satisfactory for skin testing. The method of testing employed at the St. Mary's Hospital Hay Fever Clinic is the "prick" method (Freeman,¹ Harley⁷): a drop of pollen extract is placed on the skin of the forearm or leg and the latter lightly pricked with a hypodermic needle through the drop. The drop is then wiped off with cotton-wool. For routine testing two dilutions of pollen extract are used, 5,000 and 50,000 units per c.cm. respectively. If the patient is sensitive—that is, a true hay-fever sufferer—whealing and erythema develop about the site of the skin puncture in ten to fifteen minutes. This method has been found to be more convenient and exact than either the intradermal or the scratch method.

DIFFERENTIAL DIAGNOSIS

The characteristic type of symptoms, the periodicity, and the evidence of the skin tests usually make it easy to differentiate hay fever from the common cold, chronic infective nasal catarrh, and paroxysmal rhinorrhoea due to causes other than pollen.

Treatment

The most satisfactory treatment of hay fever is that of specific desensitization by a course of subcutaneous injections of Timothy pollen extract controlled by skin tests (Freeman,^{1 2 3} Harley⁷). The doses are usually increased by 15 per cent. each time, and the amount of treatment required varies from case to case. If treatment is continued until the skin reactions and serum idiopector are abolished complete relief of symptoms can be guaranteed. However, it is often found that satisfactory clinical results are obtained by a course of treatment shorter than that necessary to abolish completely the skin reactions. The injections are given most conveniently at intervals of two to three days during the months of April and May, but the rate of administration can be varied within wide limits. Freeman has perfected a method of "rush inoculation" by which the patient can receive the whole course of injections in less than a week, but careful and constant supervision by the medical man is necessary.

The next best method of treatment, should the patient present himself for treatment after the hay-fever season has started, is that of small daily doses of pollen extract combined with adrenaline. Many non-specific methods are often advocated, such as nasal ointments, sprays, douches, etc., and may give some relief in mild cases, especially those preparations containing adrenaline, but the effect is of short duration. As stated above the treatment of choice is specific desensitization with Timothy pollen extract, which gives practically 100 per cent. relief in all cases.

A word may be added, in conclusion, on the necessity of making skin tests for diagnosis and treatment. Last year a patient presented himself for treatment who was alleged to suffer from hay fever and who had received several courses of injections of pollen extract with no relief of symptoms; skin tests had not been made. The patient complained of attacks of sneezing, accompanied by nasal discharge, aggravated by dusty warm weather but occurring at intervals at all times of the year, and a general feeling of "stuffiness" of the nose between attacks. The history made one doubtful of the diagnosis, and skin tests with pollen extract were found to be negative. The condition was one of chronic nasal catarrh due to a streptococcus, with a hypersensitivity to the products of that organism, which explains the lack of improvement by injections of pollen extract. The condition cleared up with autogenous vaccine treatment.

My thanks are due to Dr. John Freeman, director of the Asthma Clinic, St. Mary's Hospital, for his advice and criticism.

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THE TREATMENT OF CEREBRO-SPINAL FEVER

BY

JOSEPH MORROW KENNEDY, M.B., D.P.H.

SENIOR MEDICAL OFFICER, LODGE MOOR HOSPITAL, SHEFFIELD

Historical Survey of the Malady

Cerebro-spinal fever was first differentiated by Vieusseaux, in Geneva, in 1805. Danielson and Mason recorded an outbreak in Massachusetts in 1806, since when various manifestations of the disease have been recorded at intervals. In 1887 Weichselbaum gave a full description of the diplococci found in the direct smear of meningeal exudate observed post mortem in people who succumbed to meningitis. In 1896 Heubner was the first to demonstrate meningococci in cerebro-spinal fluid obtained from a living person. The most beneficial contribution was probably the discovery of anti-meningococcus serum by Jachmann in Germany and by Flexner in America, and the introduction of the intraspinal injection of the serum by Flexner in 1904.

Outbreaks of the disease were being recorded from nearly all parts of the world, with the result that towards the end of the nineteenth century cerebro-spinal fever had become—or at least was generally recognized as—a cosmopolitan disease. Except for two or three small epidemics recorded in London and Rochester, this country was comparatively free until the early part of the present century. The first serious outbreak in the British Isles occurred in Glasgow in 1907-8: there were 1,238 cases, with 838 deaths. About the same time the disease was prevalent in Belfast, where there were 725 cases.

The disease was made notifiable in 1912, and the following table shows the incidence since that year.

Year	Notified Cases	Registered Deaths
1912	104	142
1913	305	163
1914	315	194
1915	2,566	1,974
1916	1,306	1,214
1917	1,465	1,531
1918	798	812
1919	848	573
1920	583	412
1921	411	416
1922	344	360
1923	301	284
1924	397	301
1925	402	354
1926	385	365
1927	470	430
1928	412	438
1929	650	588
1930	664	638
1931	2,157	1,440
1932	2,095	1,199

The increased prevalence of the disease amongst the civilian population during the war years was a striking feature, and coincided with the outbreaks in the Army, where there were 4,238 cases, with 1,928 deaths, in the Home Commands from 1914 to 1918.

Epidemic Position

Thirty years ago it might fairly be said that cerebro-spinal fever was almost unknown in Great Britain, until in 1907-8 the malady appeared in epidemic form in Glasgow, Belfast, and Edinburgh.

The spread of infection of this disease cannot be explained on the basis of most other infectious diseases, as it differs considerably in several ways.

(a) The disease tends to remain localized in one particular district, and does not spread to the surrounding areas.

(b) The source of origin of the epidemic cannot be traced, as the disease starts suddenly in some area when the remainder of the country is free, and after about two years, more or less, suddenly stops and does not reappear again in that district.

(c) The disease is not highly infectious, as it is seldom that a second case appears in the same house.

Of 500 cases admitted into Lodge Moor Hospital there were only four instances where a second case had occurred in the same house: also, none of those in attendance in the hospital developed the malady. Again, Dickson¹ records an outbreak of thirty cases of cerebro-spinal fever, with twenty-two deaths, at Ojuela, a compactly built and greatly overcrowded mining town of 5,000 inhabitants in Durango, Mexico, between March and July, 1929. The patients' ages ranged between 2 months and 40 years, and the disease was equally prevalent at all ages up to 25. In no instance did two cases occur in the same house or family, although isolation was impossible.

(d) The cases cannot be traced to have any relation to each other, as one case appears for the first time in one thickly crowded street or area, and the subsequent case from the other end of the district, in perhaps ideal surroundings, no common source or means of infection being traceable between the cases.

(e) For each case that was diagnosed in Sheffield, in the epidemic under review, the other members of the house were sent to the university laboratory, where a posterior nasal swab was taken, and any carriers found were isolated until free. It is interesting to note that none of these carriers developed the disease themselves, and in no instance could they be traced to be a source of infection to other cases.

Diagnosis

The disease presents no difficulty in those cases which show the classical signs of meningitis, such as headache, neck rigidity, and Kernig's sign, but it is in respect of those cases where the above signs are wanting that I wish to make a few remarks. I have found that, in most infants of about 1 year and under, a correct diagnosis can only be made after lumbar puncture. These cases merely showed the following features.

(a) A remittent type of temperature of about 102° F., for which no definite cause could be found.

(b) Irritability and resentfulness, which became more marked in routine examination.

(c) Complete absence of neck rigidity, head retraction, and Kernig's sign.

(d) Several cases showed a very heavy and dull appearance of the eyes, with slow gyrate movement of the eyeball, to which latter sign I attached some importance.

Speaking of the symptomatology of cerebro-spinal fever, Mogilnicki² states:

"The onset in infants differs considerably from that in adults, in whom it is sudden and accompanied by shivering, vomiting, high fever from the first, headache, rigidity of the neck and limbs, and in most cases (60 to 70 per cent.) herpes labialis. In infants, on the other hand, it is rare to find an onset accompanied by convulsions, high fever, and vomiting, but the disease usually begins insidiously, without meningeal symptoms or herpes. In some cases there may be signs of respiratory disease, followed later by meningeal symptoms."

The fever seems to bear little or no relation to the severity of the symptoms, except immediately before death, when the temperature may reach hyperpyretic degrees—107° F. or over. The pulse appears to be as variable as the temperature when the patient is seen in the early days of the disease: it is usually soft, full, and slow. Often one sees a patient with a temperature of 102° and a pulse rate of 60. When the patient is restless and suffering much pain the pulse is usually small and rapid.

As regards the special symptoms—vomiting, headache, and rashes—about 98 per cent. of patients give a history of vomiting in the first day or so of the disease, but it is not seen much in hospital when they are under treatment. Most of my patients complained of severe frontal headache during the early days of their illness. The large purpuric type of rash resembles that seen in an acute pyaemic infection, and appears rapidly. The prognosis is very grave. The other type of haemorrhagic rash—the petechial variety—is not so likely to be fatal, and resembles the "rose spot" of typhoid fever or fresh flea-bites. Herpes usually appears around the mouth, but may occur in any part of the body, such as the hands, feet, legs, around the vulva, and the anus. The most characteristic point about the herpes is that it appears with unfailing regularity on the fourth day of disease, and also that the contents of the vesicle contain the meningococcus.

Lumbar Puncture as an Aid to Diagnosis

Too much stress cannot be laid on the value of lumbar puncture. I consider that it is a simple and harmless operation, and should be performed more often—especially during epidemics of cerebro-spinal fever—in those patients where the slightest suspicion arises. I have carried out over 1,500 lumbar punctures, and never have I seen any fatal results follow the operation.

Lumbar puncture is one of the most valuable aids and means at our disposal for arriving at a correct diagnosis. The macroscopic appearance of the cerebro-spinal fluid usually gives a fair idea of the type of meningitis. Should it be the least turbid, anti-meningococcal serum should be given forthwith, without waiting for a bacteriological report. On the other hand, a clear fluid does not eliminate cerebro-spinal fever, as the following case illustrates.

A female child, aged 3 years, was in a normal state of health, and quite playful, one Saturday afternoon. At 9 p.m. she was taken ill very suddenly, with vomiting, headache, restlessness, and irritability with mild delirium. The following morning she became unconscious, and numerous purpuric haemorrhages appeared on the skin. She was admitted into Lodge Moor Hospital about 3 p.m. on Sunday, and died at 8.30 p.m., death having taken place in less than twenty-four hours from the onset. Lumbar puncture was performed. The cerebro-spinal fluid was perfectly clear, and the pressure appeared normal. Only one polymorphonuclear cell was seen. Protein was 0.02 per cent., and direct examination of a film showed no organisms. A broth culture was examined after fifteen hours' growth, and was also negative, but after thirty-six hours' incubation at 37° C. was found positive, and a meningococcus, Group I, Type I, was isolated. At necropsy dilatation and congestion of the blood vessels over the surface of the brain were present, and on sectioning of the cerebral hemispheres numerous small pin-point striated haemorrhages were seen throughout the grey and white matter. The ventricles did not appear dilated, but the choroid plexuses were swollen and hyperaemic.

This type of case bears out the statement made by Herrick, that "no other infection so quickly slays."

Present Lines of Treatment

In the treatment of cerebro-spinal fever I think it is generally agreed that the best results have followed the introduction of anti-meningococcal serum. When Flexner

read his paper on the treatment of cerebro-spinal fever by the use of anti-meningococcal serum he gave the mortality rates in epidemics before serum was introduced or applied as follows: New York, 73 per cent.; Edinburgh, 80 per cent.; Glasgow, 74 per cent.; Belfast, 70 per cent.; France, 75 per cent.; Belgium, 77 per cent.; Palestine, 80 per cent.

He then showed a mortality of 30.9 per cent. on 1,294 cases treated with anti-meningococcal serum.

Robb³ produced the following figures:

	Cases	Deaths	Mortality
Cases treated without serum in Belfast Fever Hospitals, January to August, 1907	275	199	Per cent. 72.3
Cases treated at home without serum, September to December, 1907	34	29	85.2
Cases treated with serum in Belfast Fever Hospitals, September to December, 1907	30	8	26.6

Ker⁴ also reduced his death rate in Edinburgh, by the use of serum, from 80 to 37 per cent.

When Flexner introduced his serum he advised the following method in the treatment.

A daily lumbar puncture and intrathecal injection of 30 c.cm. of serum for at least three or four days, in adults, with a proportionately smaller injection, if thought advisable, in infants. In more severe cases he considered that larger doses of serum should be given at even shorter intervals, say, every twelve hours, and that this treatment should be continued for as many days as were necessary to clear the cerebro-spinal fluid and to alleviate the symptoms of meningitis.

Since the introduction of serum many observers have differed as to the best route for its administration.

Herrick, believing that the disease originates as a generalized meningococcus sepsis, endeavours to sterilize the blood stream by massive doses of anti-meningococcal serum given intravenously. Banks⁵ states that it has been his practice to give large doses of multivalent serum—for example, an initial dose of 100 to 200 c.cm. intravenously—and to do repeated lumbar punctures at twenty-four-hour or forty-eight-hour intervals, with or without an initial intrathecal administration of serum.

Peters and Gunn⁶ reported the results of 134 cases which occurred in Glasgow between January and the end of June, 1929, which were 112 deaths with only twenty-two recoveries, producing a death rate of 83.6 per cent. These cases were all treated in hospital with the use of serum, and Peters and Gunn pointed out that the mortality rate among cases in this outbreak (1929) was rather higher than that of the epidemic of 1906-8 by about 10 per cent. This seems to point to the absence of any degree of success attributed to improved methods of preparing and administering the specific antiserum. Experience in Glasgow does not confirm that of Flexner and others in America, where the case mortality is said to be halved by the use of serum.

Underwood⁷ reports an outbreak of the malady in Rotherham between January and December, 1931, when sixty-nine cases were notified. Sixty of these were admitted to hospital, and in thirty-seven the diagnosis of cerebro-spinal fever was confirmed, and the death rate of these cases was 86 per cent.

Goldman and Bower⁸ compare the results of forty-eight cases of cerebro-spinal fever treated by lumbar puncture plus injection of serum intrathecally, intravenously, and intramuscularly, with fifty cases treated by cisternal puncture plus the injection of serum intracisternally, intravenously, and intramuscularly. The forty-eight cases treated by the lumbar puncture method gave a mortality rate of 58.3 per cent. The average number of lumbar punctures performed in each case was

8.4. The average amount of serum given intrathecally was 200 c.cm., and 95 c.cm. either intravenously or intramuscularly. The total average amount was 295 c.cm. The fifty cases treated by the cisternal puncture produced a mortality rate of 36 per cent. The average number of cisternal punctures done per case was 6.4, the average amount of serum given intracisternally 135 c.cm., and 128 c.cm. either intravenously or intramuscularly, the total amount being 263 c.cm.

Ford, Shera, and Purves-Stewart⁹ report a case of fulminating meningococcal meningitis with recovery following systematic cisternal punctures and polyvalent serum. In this case five lumbar punctures and five cisternal punctures were performed, 90 c.cm. of serum given intrathecally, and 82 c.cm. of serum intravenously—total amount of serum, 172 c.cm.

Josephine B. Neal¹⁰ states, on the result of treatment of over 1,000 cases, that the Research Laboratory of the New York City Health Department advises the following method: "Intraspinal administration of serum is continued about every twenty-four hours, until at least two successive specimens of the fluid show no organisms by smear or culture. The dose of serum is usually 20 c.cm., if as much or more fluid has been obtained.

J. Cantacuzène¹¹ has published perhaps the best results ever known, and he has reduced his mortality rate as low as 4.8 per cent. In brief, serotherapy is administered as follows:

(a) Intraspinal inoculation as early as possible. (b) Daily inoculation of 25 to 35 c.cm., the operation being always preceded by microscopical examination of the cerebro-spinal fluid, which should serve as a guide. (c) Stop the inoculations as soon as the meningococci have disappeared and the purulent character of the fluid is changed, otherwise there is a danger of serous meningitis. (d) Inoculate the serum as closely as possible to the infected site, and in young children perform intraventricular injections through the fontanelle. (e) The intraspinal injections should be accompanied by intramuscular inoculations.

Personal Experience

During the years 1931-2-3, 369 cases of cerebro-spinal fever were admitted into Lodge Moor Hospital, Sheffield, of which 132 were fatal, giving a mortality rate of 33.06 per cent. Of these 132 deaths, fifty-two occurred within forty-eight hours of coming under treatment, which, when deducted, gives a mortality rate of 25.26 per cent. In 1931 there were eighty-five cases, with thirty-six deaths (42.35 per cent.). In 1932 there were 160 cases, with forty-nine deaths (30.62 per cent.). In 1933 there were 124 cases, with forty-seven deaths (37.9 per cent.).

The following table shows the age incidence and death rate amongst the 369 cases during the three years.

Age	Cases	Deaths	Death Rate
Under 1 year	25	15	Per cent. 60
1 year and under 5 years	76	25	32.8
5 years and under 30 years	218	67	30.7
30 years and over	50	25	50
Total	369	132	33.06

During the year 1931 serum produced in Great Britain, France, and the United States of America was used, in the hope that we should find an efficient or active remedy, but it gave rather unsatisfactory and disappointing results. Towards the end of 1931 we were advised by Dr. E. L. Sturdee, of the Ministry of Health, to try a serum produced in London. We used this serum exclusively for

the treatment of our cases during the years 1931-2-3. By the results obtained during 1932-3 this serum would seem to have been very effective.

Of the 188 cases which recovered during 1932-3 by the use of this serum, I found that meningococci disappeared completely from the cerebro-spinal fluid after one intrathecal injection in ninety-eight cases, or 52.1 per cent., and that the meningococci disappeared in 148 cases, or 78.7 per cent., after having three consecutive intrathecal injections of serum. I believe that the presence or absence of the organism in the cerebro-spinal fluid is the only criterion by which we can form an opinion as to the value of the serum. I am inclined to agree with Dr. Cantacuzène that once the cerebro-spinal fluid has become sterile further intrathecal injections are dangerous, but it has been my practice to continue until the cerebro-spinal fluid has been found to be sterile on three consecutive days.

Out of the total of 132 deaths, the fifty-two occurring within forty-eight hours of admission to hospital were regarded as fulminating types of the disease. Of the remaining eighty deaths, it was found that in sixty-five instances (81.25 per cent.) the cerebro-spinal fluid remained persistently positive in spite of daily intrathecal injections of serum.

It is my opinion that the intrathecal method is the best, and gives the most satisfactory results. I used this method in all cases, and in those cases which showed signs of a septicaemia (by the appearance of purpuric or petechial haemorrhages) intravenous and intramuscular injections were used in addition.

We are informed that the cerebro-spinal fluid contains no complement, and thus no direct bactericidal action is likely to occur. The action of the serum is probably that of an increased phagocytosis. Physiologically, the lining membrane of the choroid plexus and the subarachnoid space is impermeable to substances passing from the blood to the cerebro-spinal fluid, except in the case of a few drugs. Serum injected intravenously must not reach the subarachnoid space, and, even if it does, must be in only very small and diluted quantities, and nothing like the amount which is brought into immediate and direct action by the intrathecal method.

I think that one can afford to neglect the clinical signs and symptoms that appear in the treatment of cerebro-spinal fever, and to attach the greatest importance to the condition of the fluid, as to whether meningococci are present or absent. Rigidity and irritability are increased by the intrathecal injection of serum, the following case being one of the many examples.

Case 175.—This boy was admitted on the second day of his illness. He was moderately conscious, and complained of severe headache. Neck rigidity and Kernig's sign were present. He was lumbar-punctured, and serum was given intrathecally. The following day the cerebro-spinal fluid was sterile, yet his clinical condition was apparently worse, as the rigidity was increased, with head retraction, and towards the same evening he had great difficulty in swallowing fluids. The following day he was so rigid and retracted that opisthotonos was present and he was unable to swallow anything. He was fed by an oesophageal tube. This condition became more marked each day, until lumbar puncture was stopped, and on the first day that this was omitted he was able to swallow a little fluid the same evening. The following day he enjoyed his full meals.

Some authorities advise cisternal puncture in the treatment of cerebro-spinal fever, but this method does not appear to me to have any advantage over the more simple lumbar puncture. It entails more risks, and should only be attempted by one skilled in the operation. By doing lumbar puncture one is able to drain the cerebro-spinal fluid very well and inject serum without any danger; the

field of operation is quite safe, whereas in cisternal puncture the field of operation is exceedingly dangerous, and the injection of serum has to be done very cautiously. If one does not obtain cerebro-spinal fluid by lumbar puncture in patients suffering from cerebro-spinal fever, it is my experience that it will not be obtained by cisternal puncture, as the blockage usually occurs at the foramina of Luschka and Magendie, and has produced an internal hydrocephalus, so that the only thing that is of any value is ventricular puncture, which can be done quite easily in infants if the fontanelle is still patent.

The following table shows the average amount of serum used by the different routes, and the average number of lumbar and/or cisternal punctures performed by various authorities. The figures from Lodge Moor Hospital are included.

HERRICK:

Average number of lumbar punctures	7
Average amount of serum given intravenously	400-600 c.cm.
Average amount of serum given intrathecally	100 "
Average total amount of serum given	650 "

BANKS:

Average number of lumbar punctures	5
Average amount of serum given intravenously	255 c.cm.
Average amount of serum given intrathecally	45 "
Average total amount of serum given	300 "

GOLDMAN AND BOWER:

Average number of lumbar punctures	8.4
Average amount of serum given intravenously	95 c.cm.
Average amount of serum given intrathecally	200 "
Average total amount of serum given	295 "
Average number of cisternal punctures	6.4
Average amount of serum given intracisternally	135 c.cm.
Average amount of serum given intravenously	128 "
Average total amount of serum given	263 "

FORD, SHERA, AND PURVES-STEWART:

Average number of lumbar punctures 5, with average number of cisternal punctures 5	10
Average amount of serum given intrathecally	90 c.cm.
Average amount of serum given intravenously	82 "
Average total amount of serum given	172 "

LODGE MOOR HOSPITAL (1932-3):

Average number of lumbar punctures	5.2
Average amount of serum given intrathecally	76.2 c.cm.
Average amount of serum given intravenously and intramuscularly	11.8 "
Average total amount of serum given	88 "

Choice of Anaesthetic

I prefer to do all lumbar punctures under a local anaesthetic, avoiding a general anaesthetic in all cases except those where a wildly delirious patient necessitates its use. In doing punctures under a local anaesthetic I give either morphine 1/3 grain or heroin 1/6 grain, according to the age of the patient, about a quarter of an hour beforehand, followed by 1 or 2 c.cm. of a 2 per cent. solution of novocain. With a general anaesthetic, when the patient is coming round he is exceedingly irritable, noisy, and very restless, and even the subsequent administration of morphine or heroin has very little effect.

Death occurring during the acute stage of cerebro-spinal fever is usually brought about by respiratory failure. I have seen numerous cases in which this condition occurred, and artificial respiration was carried out for several hours while the heart continued to beat regularly and forcibly. Under general anaesthesia respiratory failure is more liable to occur, and this is another reason in favour of a local anaesthetic. Another point of interest may be mentioned here. The meningococcus is not so delicate an organism as is generally believed. As a routine, about 5 c.cm. of cerebro-spinal fluid was collected from the patient by punctures and run into a similar quantity of glucose broth. This was incubated overnight, and the following morning a tube was forwarded to Dr. Scott (of the Ministry of Health) by ordinary post, in most instances arriving quite safely. From a broth culture I inoculated a blood agar

slope, which gave me a good growth. This was washed off with normal saline containing 0.5 per cent. phenol, and an emulsion obtained, which I put up against the four standard sera and the type of organism identified. The typing of the meningococcus during an epidemic is exceedingly valuable, as the particular type is always kept in view, and any change that may occur in the types is recognized and, if necessary, the serum altered.

Conclusion

During an epidemic of cerebro-spinal fever, when a patient complains of headache, and has some pain or tenderness on flexing the head—not necessarily neck rigidity—the examination of the cerebro-spinal fluid should be carried out without further delay. One cannot stress too much the great importance of lumbar puncture in infants where there are no definite signs or symptoms of meningeal irritation other than pyrexia, with fretfulness or irritability. I am convinced that a number of infants die during an epidemic when the disease is not even suspected.

During an epidemic serum should be prepared at once from the type of organism causing the disease, and freshly isolated strains of the infecting organism should be sent at regular and frequent intervals to the manufacturers of the serum. Once the disease is diagnosed, or when a turbid cerebro-spinal fluid is obtained, some anti-meningococcal serum should immediately be given intrathecally, without awaiting a bacteriological report on the fluid.

In treating the disease the condition of the cerebro-spinal fluid is very important, and as soon as it becomes sterile further punctures and injections of serum must be carefully considered. It has been my practice to obtain three consecutive sterile fluids before stopping the injections, though after I have obtained the first sterile fluid I reduce the quantity of serum. I believe that we do more harm than good by continued drainage of the cerebro-spinal fluid and intrathecal injection of serum. The examination of a direct smear is not sufficient evidence of persistent infection; the fluid must be cultured before it can be said to be sterile. Frequently the rigidity is increased by the intrathecal injection of serum, and no great importance need be attached to this, provided that the cerebro-spinal fluid is sterile on culturing.

In conclusion, I do not claim that my results are any better than those of other workers, but I think I can safely state that the quantity of serum used and the number of lumbar punctures performed are much less, and that the number of days the patient is under active treatment has been reduced.

I am deeply indebted to the late Dr. Egerton Williams, medical superintendent, Lodge Moor Hospital, to Dr. Sturdee and Dr. Scott (Ministry of Health) for valuable suggestions; and also to my friends and colleagues Dr. Mackenzie and Dr. Wilbourn, for their assistance in carrying out the treatment.

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According to M. Lasnet, the Director-General of Public Health in Algeria, owing to the systematic vaccination carried out in the urban and rural districts, only twenty-nine cases of small-pox occurred in Algeria during 1934. Five of these were in the province of Algiers, eighteen in that of Oran, two in that of Constantine, and four in the southern territories.

TWO CASES OF INJURY TO BLOOD VESSELS

BY

JAMES C. GILLIES, F.R.C.S.ED.

HACKNEY HOSPITAL

The following two cases were under my care at the same time at Hackney Hospital, and they are worthy of reporting on account of some interesting points in their diagnosis and treatment. The injury in each case was the same—namely, the puncturing of an important blood vessel by a cutting instrument. The lesions produced were markedly dissimilar.

Case I—Injury to Femoral Artery

A Jewish tailor, aged 61, was admitted to Hackney Hospital on October 5th, 1933. Eighteen days before admission, while working at a bench, he ran a sharp-pointed scissors into the upper part of his left thigh. The wound was small, but bled briskly, so much so that he was admitted into another hospital, where he remained for two weeks. During that time the wound bled occasionally. On discharge he was able to walk with difficulty. When the wound was dressed at home by the district nurse there was sharp bleeding on three occasions, and his doctor sent him into Hackney Hospital.

On admission he complained of swelling and pain in his thigh. There was a large haematoma occupying Scarpa's triangle, and on its eminence a wound less than half an inch long, which discharged a little dark blood. The circulation in the lower extremity was good. After five days in hospital there was no diminution of the swelling, and there continued a very slight oozing from the wound. Then it was thought that a large vessel had been injured, most likely the femoral vein, and operation was considered necessary.

On October 12th, under general anaesthesia, a transverse incision was made across the most prominent part of the swelling. Reflexion of the skin showed a haematoma protruding from a hole about an inch long in the deep fascia. When this hole was enlarged the clot shot out of the wound, and was followed by a fountain of blood from the femoral artery. This was controlled immediately by digital pressure, and a ligature was passed round the femoral artery above and below the point of bleeding. The lesion was found to be a hole in the femoral artery to the outer side and below the origin of the profunda femoris branch. It was oval in shape, about half an inch long, and had rounded everted edges. The wound was closed with drainage.

At no time after operation did the circulation of the limb give any cause for anxiety. The patient made an uninterrupted recovery, his only trouble being stiffness of the knee, which was still present to some degree at the time of his discharge on December 6th.

The interesting feature in this case was the difficulty in diagnosing the seriousness of the injury. With a hole in the femoral artery one would expect more urgent symptoms, and even some interference with the circulation of the limb. Probably the hole made in the artery at the time of accident was small, becoming larger from the pressure and clot formation.

Case II—Injury to Deep Palmar Arch

A butcher, aged 25, was admitted to Hackney Hospital on November 23rd, 1933. While he was at work, three days before, a knife fell on him from the floor above and punctured his right hand. A painful swelling soon appeared in the hand.

On admission there was a small wound over the dorsum of the first interosseous space of the right hand, and a swelling about the size of a walnut filling up the first space. This swelling was painful and definitely pulsatile. The pulsation was lessened by occluding the radial artery, but it could be completely stopped only by occluding both the ulnar and the radial arteries. With both arteries occluded it was possible rapidly to empty the swelling by pressure. This seemed to indicate a free communica-