temperature dropped suddenly to nearly normal. A few hours later I found him quite happy and playing with his toys. His convalescence was also uneventful. (See Fig. 4.)

FIG. 4.—Case IV.

CASE V.

A youth, aged 17, very well developed and engaged as an errand boy, was taken ill in the evening with a rigor and with pain in the right side of his chest. Examined thirty-six hours after the onset he showed well marked signs of acute lobar pneumonia, with dullness, crepitations, and rusty sputum. Injections of four ounces of permanganate solution were given at four-hourly intervals for twenty-four hours. As these were easily retained the dose was doubled throughout the following twenty-four hours. Forty-eight hours after beginning treatment I found a remarkable change in his condition. His look of distress had changed to an expression of content. He no longer complained of pain. His respiration rate had dropped from 28 to 18, his pulse from 110 to 93, whilst his temperature had fallen from 103.5° to 101.8°. His cough was less troublesome, and he was able to lift profuse expectoration with comfort and ease, which rapidly lost its rusty colour. He made a quick and uninterrupted recovery, and with the exception of doses of compound ipecacuanha powder in combination with aspirin, in the early stages, he had no other drug treatment throughout his illness. (See Fig. 5.)

FIG. 5.—Case V.

Although it may be unusual to report so small a number of cases in support of a new line of treatment, the circumstances surrounding these cases seem to make it desirable to do so. I undertook the treatment with some misgiving, but, to my surprise, case after case confirmed what the co-workers at the Ellesmere Port Cottage Hospital had seen, and the temperature charts in my cases seem to follow closely those which illustrated Dr. Nott's paper.

As most practitioners have experienced a disappointment caused by the failure of this or that treatment for pneumonia, it was pleasing to me to find a remedy doing exactly what it had been described it would do; the value of this set of cases is enhanced by the fact that my patients were all treated in their own homes, with ordinary home nursing, with no other medicine, in the case of the children, than a light diaphoretic mixture.

The ease and certainty with which these rapid results were brought about has determined me not in future to allow a human being, and for that matter any animal I cared for, to perish from the toxæmias of pneumonia without attempting to help them by this method.

Believing, too, that we are likely to learn more as to the limitations of this treatment from numbers of short reports coming from general practitioners, working under different conditions, than from a long report drawn up under institutional conditions, I present this for what it is worth; if it should be the first I hope it will soon be followed by others, for by this means we may hear how other complications (otorrhoea, empyema, and meningitis) dependent upon the pneumococcus fare under the permanganate treatment.

REFERENCE

¹ BRITISH MEDICAL JOURNAL, July 17th, 1926, p. 109.

THE EARLY TREATMENT OF POLIOMYELITIS.

BY

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POLIOMYELITIS is an endemic disease which occurs in this country periodically in epidemic form. Its importance justified a discussion at the International Congress in 1913, which was opened by the late Dr. F. E. Batten, whose teaching at the Hospital for Sick Children, Great Ormond Street, in 1912 and 1913 is the accepted doctrine to-day.

In 1921 there was a discussion on the early diagnosis and treatment of acute poliomyelitis at the annual meeting of the British Medical Association (JOURNAL, 1921, vol. ii, p. 225). The discussion was opened by Dr. Farquhar Buzzard, who said that at necropsies which he had attended the cord and membranes in the affected areas had been found to be intensely inflamed and congested. I mention this because it has an important bearing on treatment. In the course of the discussion it was stated that there was no specific drug in the treatment of the disease, and that electrotherapy was harmful in the acute stage, being of use later only as an adjunct to orthopaedic treatment. Treatment on general principles during the febrile stage was advocated, particular attention being paid to warmth and quiet. When the febrile condition had subsided splinting was advised to prevent contractural deformities, to be followed by massage, remedial exercises, and electrotherapy. Where the recovery was incomplete various surgical procedures, such as stabilization of joints and transplantation of tendons, were advocated.

It will be remembered that in 1922 Sir Robert Jones gave an authoritative address on the treatment of paralysis in children to the Section of Diseases of Children of the Royal Society of Medicine (BRITISH MEDICAL JOURNAL, 1922, vol. i, p. 705). My present purpose is to deal only with the early treatment of the disease.

Some three years ago the first early case of poliomyelitis was admitted to the Hartshill Orthopaedic Hospital for treatment. Up to July of last year eight early cases had been referred. Since July, 1926, fourteen early cases have been treated here, all on the same lines, and the results are good.

During the last six years I have seen several hundreds of practically untreated patients who have attended this hospital with deformities of the most disabling type, yet presenting the same initial history as the early cases. On comparing the end-results the conclusion reached is that co-operation between the physician and the orthopaedic surgeon is essential from the very onset of the disease. By this means alone will the prevention of most of the deformities in each case be achieved.

The first indication for treatment in an early case of poliomyelitis is immobilization of the inflamed part. This can best be done by fixing the patient on a Thomas's straight frame with head-piece, thereby immobilizing the head and spine. This may seem a drastic measure, but the results, as detailed in my notes of the cases, justify the procedure. Fixation on a frame is our routine method of treatment in all early cases, even if the initial paralysis or paresis is slight. Pain is often a very distressing symptom in the early stages, and has been regarded as intractable. Our experience is that pain rapidly subsides as soon as the patient is immobilized on a frame.

The second indication for treatment is the prevention of contractural deformities. These are caused by unequal muscle balance, and are prevented by fixing the paralysed muscles in relaxation, the fixation being maintained until they are sufficiently recovered to hold their own against their antagonists. The Thomas frame is an ideal splint for fixing the head, trunk, and lower limbs in the position of selection. It leaves the arms and feet to be dealt with if necessary. This is done by moulding a plaster-of-Paris splint to the affected part, and fixing it to the metalwork of the frame. The patient is kept immobilized on the frame until the inflammatory condition of the cord has subsided and the amount of damage to the musculature can be ascertained. The frame is then gradually discarded, and

the paretic or paralysed limbs splinted in the position of selection. We have found that this can be commenced in approximately four to six weeks from the onset, and the frame finally discarded in a further two to three months.

Notes of six early cases treated on these lines are appended.

Case 1.—A boy, aged 3½ years, was first seen three days after onset. He had complete paralysis of both legs, but was able to contract the flexors of the hips slightly with assistance. Back weak. High temperature. Cerebral cry. He was immobilized on a frame, with club-foot shoes holding the feet. Two days later removal of the frame was suggested as the child was thought to be dying, but it was retained, and the acute stage subsided two days later. The frame was discarded in two months. Three months later the boy began to walk, and two years later was leading a normal life.

Case 2.—A boy, aged 3 years, was first seen five days after onset. There was complete paralysis of both legs, thighs, and glutei, and very marked weakness of the back and the abdominal muscles. He was immobilized on a frame with two light plaster cases holding the legs in the desired position. He began to discard splints eight weeks later, and four months after the onset all muscles were acting voluntarily. Back and abdomen good.

Case 3.—A boy, aged 5½ years, was first seen five days after onset with the left leg and foot flail-like. The right leg quadriceps and glutei were normal, but the back and abdomen were weak. He was immobilized on a frame, with a plaster case for the left leg. He first began to discard splints five weeks later, and eighteen months from onset had regained full control of the limbs and was leading a normal life.

Case 4.—A boy, aged 5 years, was first seen four days after onset; the left leg was flail-like, the right quadriceps weak, the back and abdomen very weak, and the left arm weak. He had a high temperature, with periods of unconsciousness. He was immobilized on a frame, with plaster casing of the left leg and arm. He first began to discard splints three months later, and two years afterwards was walking with calliper splint, his arm being apparently normal.

Case 5.—A girl, aged 8 years, was first seen seven days after onset with complete paralysis of the right leg and shoulder. She began to discard splints six weeks later, and two and a half years afterwards had full control of the leg and shoulder, but the grip of the right hand was slightly weaker than that of the left.

Case 6.—A girl, aged 6½ years, was first seen eight days after onset. The left leg and right arm were flail-like, and the right leg weak. The temperature was 100° to 101°, and she was very irritable. She was immobilized on a frame with plaster cases on both legs, and her arm was tied to the top of the splint. One week after fixation the temperature and irritability were much diminished. She first discarded splints six weeks later, and a year afterwards was an apparently normal child.

Of the fourteen cases since July, 1926, in nine both lower limbs, the back, and abdominal muscles were affected. Of these, six are now gradually discarding their splints. In three cases one leg was affected; of these, two are now walking in callipers, and one is free of all splints. In the two remaining cases both upper arms and shoulder girdles were affected. These two children are wearing plaster cases, which are being discarded while in the prone position.

I am indebted to Dr. Mitchell Smith, under whose care these patients were, for permission to publish these notes.

THE ELECTRICAL TREATMENT OF THE PARALYSIS OF POLIOMYELITIS.

BY

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In a paper published in the *Archives d'Electricité Médicale* in February, 1912, Professor Bergonié appealed against the discouraging prognosis given of infantile paralysis in spite of the efforts made by medical electricians to show that this need not be so, and that it is only so when, through lack of courage or through scepticism, treatment is omitted or given as a matter of form, or is badly applied by incompetent persons, or is insufficient as regards intensity, duration, or instrumentation. Electrotherapeutic treatment, more than other methods, requires clinical experience and practical knowledge which it is impossible to acquire through books; and this applies very particularly in cases of infantile paralysis. The part of the medical electrician will begin at the end of the acute stage by making a

precise and complete electrodiagnosis as a basis for everything which shall be done afterwards. To examine the leg, for example, a compress soaked in warm weak saline solution is wrapped around the foot and ankle, and a flexible metallic electrode bandaged to it; the patient may be seated or recline on a similar electrode of large size placed about the buttocks. These electrodes are then connected to the poles of a source of faradic current of low tension (coil with coarse winding); this current is passed through a metronome which rhythmically interrupts and reverses it about forty times a second. The intensity of the current is regulated by a progressive rheostat; if the intensity is very gradually increased, the coil being of the proper coarse winding, and the electrodes large, the process will be painless. It is possible to see and feel the muscles which respond, and those which have lost their faradic excitability. To ascertain which muscles show signs of degeneration it is only necessary to move the commutator of the apparatus and send the galvanic current by the same electrodes to be rhythmically interrupted and reversed by the same metronome at the rate of twice a second. By this means the muscles can be divided into two classes: (1) those which have preserved their faradic excitability; (2) those which have lost it and show the slow contraction of degeneration. Having completed the electrodiagnosis the treatment can be continued with the same apparatus.

It will be necessary to commence with the galvanic current rhythmically interrupted and reversed and to follow with the faradic current; the instrumentation is simple, and consists of a source of supply of galvanic current (24 to 36 volts), a metronome to interrupt and reverse the current rhythmically, and a finely graduated rheostat; the milli-ampere-meter may be dispensed with. This electrization of all the muscles of the limb has the advantage that by sight and touch we can be certain that the affected muscles are well acted on, and we can see the progress and modify the technique. There is no objection to this electrization *en masse* on the theory that the healthy antagonists should not be stimulated at the same time as the partially paralysed muscles. The results are more favourable than in cases subjected to local electrization. The duration and intensity of the electrization are very important. It has been proved by experience and numerous observations carried on over a long period that the condition of the patient improved more and more as the treatment was increased in duration and intensity; it can therefore be laid down as a principle that the intensive treatment of the paralysis of infantile paralysis can be repeated with a duration and intensity not formerly used. Bergonié states that he was driven to this conclusion little by little by ever better results. He quotes, from a large number of cases similarly treated, one of infantile paralysis of the hemiplegic kind. After two months the muscles of the leg responded to faradic stimulation, while in the arms, on the contrary, the biceps, triceps, and deltoid muscles did not respond. Treatment was commenced with an electrode of 300 sq. cm. at the level of the shoulder, and the hand was enveloped in the other electrode. Electrization commenced with half an hour a day at one sitting, then three-quarters of an hour, then one and a quarter hours, always at a sitting, finally one and a half hours at two sittings, then two hours—one hour in the morning and one in the evening; this was continued for two months. The child played and slept during the electrizations; his arm, roused by extensive rhythmic movements, did not make him suffer at all; he did not even wake when the current was intensified. The muscles made such progress that the biceps alone was a little backward, but it contracted at will.

The practice of long electrizations *en masse* by galvanic currents rhythmically interrupted and reversed automatically is the best treatment in these cases. Bergonié frequently stated that, from his experience of over twenty-five years, even in the most serious cases of infantile paralysis a good prognosis can be given if the electrical treatment is intensive, well regulated, and assisted by the adjuvant treatments—muscular relaxation, massage, passive and resistance movements, exercises, and, in particular, warmth to the limbs, as discussed by him at the Congress of Physiotherapeutics in 1910.