those made by Poulenc Frères, Paris; but, of course, good, fresh, damp-free English chloride of lime may serve equally well.

To many the above may seem small or obvious details, but if the observance of them leads any one sceptical of Carrel treatment to a revision of his opinions and to his making full use of this new method, I believe that many lives and limbs will be saved.

I append notes of two cases which, although not gunshot wounds, may be of interest as supporting the claims I make.

G. R., on May 13th, 1917, at Landrecourt, sustained by a fall from a wagon a simple fracture—spiral—at the junction of the lower and middle thirds of both bones of the right leg. Reduction was said to have been made under *x* rays, and a gutter plaster had been applied. He was evacuated to another hospital and then sent to us on May 21st. The bones seemed to be in good position, but there was a shortening of 2 cm.

Pressure of work on more urgent cases prevented my making a fuller examination until June 11th, when the plaster was removed, and not the least sign of union was found. Under *x* rays a left-handed spiral fracture of the tibia at the site above indicated was made out. Under ether, on June 21st, the fracture was exposed and muscle found intervening between the fragments. This was dislodged, and the ends of the fractured bones nibbled and freshened. An attempt was then made, with difficulty, to overcome the overlapping. The fracture being five weeks old the muscles had retracted, and the apposition was not all that could be desired. A Lane's four-screw plate was applied and the wound close sutured. An Edinburgh box splint was used.

At the operation I was short-handed for assistants during extension, and had myself to attempt, at one stage, helping with one hand to get the proper degree of torsion. The sterile foot-covering slipped, and I suppose that at this moment my hand must have come into contact with some non-sterile portion of skin, and been imperfectly resterilized by washing thereafter. In any case, an infection of the wound occurred; and on June 27th two of the lower stitches showed signs of infection. On July 2nd definite infection of the whole line of suture was present. The incision was opened up afresh and a Carrel tube led down to the plate, vaselined gauze applied to the skin around, and gauze pads soaked in Dakin's solution applied. Absorbent wool, covered by a layer of non-absorbent, was laid over this, and injections of Dakin's solution given by tube every two hours—that is, the usual Carrel treatment was followed. The leg was placed on a Pringle's splint for leg fracture.

The plate was removed on August 27th, when union was good, and by September 10th the wound was well healed under Carrel dressing.

On September 29th the patient was walking. There was slight eversion of the foot and some stiffness at the ankle. Massage to the whole limbs and single daily movements of knee and ankle were given during this rather lengthened treatment. The patient was evacuated, walking fairly well, to Bourbonne-les-Bains, a centre for mechano-therapy, on November 23th. The shortening was 2 cm.

The points in this case that seem to me of interest are:

1. Fracture at a site where good union is extremely difficult to obtain.
2. Definite control of a fresh infection of a clean wound during operation (even in the presence of so large a foreign body as a Lane's plate with four screws) until the bony union of a fracture is complete.

In the absence of Carrel treatment, such a case, instead of closing in in ten and a half weeks, would probably fail altogether, or take three or four times as long, and necessitate several cleansing operations.

H. R. was injured on April 21st, 1917, at Verdun by a kick from a horse. He presented a badly infected compound fracture of the right tibia and fibula at the junction of the middle and lower thirds. He had received an injection of antitetanus serum on April 21st and a second on April 30th. It was impossible to say what treatment he had had in the way of dressing, but the fracture had been reduced and a gutter splint of plaster-of-Paris applied.

He was admitted to our hospital on May 2nd in the evening, and operated on thirty-six hours later. *X* rays had shown a comminuted transverse fracture of tibia and fibula at the junction of the lower and middle thirds; the comminution being confined to an area of about 3 cm. square in the tibia. At operation some splinters of dead bone were removed. A copious sanious discharge was present. The alignment of the upper and lower fragments of the tibia was good. The wound of the soft parts was dissected out and opened up freely. The ends of infected bony parts were nibbled off and gutters cut in the anterior surface of both fragments to allow of penetration of Dakin's solution to the cancellous tissue. Carrel dressing with five tubes was applied; and the limb immobilized in an Edinburgh box splint.

The wound continued dirty, and soft tissues remained swollen for sixteen days. Injections of antitetanus serum were made,

and seemed to have a good effect on the wound. The temperature range was from 37.4° C. to 39.4° C. The wound began to granulate well after the sixteenth day. On June 5th it was noted that the shortening of the limb was 4 cm. On July 7th the wound was well epithelialized all over, except for an area of about 1 cm. square. Movement could be elicited at the site of fracture. On July 15th a Pringle splint for fractures of the leg was used, with extension by strapping and weight. A rotating pull against eversion and a vertical pull against drop-foot were also applied.

By August 7th the surface was quite epithelialized, and under ether a Lane's plate with four screws was fixed over the fracture on the antero-internal aspect of the tibia. The wound was left widely open, and Carrel tubes and dressings applied. On August 24th the wound was granulating well, and the plaque was covered in at the upper end. On October 5th the plate was removed and the bone found to be well consolidated. The patient was evacuated to Bourbonne-les-Bains for massage and mechano-therapy on November 23th.

The shortening in this case was 4 cm., due to the comminution between the two principal fragments.

The points of interest in this case are similar to the last:

1. Fracture at a site where non-union is notoriously frequent.
2. Extremely bad infection of all parts, soft and bony, loss of bony substance, and gross trauma of the muscles and skin.
3. Definite control of the infection even in the presence of a large foreign body—a four-screw Lane's plate.

Without Carrel treatment I think this case would have required amputation at seat of election.

REFERENCE.

¹ *Le Traitement des Plaies Infectées*. Par A. Carrel et G. Dehelly. 1917. Paris: Masson et Cie. *The Treatment of Infected Wounds*. By A. Carrel and G. Dehelly. Translation by Herbert Child. 1917. University of London Press.

GONORRHOEA COMPLICATED BY SYPHILIS.

BY

N. P. L. LUMB, TEMPORARY CAPTAIN R.A.M.C.

In the past it has been customary to look upon syphilis as a much more important disease than gonorrhoea, and considerably more attention has been paid to it than to the latter. This is evident from the fact that a patient presenting himself with signs of both syphilis and gonorrhoea is commonly given thorough antisyphilitic treatment without delay, whilst the sum total of the treatment advised for gonorrhoea is an irrigation twice a day with permanganate of potassium. This plan is unsatisfactory, and an experience of large numbers points to the fact that modern antisyphilitic treatment at times (1) stirs a latent gonorrhoea into activity; (2) leads to the development of complications; (3) renders the gonorrhoeal lesions very intractable.

These three points are illustrated by the ten cases quoted below, all of which were treated by injections of arsenobenzol compounds (either by the deep subcutaneous method or intravenously) and weekly injections of mercury:

CASE 1.—Primary syphilis. No urethral discharge; two-glass urine test on admission: clear, no filaments. Gonorrhoea twelve months before; no relapse since. After four arsenobenzol and three mercury injections acute prostatitis developed, followed by inflammation of the left Cowper's gland, the pus from which was found to contain gonococci. Later there was arthritis of the left shoulder.

CASE 2.—Primary syphilis. No urethral discharge; two-glass urine test on admission: clear, no filaments. History of gonorrhoea two months before. Acute left epididymitis developed after ten injections of arsenobenzol and five of mercury.

CASE 3.—Primary syphilis. No urethral discharge; two-glass urine test on admission: clear, no filaments. Past history of gonorrhoea not clear. After three mercury injections acute prostatitis developed, followed ten days later by acute epididymitis.

CASE 4.—Primary syphilis. No urethral discharge; two-glass urine test on admission: clear, no filaments. History of gonorrhoea six months before; no relapse since. After ten arsenobenzol and seven mercury injections acute epididymitis developed.

CASE 5.—Primary syphilis. No urethral discharge; two-glass urine test on admission: clear, no filaments. History of gonorrhoea four years ago; no relapse since. After five arsenobenzol and three mercury injections acute epididymitis developed.

CASE 6.—Early secondary syphilis. The primary lesion appeared three weeks after exposure to infection, and there was a doubtful history of a slight purulent discharge for two days, possibly of balanitic origin. No urethral discharge on admission, nor subsequently for three weeks; throughout this period the urine was under observation; it was clear and free from filaments. There had been no previous attack of gonorrhoea. Three days after the third weekly injection of mercury and arsenobenzol a profuse purulent discharge appeared and the urine became cloudy. Eventually, when the discharge had been reduced to a minimum, the urethroscope showed clearly that Littre's glands were responsible for the trouble. Very persistent inflammation of them kept up a discharge for three months.

It will be observed that in Cases 1 to 6 there was no evidence of active gonorrhoea when antisyphilitic treatment was commenced; but in four of them a definite past history of gonorrhoea, varying from two months to four years, without subsequent relapse.

CASE 7.—Primary syphilis. Gonorrhoea evident on admission. After three arsenobenzol and two mercury injections acute epididymitis and prostatitis developed.

CASE 8.—Secondary syphilis. Gonorrhoea evident on admission; two months since exposure to infection. After three arsenobenzol and one mercury injection acute epididymitis developed.

CASE 9.—Primary syphilis. Gonorrhoea evident on admission. After five arsenobenzol and two mercury injections acute epididymitis and prostatitis developed, and later a small hydrocele of the affected testicle.

CASE 10.—Primary syphilis. Gonorrhoea evident on admission. Eleven arsenobenzol and eight mercury injections were given. One month after the last mercury injection acute epididymitis developed.

In Cases 7 to 10 there was evidence of gonorrhoea when treatment was commenced.

An analysis of these ten cases shows the following frequency of occurrence of each complication: Epididymitis, 8 times; prostatitis, 4 times; cowperitis, littritis, arthritis, hydrocele, once each.

Of the four cases in which gonorrhoea was evident, epididymitis developed in every instance, and prostatitis in two of the cases. Taken by themselves, these four cases (7 to 10) are not noteworthy, though it is unusual for gonorrhoeal epididymitis to develop in the ninth to tenth week, as in Case 10; but in conjunction with Cases 1 to 6 considerable interest attaches to them.

It is impossible to state definitely what is the cause of the onset of these complications, but the evidence points to the mercury compound rather than to the arsenobenzol. In another place¹ I have described a series of cases of acute gonorrhoea treated by injections of mercury compounds, such as enesol and mercury succinamide. In some of these it was found that epididymitis and prostatitis developed, without any exciting cause, as late as the tenth to twelfth week. This corresponds with the facts observed in Cases 2, 4, and 10.

At the moment of writing there are no figures available to show what the effect on the Wassermann reaction would be of withholding mercury for the first three weeks and administering arsenobenzol alone. If this could be done without detriment there would be a reasonable chance of controlling the gonococcal invasion before the mercury could exert any effect.

The number of cases recorded is much too small to allow any generalization, but it seems advisable to review the situation and consider what is the best line of treatment in patients presenting themselves with syphilis and either active signs of gonorrhoea or a past history of gonorrhoea.

The proportion of cases in which untoward effects are noticed seems to be about 10 per cent., and, in consequence, I have adopted the following routine in every case of syphilis, varying according to whether there are active signs of gonorrhoea or a past history of it.

1. When there is a past history of gonorrhoea and no active signs.

(a) A six to eight hours specimen of urine is taken twenty-four hours after the first mercury injection and examined microscopically for gonococci after centrifuging. The presence or absence of threads is also recorded.

(b) The prostate and vesicles are examined during the first week of treatment. A smear of the expressed secretion is made and examined microscopically for gonococci.

If both (a) and (b) are negative a dose of gonococcal vaccine is given (50 million gonococci), and test (a) repeated twenty-four

hours later. If no gonococci are found, no treatment is necessary.

If gonococci are found, the urethra is examined carefully with the urethroscope to locate the infection, and suitable treatment commenced at once, varying with the nature of the lesion.

2. When there are active signs of gonorrhoea.

Irrigation into the bladder with 1 in 3,000 potassium permanganate is commenced at once, the strength being rapidly increased to 1 in 4,000 as soon as the patient can irrigate successfully. Vaccines are given from the start at regular intervals and the prostate examined about the tenth day. A straight bougie is passed at the end of the second week, and this reveals the presence of any inflamed glands of Littre.

The whole idea of the treatment is to prevent the gonococci from getting settled down in the tissues and so prolonging the attack. The intractability of some of these cases, especially when littritis is present, has been referred to elsewhere,² and it is constantly necessary to vary the strength of the irrigating solutions and the instrumental treatment according to the progress of the case. It has not been considered necessary to refer to the various mechanical ways in which syphilis may complicate the treatment of gonorrhoea, as, for example, when a meatal chancre is present or phimosis results from the presence of a syphilitic abrasion, since the correct method of dealing with them presents no difficulties.

REFERENCES.

¹ *Systematic Treatment of Gonorrhoea*, N. P. L. Lumb (Lewis and Co.), p. 55. ² *Ibid.*, p. 83.

Memoranda:

MEDICAL, SURGICAL, OBSTETRICAL.

THE LIFE-HISTORY OF ASCARIS LUMBRICOIDES.

I HAVE followed with great interest the discussion between Lieut.-Colonel Clayton Lane and Major F. H. Stewart on the life-history of *Ascaris lumbricoides*, and am familiar with the editorial note in the BRITISH MEDICAL JOURNAL, July 1st, 1916, which is frequently referred to by both of them in their papers (vide *Indian Medical Gazette*, August and October, 1917). I did not write on Major Stewart's letter, published in the BRITISH MEDICAL JOURNAL, September 30th, 1916, at the time, as no very useful purpose would have been served thereby, not enough work having been done at that time to determine the point one way or the other. Lieut.-Colonel Clayton Lane has dealt with the subject so fully in the *Indian Medical Gazette* (loc. cit.) that there is no necessity to say much more. He came independently to a similar conclusion to myself, that the passage of the ascaris larvae into the lungs of rats and mice indicated a vasculo-pulmonary circuit, as is seen in ankylostomiasis. Major Stewart's recent paper, published in *Parasitology*, January, 1918, which deals with *A. suilla* and the passage of its larvae to the lung of the pig, is very suggestive, and to my mind, though he did not always find adult ascaris in the intestines of his pigs after feeding with the ripe eggs, seems practically to prove the vasculo-pulmonary circuit. It certainly diminishes the force of the alternative hypothesis, that the lower animals act as intermediate hosts for the parasite, to practically zero. If *A. suilla* does the circuit in the pig, then it stands to reason—and this Major Stewart, I think, admits—that *A. lumbricoides* will do the same in man. If so, then there is only the other step for it to pass up the trachea, like the ankylostome, and so into the intestine, where it can become sexually mature. It is unfortunate that some of Major Stewart's pigs should have been infected before his experiments were begun, as it renders it difficult to say whether he reinfected them or not. The interval between the arrival of the larvae in the intestine and their development into adults may differ, and it may even be fairly long. The experiment to prove this point finally should not present insurmountable difficulties, and it is to be hoped that in the interests of helminthology this may shortly be carried out, preferably by Major Stewart himself.

GEORGE C. LOW, M.D.,

Assistant Physician and Lecturer, London School of Tropical Medicine; Temporary Captain I.M.S.