Stages II and III.

The treatment of Stages II and III may most conveniently be considered together.

In performing the diagnostic lumbar puncture, it is well to administer a first dose of serum without waiting for the bacteriological report. Much valuable time is thus saved. It may be necessary to repeat this procedure daily or every forty-eight hours, being guided by the condition of the patient, until there is marked improvement in the condition. Under this treatment the disease is generally favourably affected. Consciousness is restored, headache is relieved or abated, and the general condition of the patient shows marked improvement. The fluid obtained by frequent lumbar puncture, followed by intrathecal injection of serum, becomes successively clearer, and, finally, it is sterile, and of normal pressure. This method of treatment should be persisted in until this end is attained. The serum almost invariably used has been that prepared by Mulford and Co., according to Flexner's directions.

We always remove as much fluid as will flow out spontaneously without suction; this may amount to 100 c.cm., and we always introduce a smaller quantity of serum than the amount of fluid removed. The usual dose is 30 c.cm.; if less fluid than 30 c.cm. has been removed, of course relatively less serum must be introduced.

The point we aim at is to make sure that the resultant will always be less than the initial pressure, and it is probable that part of the improvement is due to this point being always observed. (A curious fact is that the meningococcus grows vigorously on certain specific agglutinating serums.)

Autogenous Vaccines.

Some benefit may be obtained by this method used in conjunction with serum treatment. In chronic cases the results have not been encouraging. Further observations are in progress.

Medicinal Treatment.

Medicinal treatment can at best be only palliative. Numerous drugs have enjoyed a temporary reputation as curative agents in this disease, notably soamin and urotropin. We have tried these without observing any beneficial results, although urotropin has been pushed to the extent of producing haematuria. Soamin is particularly dangerous on account of its possibly deleterious effect on the optic nerve.

Sulphonal is very useful in the milder cases for its sedative action. In the severer cases morphine is indicated. For the slighter headaches in convalescence aspirin is very useful. We have found bromides of little use. Stimulants may be called for at any time in the disease. Brandy and digitalin can safely be used; strychnine is always contraindicated.

General Treatment.

Good nursing is absolutely essential if success is to be obtained. The toilet of the mouth and eyes is very necessary. Special attention must be paid to the prevention of bed-sores; incontinence of urine and faeces make this condition difficult to avoid. In cases of retention of urine the use of the catheter must not be neglected. Particular attention to the bowels is necessary, and calomel (gr. 3-5) is found best for preventing constipation.

The patient should be kept in an airy, quiet room, with the light subdued. Disinfection of the excreta should always be carried out.

Dietetic Treatment.

In the acute stages a milk diet only is advisable, but a noticeable feature is the ability of the patient to resume a normal diet at an early stage. Occasional vomiting or a swinging temperature does not contraindicate a generous diet, if the patient is already convalescing or progressing favourably in other respects. In the later convalescence the diet should be liberal and the patient should be kept as much as possible in the fresh air.

Lumbar Puncture.

A general anaesthetic may be necessary for excitable patients, or those showing much rigidity of the lumbar

muscles. No ill effects have been noted from its use. The site of puncture is between the fourth and fifth lumbar vertebrae in the middle line. We arrive at this point by drawing a horizontal line between the highest points of the iliac crests. A 3-in. exploring needle with a stylet is employed. This is inserted a short distance centrally below this line and directed forwards and slightly upwards until the resistance of the interspinous ligament is felt. The next resistance encountered is that of the posterior common ligament; the point of the needle is then slightly withdrawn and the stylet removed, when fluid should at once appear, but if it does not come, the stylet should again be passed and the needle rotated. The usual antiseptic precautions should, of course, be observed. The serum is gently introduced by gravity through a short rubber tube from a glass funnel held about a foot above the patient. On no account must a serum syringe be used to force it in. The puncture is sealed by collodion.

The recovery-rate in the series of 170 cases is 75 per cent.

EIGHT CASES OF EPIDEMIC CEREBRO-SPINAL MENINGITIS IN INFANTS.

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THE eight cases here recorded were seen and treated within three weeks; all presented similar symptoms, and all proved fatal, notwithstanding different lines of treatment. Seven of the cases were between the age of 6 months and 1 year, while one was 2 years of age. All came from Manchester and the surrounding districts, but no connexion could be traced between any of them, and there appeared to be no relation to soldiers who had been outside the district.

In each case the onset was fairly sudden, often starting with vomiting, and all presented the same symptoms. Marked head retraction was a prominent feature in every case, and the anterior fontanelle was very tense. Drowsiness was also present, and the infants would lie in their cots taking no notice of anything except when awakened to have their feeds, which they took well. Squint and blindness were invariable, especially towards the end. The bowels acted regularly, in contrast to the constipation found in tuberculous meningitis.

The other symptoms included slight fever, irregular pulse, Kernig's sign, and increased reflexes; towards the end twitching of the limbs and convulsions were common. The lumbar fluid was examined in each case by Dr. A. H. Miller, pathologist to the hospital, who reported the presence of a meningococcus found inside the leucocytes, and giving the cultural properties of the *Diplococcus intracellularis* of Weichselbaum.

Treatment did not appear to help very much. Repeated lumbar punctures were done, even twice a day, according to the tenseness of the anterior fontanelle; the object of doing this was to draw off the infected fluid, which was under pressure, with the hope that as fresh cerebro-spinal fluid was formed the organisms would be diminished. After a few days, however, it became impossible to withdraw any cerebro-spinal fluid, which appeared to dry up, although the anterior fontanelle kept tense and bulging. It thus appeared as if there was no communication of the fluid in the skull with that in the spinal column.

The first four cases were also treated with soamin, which has proved so successful abroad in cerebro-spinal meningitis of adults. An injection of soamin, gr. iii, dissolved in sterile water, was given intramuscularly for three days; then, after an interval of two days, three more injections were given daily. As the result in these cases was not successful, the next four cases were treated with antimeningococcus serum injected into the spinal canal after the withdrawal of cerebro-spinal fluid. An injection of 10 c.cm. of serum was given daily for three days and repeated for a similar period after an interval of two days. These latter cases were unsatisfactory as those treated with soamin. To all of them also urotropin was given by the mouth during the whole time they were under treatment.

These cases are interesting from the fact that cerebro-spinal meningitis in adults is at present more common in England than it generally is, but whether these cases in infants are infectious is doubtful. It will be best, however, in the future to treat them as possibly infectious and isolate them in a fever hospital. None of these patients had any nasal discharge, except two cases, in whom it came on just before death.

ALUMINIUM SKELETON SPLINTS IN THE TREATMENT OF COMPOUND FRACTURES.

BY

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THE value of skeleton splints in the treatment of gunshot fractures has been recently pointed out by Mr. Robert Jones and others. Their virtue is determined by the self-contained nature of the extension which they render possible, and by the ready adaptability of the slings which hold the limb in position.

The general adoption under active service conditions of these splints is bound to be difficult, since, as usually described, they must be manufactured to measure by an instrument maker.

I have found that from the aluminium splinting contained in the regulation field fracture box substitutes for any such splint can be readily contrived. The malleability of the material renders splints made from it more adaptable to present conditions than are those of wrought iron.

I will describe two splints in detail—one, a modified Thomas's knee splint, the other an arm splint, suitable for fractures of either upper or lower arm. These two splints alone suffice for the treatment of about 80 per cent. of fractures of the extremities that are met with. For special cases similar splints can be contrived from the same material.

Modified Thomas's Knee Splint: Scope and Advantages.

This splint is most satisfactory for any fracture in the lower two-thirds of the femur, for injuries of the knee-joint, or fractures of the tibia and fibula, where extension and free access to wounds is required. The splint can be applied at a clearing station, and is adequate for the treatment of the case till union of the fragments has taken place.

The conclusions in these notes have been arrived at chiefly from the treatment of cases of fracture of the femur. As a standard of comparison I would say that I had previously treated this type of injury with various forms of long outside splint—including the adjustable type with a perineal ring—Hodges's splint and interrupted plaster-of-Paris splinting. The points in favour of a splint of this modified Thomas's type are as follows:

1. The splint can be applied to the limb, without an anaesthetic if need be, whatever the degree and stage of swelling.
 2. The slings can be arranged or the side pieces bent so that any sized wound can be easily dressed without disturbing the patient's comfort.
 3. The splint maintains constant fixed extension on the fragments. Transport is thus without discomfort, and night starting-pains are abolished.
 4. The patient is free to move his body in any direction. Movement of the body does not affect the injured leg. The patient can be rolled on his side and dressed by one person. The ordinary slipper bed-pan can be comfortably used. The fragments are pulled and constantly kept with their long axes in the natural line of the limb. Though there may remain some flexion of the fragments, the ultimate shortening need be very slight if the extension be kept adjusted.
- In general the independence and comfort of the patient in one of these splints is remarkable, if comparison be made with his state when he is fixed to any form of long

outside splint. Nursing and transport are correspondingly easy.

Preparation of the Splint.

The measurements required are (A) from the tuber ischii to the point of the heel; (B) an oblique from the tendon of the adductor longus an inch below its origin, passing behind the limb, to the upper margin of the great trochanter of the femur.

The splint is made from two U-shaped pieces of aluminium splinting as usually supplied (length 60 in.) (Fig. 1). The convexity of one U is bent to form the hip crutch, which will be of the size of measurement B. For manipulating the splinting a large screw wrench (as supplied with the ambulance carriages) will be found most useful. The other piece of splint is bent symmetrically to form a stirrup. This stirrup should be formed with a slight concavity downwards (not shown in Fig. 1), in order to keep the extension strap in place.

The crutch of the upper U is padded with tow and covered with jaconet. When the splint is wanted, the two U sections are joined together with aluminium ribbon, so as to give a length from the margin of the crutch to the stirrup of 4 in. to 6 in. more than measurement A. Slings of linen or other firm material are then attached to the inner limb of the splint at such levels as to support the leg but not to interfere with dressings. A triple fold of jaconet will be found a useful form of sling near a wound. Fixation of the slings can be effected by safety-pins.

Application of the Splint.

An ordinary extension attachment is first fixed to the leg. I have found that a four-tailed extension bound in place with two or three plaster-of-Paris bandages gives good results. The

Fig. 1.—Modified Thomas's knee splint. The arches of aluminium ribbon here shown should be replaced by webbing and buckle in the case of the transverse to the crutch, and by fabric slings below.

Fig. 2.—The modified knee splint applied.

bandage is carried over the heel and instep as well as the leg; this checks the formation of any pressure sore, and as long as the plaster remains rigid prevents any give in the extension.

Fig. 3.—The knee splint applied. The patient has been rolled on his side to show how well the limb is supported in this position.

The splint is then slipped under the leg and the crutch pushed against the tuber ischii; the crutch is moulded to fit the thigh firmly at this level, and then fixed by buckle and webbing passing across in front of the limb. Extension is then applied by a strap passed from the loop and round the stirrup. The slings are passed under the leg and made fast to the outer limb of the splint with safety-pins, in such a way that the limb lies evenly in the middle of the splint (Fig. 2).