TREATMENT IN GENERAL PRACTICE

This article is one of a series on the management of some diseases of the nervous system met with in general practice.

THE TREATMENT OF MENINGITIS*

BY

GEORGE RIDDOCH, M.D., F.R.C.P.

Certain general rules should be followed in the treatment of all forms of acute meningitis. The patient should preferably be nursed in a quiet, darkened room. Nurses, who ought to wear slippers with soft soles, must move about quietly, avoiding noise, and in tending the patient must do so gently. Visitors should be prohibited. Diet should be fluid but nourishing, and vitamin preparations may with benefit be added. If the patient is unable to swallow, nasal feeding will be necessary. For the relief of headache, ice-packs and analgesic drugs such as aspirin (10 grains), pyramidon (10 grains), or veganin (one or two tablets) are useful and supplementary to lumbar puncture. For restlessness and sleeplessness tepid sponging is soothing if there is much fever, and simple sedatives, such as potassium bromide 12 grains, chloral hydrate 10 grains, two or three times a day, or twice that amount at night, should not be withheld. This is the adult dose, and should be correspondingly reduced for children. Morphine may be required, especially in the later stages in serious cases. Care should be taken that the bladder is periodically emptied.

Acute Pyogenic Meningitis

Apart from meningococcal infection, which will be considered by itself, the organisms which are the usual causes of this form of meningitis are streptococci, staphylococci, and pneumococci. It may follow septicaemia, from extracranial foci, such as pneumonia, empyema, or osteomyelitis, or be due to direct spread of infection from erysipelas of the scalp, penetrating wounds, or fractures of the skull with tearing of the meninges, or from bursting of an intracranial abscess. But the most common source of infection is inflammation of the ear, mastoid, or paranasal sinuses.

In such cases the first principle in treatment is, when possible, to deal with the primary focus of infection. Pneumococcal meningitis is usually fatal whatever is done and whether due to aural infection or pneumonia. But recovery from streptococcal and staphylococcal meningitis, secondary to sinusitis or mastoiditis, is always possible provided that adequate drainage is established and the bulk of the intracranial infection is not great, as shown by the absence or small number of organisms found in the cerebro-spinal fluid. Withdrawal of as much fluid as possible by lumbar puncture should be carried out at least once daily. Sera are of doubtful value and may even do harm, but, hexamine, 15 grains in water four times a day by mouth, or 10 c.cm. of a 10 per cent. aqueous solution intravenously once daily, is worth trying for its antiseptic properties and its capacity for gaining entry into the subarachnoid space from the blood stream.

Meningococcal Meningitis

Cerebro-spinal fever appears in this country sporadically or in epidemics in the winter and spring. The disease, which is not highly contagious, is probably spread by droplets from the nasopharynx in coughing and speaking, and carriers may be immune. Children are particularly

susceptible to the infection, and overcrowding predisposes to epidemics. Much, however, has yet to be learned of the factors that determine entry into the body, for in epidemics cases are scattered regionally.

In children and adults the symptoms and signs of meningitis are as a rule unmistakable, and the skin eruption, when present, indicates the meningococcal origin. The eruption may be a petechial rash like flea-bites, a blotchy purpuric rash when septicaemia is severe, or herpes on the face or other parts of the body, which Kennedy¹ insists always appears on the fourth day of the disease. It should, however, be kept in mind that infected infants not only may be free from rashes but may show none of the specific signs of meningitis such as cervical rigidity and Kernig's sign. They may merely be feverish, irritable, and fretful, although pus and organisms are present in the cerebro-spinal fluid.

Specific Therapy

Before the introduction by Flexner of specific serum therapy, the mortality rate was about 80 per cent., while now, although it varies in different epidemics, it has dropped to about 30 per cent. It is of the greatest importance to begin specific therapy as early as possible. Either serum or the new Ferry's antitoxin is employed. Gordon has identified four types of meningococcus, and a specific serum can be prepared for each. Whenever possible, the infection in each case should be typed, and for this purpose a sample of the cerebro-spinal fluid in a sterile test tube can be sent to the Ministry of Health. When the organism belongs to one type, the serum for that type, to give the best result, should be administered. For a mixed infection a polyvalent serum is employed. Ferry's antitoxin is polyvalent, and, experimentally, neutralizes the extracellular toxins of the meningococcus as well as acting on the organism itself. It has not as yet been tried extensively enough to decide whether in human infections it is more potent than serum; but Banks⁵ concludes from a small series of twenty-five cases, with seven deaths, that in large doses it is particularly valuable in Group I infections. Theoretically, at least, it is the most potent remedy as yet available.

In every suspected case of cerebro-spinal fever lumbar puncture should at once be carried out. When meningitis is present the cerebro-spinal fluid, in the majority of cases, will be under pressure and turbid. In fulminating cases, however, with blotchy, purpuric eruptions and rapid development of stupor and coma, the pressure may be almost normal and the fluid clear. A sample of the fluid drawn off should be immediately sent to the laboratory, where it must be cultured as well as examined in films. When fresh serum or antitoxin is available, a dose should at once be injected intrathecally while the practitioner is waiting for the pathologist's report. It is important that the serum be fresh, for it soon deteriorates. If there is a skin eruption, or, in its absence, if the case is diagnosed in the first day of the illness, 200 c.cm. of the serum, or 20,000 to 30,000 units of the antitoxin, diluted with 120 to 200 c.cm. normal saline or with 10 per cent. glucose solution should also be given intravenously or intramuscularly. This should be repeated daily for two or three days or until blood cultures are negative. In regard to the intrathecal dose, as much cerebro-spinal fluid as possible should be withdrawn and about 5 c.cm. less of the specific remedy,

* Because of the available space only acute and subacute meningitis will be considered.

warmed to body temperature, slowly introduced by gravity through a sterile funnel, rubber tube, and metal connexion. If this is not at once available, the barrel of a 10 or 20 c.cm. syringe will do if the patient is turned a little over to one side. The open mouth of the syringe should be protected by a piece of sterile gauze. After the injection the skin puncture is sealed with gauze and collodion and the foot of the bed raised on blocks.

When it is desirable to inject serum intravenously and there is a history of horse serum having been used, for one reason or another, more than ten days before, the danger of anaphylaxis has to be considered. If the case is urgent, anaphylaxis can as a rule be prevented by giving a general anaesthetic, but if delay can be afforded the patient's sensitiveness to serum can be tested by an intradermal injection of 0.25 c.cm. Should he prove to be sensitive by the development of an urticarial wheal at the site of injection within half an hour, he can be desensitized by a preliminary subcutaneous injection of 1 c.cm. of serum.

Lumbar Puncture

When the pathologist's report confirms the diagnosis, lumbar puncture should be repeated in severe and moderately severe cases twice daily, and in slight cases once daily. As before, as much fluid as possible should be allowed to run out into a sterilized container and measured, and 5 c.cm. less of the serum or antitoxin run in. Each sample of cerebro-spinal fluid ought to be cultured and intrathecal injections continued until three consecutive samples of fluid have been reported sterile. This result may be achieved in a few days. After that, the cerebro-spinal fluid should be drained once daily until it is clear to the naked eye, but more serum should not be injected unless a relapse occurs. Serum itself is a meningeal irritant, and often increases the number of cells in the cerebro-spinal fluid, as well as spinal rigidity and irritability. This adverse reaction is, however, to be neglected provided that plenty of fluid is obtained, thus indicating free communication between the intracranial and spinal portions of the subarachnoid space, and that organisms are disappearing from the fluid.

The introduction of specific remedies into the subarachnoid space by lumbar puncture has been the orthodox method, and is probably all that is necessary in mild cases. But the simultaneous employment of lumbar puncture for drainage with ventricular or cisternal puncture for the injection of serum (or antitoxin) is gaining in popularity, and there is much to be said for it. The results of its advocates are encouraging, and it will may become the method of choice in the future. By its use not only may the mortality rate be diminished, but the number of cases of chronic hydrocephalus and post-basis meningitis be seriously reduced. At the same time, its superiority over the more orthodox methods of introduction of serum into the lumbar sac has not yet been proven, and it involves an additional burden on the patient. For the present, it might be said that indications for its employment are: (1) severe fulminating meningitis with rapid development of stupor; and (2) meningitis of moderate severity with persistent positive cultures from the cerebro-spinal fluid after adequate treatment by lumbar puncture has been carried out for about a week, and especially if head retraction is increasing and the amount of fluid obtained is diminishing.

Ventricular Puncture

The scalp is shaved and cleansed with iodine or spirit. The needle must be sharp and of medium diameter. In infants the needle is easily passed into the distended lateral ventricle through the lateral part of the anterior fontanelle. As much fluid as possible is then withdrawn

very slowly by a syringe, and about 5 c.cm. less of serum or antitoxin are introduced by gravity.

In children or adults an opening in the skull has to be made in a situation in which perforation of the brain would cause least damage. The situation usually chosen for ventriculography is suitable, for, in addition, it allows of drainage of cerebro-spinal fluid by tilting of the head. The "landmarks" are three-quarters of an inch above the superior curved line of the occipital bone and one inch from the middle line. The skin is incised and an opening in the skull is made by a small drill such as that devised by Purves-Stewart.² The needle is then slowly pushed forwards horizontally and slightly outwards so as to enter either the posterior horn or the vestibule of the lateral ventricle. The head should then be tilted backwards to drain off all the cerebro-spinal fluid that will flow. Again about 5 c.cm. less of serum or antitoxin are run in by gravity.

Cisternal Puncture

The cisterna magna lies between the cerebellum above, the medulla below, and the occipito-atlantoid ligament behind. In shape it is roughly triangular, and in the adult, unless the intracranial structures are distorted, there is from 2 to 3 cm. between the medulla and the occipito-atlantoid ligament. With reasonable care the operation of cisternal puncture in children or adults can with safety be carried out, unless hydrocephalus is severe. After the skin has been shaved and an antiseptic has been applied, the operation is performed as follows.

The patient is lying on his side. An assistant keeps the head steady, moderately flexed, and in the middle line. The tip of the operator's left index finger is placed on the spinous process of the axis and the needle is inserted just above this landmark. The freshly sharpened needle is then gently pushed forwards and slightly upwards in a line a little above the plane, which passes through the external auditory meatus and the nasion, in order to reach the occipital bone immediately behind the foramen magnum. When the bone is reached the needle is slightly withdrawn and reinserted at a lower level. The resistance of the occipito-atlantoid ligament is easily recognized if the operation is slowly performed, and it is then that especial care should be taken. When pushing the needle through the ligament the operator should splay his fingers over the back of the patient's skull so as to have full control of his instrument. At the same time his assistant must keep the patient's head steady. As soon as the point of the needle is felt to pierce the tough ligament the stylet should be withdrawn. Unless there is a block in the cerebro-spinal fluid circulation from obstruction in either the roof of the fourth ventricle or the cisterna magna from arachnoiditis, fluid should come. If little fluid is obtained the operation should not be repeated. But if fluid flows it should be allowed to discharge freely. Again the amount should be measured and about 5 c.cm. less of serum or antitoxin be injected by gravity.

Whether ventricular or cisternal puncture be employed, lumbar puncture should be performed either immediately before or after in order to ensure as efficient drainage as possible. The frequency with which ventricular or cisternal puncture should be carried out is unsettled, but it is suggested that it should be done not more often than once a day, and that, if drainage and the injection of the specific remedy should appear to be necessary more frequently, it should be by lumbar puncture alone.

For these repeated operations an anaesthetic will in general be necessary. Those experienced in the treatment of cerebro-spinal meningitis are usually opposed to general anaesthesia, and probably they are right. A local anaesthetic such as 1 per cent. novocain or ethyl chloride spray

is all that is necessary, unless the patient is restless, and then for ventricular or cisternal puncture gas and oxygen can be used.

If adequate treatment cannot be carried out in the patient's home or in a nursing home, he should be transferred to a suitable fever hospital. Experience and technical skill are required in order to give the best results.

Prophylaxis

During an epidemic the nasopharyngeal secretion of contacts should be examined and carriers isolated. A disinfectant such as 1 per cent. chloramine-T should be used as a throat spray twice daily until swabs are negative. As a rule the throat infection will disappear in two or three weeks.³

Acute Aseptic Meningitis

The somewhat rare and benign variety known as acute aseptic meningitis is of unknown origin, and occurs sporadically or in small epidemics, chiefly in children. The onset is acute, without prodromal symptoms or any indication of local or general infection. The cerebro-spinal fluid pressure is raised and the fluid may be clear, cloudy, or, very occasionally, purulent. It contains an excess of cells, and at first polymorphonuclears may be in excess, but soon they are replaced by lymphocytes.⁴ Albumin and globulin are increased, but as a rule sugar and chlorides are little affected. The acute onset, the almost normal chloride content of the spinal fluid, and the usual complete recovery in about two or three weeks differentiate the disease from tuberculous meningitis. Treatment is on general lines along with cerebro-spinal fluid drainage by lumbar puncture carried out daily or every second day.

Tuberculous Meningitis

There are a few recorded cases of recovery with tubercle bacilli in the cerebro-spinal fluid,⁵ but they are very exceptional. Death, as a rule, occurs in about three weeks from the time of appearance of meningeal signs. In the spinal fluid the most important diagnostic indication, apart from the finding of tubercle bacilli, is the marked reduction in chlorides. It is claimed that bacilli will be found in a large proportion of cases if the fluid is centrifuged at higher velocity and for a longer time than is usual. Treatment is symptomatic, which includes lumbar puncture for the relief of headache and the use of sedatives for restlessness.

REFERENCES

- ¹ Kennedy, J. M.: *British Medical Journal*, 1935, i, 756.
- ² Purves-Stewart, Sir James: *Lancet*, 1925, ii, 1159.
- ³ Brain, W. Russell, and Strauss, E. B.: *Recent Advances in Neurology*, J. and A. Churchill Ltd., London, 1934, p. 48.
- ⁴ Gibbens, J.: *Lancet*, 1931, ii, 12.
- ⁵ Banks, H. S.: *Ibid.*, 1935, i, 856.
- ⁶ Hobson, F. G.: *Ibid.*, 1935, i, 938.

According to M. Lydaki (*Thèse de Paris*, 1935, No. 720) the first description of bou'onneuse fever in Greece was published in October, 1930, but there is reason to suppose that it had previously been mistaken for Brill's disease, which Lorando had regarded as occurring at Athens in that year. It is most prevalent in the hot months of the year (July, August, and September), but it is also fairly often seen in winter owing to the favourable temperature for the ticks during this season. Its unequal distribution in the various parts of Greece is due partly to the existence in certain districts of numerous dogs, which are tick carriers, and partly to the presence of virulent ticks in some regions and of non-virulent in others.

103rd ANNUAL MEETING

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THE SECTIONS

SUMMARY OF PROCEEDINGS

Publication of the opening papers in the Scientific Sections at Melbourne began in the JOURNAL of September 14th, and will be continued during the next few months. The reports of discussions in this and the last three issues are intended to give members a general idea of the proceedings.

SECTION OF OBSTETRICS AND GYNAECOLOGY

Friday, September 13th

The Ovarian Cycle and Endocrinology

With Professor MARSHALL ALLEN in the chair, Dr. NINIAN MCI. FALKNER opened a discussion on the ovarian cycle and its relationship to endocrinology.

Dr. Falkner referred to a previous communication in which he made an effort to elucidate the significance of haemorrhage in the human corpus luteum. At the meeting of the British Medical Association in Dublin in 1933 Professor Novak had stated that Hartman's views with regard to an active substance derived from the anterior pituitary gland as a cause of the onset of menstrual bleeding had been abandoned. He (Dr. Falkner) had endeavoured to show that in the human corpus luteum the onset of haemorrhage in the uterine mucosa was accompanied by a synchronous haemorrhage in the corpus luteum. That, to his mind, explained the very rapid degeneration of the corpus luteum of menstruation. On the other hand, in the corpora lutea of pregnancy that he had had the opportunity of examining he had never been able to demonstrate gross bleeding. Novak had not agreed with his interpretation of the series that he had collected. There was no doubt that haemorrhage occurred in the corpus luteum at various stages of its history, and this made it very difficult to come to the conclusion that a haemorrhage seen at the time of the onset of menstruation could be attributed to any specific cause. The one thing that had emerged from his study of the past two years was that no corpus luteum from pregnancy had shown the presence of bleeding. The corpus luteum had been recognized as having an influence on the mucous membranes of the uterus, and they know that this was due to its internal secretion, which had been named progesterin. The physiological effects of progesterin were to stimulate the mucous membranes of the uterus to undergo secretory changes. In mammals such as the ungulates the secretory activity of the uterine gland was essential to nourish the ovary, for in the ungulates the placenta was a placenta epithelio-chorionalis when the chorion did not invade the maternal blood vessel in forming the placenta. In the human female the chorion formed a very intimate attachment to the uterine mucosa, allowing the maternal blood stream to bathe chorionic villi, and thus the necessity for secretory activity in the uterine mucosa was obviated. It would therefore appear that only in the early weeks of pregnancy was the corpus luteum essential for the continuation of gestation. Administration of corpus luteum extracts in cases of repeated abortion might be justified on the grounds that the corpus luteum affected the contractility of the uterus, rendering it less likely to expel the products of conception.

Dr. BRUCE MAYES (Brisbane) said that endocrinology had advanced rapidly in the laboratory and slowly in practice. It was essential to make a correct diagnosis