two most striking cases had no salvarsan at all. The improvement, too, follows so hard upon the first application of ionization, and is at once so marked, that to the observer there cannot be any doubt as to its cause. Also, certain stubborn cases which failed to respond to mercury and salvarsan cleared up rapidly on the application of ionic medication; and before this treatment was tried it was unusual for the primary sores to be healed until some time after the three injections of salvarsan had been given.

In the earlier cases treated the zinc ion was used with

good results, but when, as an experiment, the mercury ion was tried the result was astonishing.

The two most strikingly successful cases (Nos. I and VI) were the two most severe.

CASE I.

In the first of these the sore was a very severe primary chancre, extending half way around the corona from frenum to dorsum. Swelling, inflammation, and pain were very great. The sore had already been present for eleven days. The patient had been treated for six days in hospital by baths and lotio nigra, with mercury internally, but there was little or no improvement. He had refused salvarsan. As an experiment mercury ionization was tried; a 2 per cent. solution of mercury perchloride was applied on layers of wool, a bent zinc wire being fitted so as to embrace the affected side of the penis. A current of $2\frac{1}{2}$ milliampères was passed for five minutes. This was the maximum current that could be borne without excessive discomfort. The treatment was painful, partly owing to the stinging caused by the perchloride solution. Cocaine, applied after treatment, gave relief. The improvement was immediate; the patient had a comfortable night, free from pain. Next day the inflammation was nearly gone, and the penis had regained its normal size. The ionization was repeated on the fourth, eighth, and thirteenth days, and on the fifteenth a short application of the zinc ion was given as a finishing touch. By the fourth day the sore was rapidly healing; by the eighth it had come down to half size, and by the seventeenth day healing was complete. Between the applications it was dressed at first with perchloride solution 1 in 10,000, and later with ung. zinci c. ichthyol 5 per cent. This sore was thus completely healed in sixteen days. I doubt if healing could be more rapid.

In the majority of the following cases healing was similarly rapid in proportion to the size of the lesion.

CASE II.

Primary chancre of four days' duration. Was given two applications of mercury ionization. Result: Almost healed on fourth day; completely healed on eighth day. One injection of salvarsan was given in this period.

CASE III.

Primary sore at frenum of eleven days' duration. Completely healed four days after a single application of mercury ions. Had one injection of salvarsan on second day. An indurated area around the healed sore disappeared after a second ionic treatment.

CASE IV.

Small early primary sore on side of penis present for four days. Healed on third day following a single treatment with mercury ions. An injection of salvarsan was given on second day.

CASE V.

This patient had had salvarsan two and a half years previously; also three further injections about six weeks before admission. On admission in July, 1913, there was apparently an early primary sore near the frenum. It had been present for twelve days and had followed coitus. Three applications of mercury ions were given. On the day following the first treatment the sore was larger and more moist, with one or two slight blisters at the periphery. These cleared up rapidly and healing was complete in thirteen days. No salvarsan was given on this occasion.

CASE VI.

This case is of special interest. The patient had a very large sore, involving the whole under surface of the glans penis, the frenum being eaten away. It had resisted antisyphilitic treatment by mercury for two months. He also had an ulcer on the right thigh. This had the appearance of a soft sore, but was thought to be syphilitic. It had been present for two weeks. Both sores were treated by mercuric ionization; the improvement in each was good at first, but while that on the penis made a rapid recovery and healed in thirteen days with two applications of ionization, that on the thigh, which was less than half the size of the other and not indurated, soon ceased to improve. On the sixteenth day it was still about the size of a shilling; on the nineteenth day iodide ions were applied. Immediate improvement set in, and two further applications completed the healing by the thirtieth day.

I am at a loss to account for the unequal behaviour of these two sores, unless on the grounds that the ulcer on the thigh was a soft sore, in which case the mercuric ion would be unsuitable. (See below.)

CASE VII.

This was one of the earliest treated. An indurated sore appeared on the penis of a man who had had three injections of salvarsan a couple of months previously. He had again been exposed to infection three weeks before its appearance. He refused salvarsan on this occasion. The sore was treated at first by zinc ionization. After the second application of zinc the mercuric ion was tried, as its good effect on Case I had been noticed. Three applications were given; but though the sore had decreased to half-size in ten days, there then seemed to be no further response to the mercuric ion, the sides of the ulcer remaining still indurated and the centre excavated. When,

however, the iodide ion was tried, immediate healing set in. This case took twenty-nine days to heal.

CASE VIII.

The patient had an old indurated punched-out sore on penis. This had first appeared in July, 1912. He was then given three injections of salvarsan. It broke down again, and healed reluctantly in May, 1913. It again broke down in July, 1913, on which occasion he came under my notice. It had already been present for thirty-eight days when ionization was commenced. On the second day following the first ionic treatment improvement was already well marked, but unfortunately for the results of the experiment a first injection of salvarsan was given on the third day, and a second on the eighth day. Healing was complete on the eleventh day. Three applications of ionic medication were given in the period.

CASE IX.

A meatal chancre of five days' duration. Healed in eighteen days. Had four applications of mercury ionization. All pain and induration disappeared on the day following the first treatment. It was difficult to treat this case effectively owing to the situation of the sore; hence the delay in healing. He had one injection of neo-salvarsan on the fifth day.

CASE X.

Early sore near frenum of six days' duration. Three applications of mercuric ionization were given. The sore was healed on the eighth day.

TECHNIQUE.

The ulcer is cleaned as thoroughly as possible. If pain is anticipated, it is first treated with 5 per cent. cocaine on lint. Any cocaine solution remaining on the sore is driven in with the mercuric ion when the current is passed. A 2 per cent. solution of mercury perchloride is then applied on several pieces of lint cut to the proper shape. The first layer should fit the ulcer as exactly as possible. The outer layers should extend a little beyond its edge. The electrodes consist of narrow strips of zinc sheeting cut to convenient sizes, and bent to suit the shape of individual cases. They are attached to the positive pole. If the ulcer is flat any circular piece of copper or zinc would do. I do not see the necessity for elaborate precautions to ensure that the ion of the metallic electrode should be the same as that in the solution. If sufficient lint is used the ions from the metal electrode will not have time to reach the ulcer. Personally I use as an electrode the head of a large bronze screw for small circular sores. If the copper (or zinc) ions from the screw reach the ulcer their effect is curative, and the corrosive action of the perchloride solution on the more expensive electrodes is obviated.

The effect of the application of the mercuric ion for a short time is to produce a slight whitening of the tissues not unlike that caused by the zinc ion. It is, perhaps, advisable not to push the treatment so far as this. If the application is too long, or if the current is unevenly distributed, blistering may occur. These blisters usually heal rapidly. The current usually borne is about 2 to 4 milliampères. It is best to make a first application of not more than five minutes' duration. This may be repeated in three or four days.

The first effect noticed is a striking diminution of pain and discomfort on the night following the treatment. By the next day the sore is more moist, and may appear a little larger, but the inflammation surrounding it is gone, and though it does not look improved the patient is convinced that it is very much better; he generally describes it as being "easier." After this progress is rapid, and by the fourth day it usually has the clean and flat appearance of a rapidly healing ulcer. The effect of each application is to produce a slight moisture for the first twenty-four hours, and therefore I think small doses are the more efficacious; and also probably a longer period than three days between applications would give better results. If induration persists in the surrounding parts after the sore is healed, it disappears quickly when given a further application. If a set-back occur in the healing process, probably a change to the iodide ion will produce a good effect.

There is unfortunately no probability of aborting syphilis by ionic medication alone. In two cases of very early sores treated by me, and healed in four and six days respectively, the Wassermann reaction became positive, though no secondary symptoms have developed so far. They had the usual internal treatment.

But in spite of the fact that we must regard this treatment as purely local, I venture to suggest that when

greater experience of it is gained by a more extended trial, it will prove to be one of the most rapid methods of healing a superficial syphilitic lesion, whether primary or secondary.

GUMMATA.

As a means of introducing the iodide ion locally ionization is very efficacious. A case of gumma of the abdominal wall which was making very slow progress under treatment with mercury and salvarsan began to resolve rapidly as soon as ionic medication was tried. It was especially serviceable in this case, as the patient could not take potassium iodide by the mouth. If the skin be unbroken, a current of 30 to 50 milliamperes can be borne for twenty to thirty minutes without injury. The lint must be folded in sixteen thicknesses and attached to the negative pole. Tincture of iodine painted on the skin (negative pole) seems to be good also, but is much more likely to cause small burns.

For broken-down gummata the iodide ion at once clears up all induration, removes sloughs, and cleans up the ulcer. Two cases of broken-down superficial gummata were treated with success.

NON-SYPHILITIC LESIONS.

In the case of non-syphilitic lesions the results obtained by zinc ionization have been very good, but by no means so striking as those mentioned above. This is due to the absence of any ion which is a specific for the disease.

SOFT SORES.

In soft sores the result of zinc ionization has been at times most satisfactory and at others very discouraging. No very recent soft sore was treated.

CASE I.

This man had an extensive irregular sore on penis, also an abscess in groin and another on the penis, each of which, after incision, had taken on the characters of a soft sore. The condition had persisted for forty-six days prior to ionic treatment. It was healed in twenty-nine days. The zinc ion was used. The number of applications were: To the bubo, two of 15 milliamperes for ten minutes; to each of the other sores, five applications of 3 to 4 milliamperes for five minutes.

CASE II.

This man had contracted severe syphilis at Colombo four months before. Since then he had been continuously on the sick list. The present lesions were a severe gummatous ulceration of the throat, two syphilitic ulcers on elbows, and a large soft ulcer on buttock. It responded at first to the Hg ion, but, though pain was absent, the sore did not look much cleaner after two weeks. Two applications of the chlorine ion were then given for the cleaning effect, with very good results. Iodide ions were then applied. At the time of writing there have been two applications of 10 milliamperes for fifteen minutes, and the ulcer is now less than half its original size, with flat healing edges. Treatment has lasted three weeks. Possibly larger and earlier doses of iodide ions would have produced a quicker effect. (Compare this with Case VI above.)

CASE III.

This man suffered recently from syphilis for which he had had three doses of salvarsan. Three small abscesses occurred in his groins, which after incision took on the appearance of soft sores, the edges being ragged and undermined. He was given six applications of zinc ions in small doses. Improvement was good at first, but relapses occurred, and no permanent benefit was obtained. He had in all nine applications of ionization (including two of iodide) when the treatment had to be suspended for other reasons.

This last case may possibly have been some infection distinct from soft chancre, but it is quoted because it was distinctly unsatisfactory.

It would appear from the above that the results with soft sores are not uniform, but though success is not certain the method is worth a trial as an adjunct to ordinary antiseptic treatment.

SEPTIC BUBOES.

The ionic treatment of large suppurating buboes after operation is on the whole very encouraging. The sloughs separate, fetor if present quickly ceases, healthy granulations soon appear, the sides remain clean, and the large cavity closes with considerable speed.

CASE I.

This case underwent extensive removal of inguinal glands twenty-one days previous to ionic treatment. When ionization was commenced there was a very large sloughing cavity, with

ragged edges, stitch sinuses and profuse discharge. He had thirteen applications of zinc ions and made an uninterrupted recovery, being completely healed in nine weeks. This period seems long, but the cavity was extremely large, and the last ten days were spent in the healing over of the superficial scar.

CASE II.

The bubo was incised on April 5th. Ionization was commenced on May 4th (that is, twenty-nine days afterwards). At this time there was a large sloughing cavity with unhealthy granulations and considerable discharge. Five applications of zinc ions were made, the current being gradually reduced from 20 milliamperes for half an hour to 10 milliamperes for five minutes. Complete healing took place in thirty-six days.

CASE III.

A large mass of inguinal glands was removed on May 19th. On May 23rd there was a large quantity of foul-smelling pus with sloughs and gas, and great inflammation. Ionization commenced on that date. May 25th, all fetor gone. May 28th, clean and healing. July 8th, completely healed in forty-six days. Had nine applications averaging 20 milliamperes for ten minutes.

The three foregoing were the worst cases treated. Healing was very rapid in view of the condition prevailing at the commencement, and the very large cavities to be filled in.

There is one other case of bubo worthy of mention. This man had syphilis.

CASE IV.

An abscess was opened in groin on May 29th. Zinc ionization commenced on June 8th. Progress was very good. Six applications were given, and on July 8th further ionization was considered unnecessary, as only a small sinus remained. This, however, persisted, and on July 26th and 27th two further doses of zinc ions were given, but no improvement followed. There was still a small, deep, punched-out sinus, with hard, yellow sides. On August 2nd a single application of the Hg ions was given. On August 3rd there was a watery discharge. By August 5th sloughs had almost disappeared from the sides, and on August 8th it was quite healed. This man had no other active signs of syphilis, and having already been treated with salvarsan was awaiting the healing of the bubo before being sent to duty.

TECHNIQUE FOR BUBOES.

The cavity is cleaned as thoroughly as the patient can bear. The sides and all diverticula are then carefully packed with wool soaked in a 2 per cent. solution of zinc sulphate. A flat strip of zinc about half an inch wide is then placed on edge in the cavity between the layers of wool, so as to be, as far as possible, equidistant from the sides. The spaces remaining are then packed with the moistened wool, care being taken that the bare metal does not touch the patient. Usually in a large cavity a current of 20 to 30 milliamperes can be borne for fifteen or twenty minutes; this gives about the right degree of whiteness of the tissues. The patient's comfort is the chief guide to current strength. As a rule, he can bear 1 or 2 milliamperes per square centimetre. It is better to give a weak current for a long time than a large dose for a shorter period, as the ions probably penetrate further in the long application.

It is advisable to reduce the dose when the healing process has been well established, as there is usually a serous discharge for the first twenty-four hours after the larger applications.

If there is much pus, I find that one or two applications of the chlorine ion (sodium chloride solution at the negative pole) is a very effective method of cleaning the wound before zinc ionization is commenced.

GONORRHOEAL RHEUMATISM.

I have not tried ionization in the acute stages of this affection, but when it has become chronic, with increased fibrous tissue around the joints, considerable benefit is obtained from the chlorine ion. The improvement is quickly appreciated by the patient. Usually a current of 15 to 20 milliamperes is passed for thirty minutes three or four times a week. On the whole, in gonorrhoeal rheumatism, as in soft chancres, or buboes which have been infected with the chancroid virus, the results, while usually good, may sometimes disappoint. But in syphilitic lesions of any stage, provided they be superficial and accessible, the treatment by ionic medication gives unusually good results, and when wider experience has been gained, bids fair to be one of the most efficient at our disposal.