be done from the axilla, and the danger of partial removal is well known; even the clearance of the axilla has disadvantages in the longer time necessary for the operation, but chiefly from the danger of oedema of the arm supervening later, even when the modern incision is made along the anterior border of the axilla. Bearing in mind the possibilities of other forms of therapy, I think the time has now come when the surgeon should consider in each case whether he should attempt to remove all lymphatics within his reach or whether he may preferably leave the prophylaxis, or even treatment, of enlarged glands to the radiologist. At our request one of our surgeons has had the courage to leave the axilla alone in several cases in which he has operated for scirrhus of the breast, and so far he has not had cause to regret his boldness. The cases were sent to the x-ray department for prophylactic treatment as soon as they were out of bed.

Conclusions.

1. All cases of carcinoma of the breast, lip, or tongue should receive efficient x-ray treatment for prophylaxis immediately after operation.
2. In the treatment of secondarily infected glands x rays are preferable to excision.
3. Efficient treatment is able to prevent local recurrence; mediastinal infection is rare, and ulceration should not occur.

REFERENCE.

- ¹ *Proceedings of the Royal Society of Medicine.*

A SMALL OUTBREAK OF EPIDEMIC CEREBRO-SPINAL MENINGITIS.

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With a Note on the Bacteriology by P. J. VEALE, M.B.

DURING 1913 and the early part of the present year cases of epidemic cerebro-spinal meningitis have been occurring at intervals in Bristol. In all 33 cases were notified up to February 28th, 1914; of these, 3 which came under our personal observation are known to be due to the pneumococcus and not to the meningococcus. Owing to the difficulty of diagnosis in certain cases, it is probable that the total number of cases was greater than those actually notified. Nearly all the patients came from the poorer parts of Bristol. In January to February, 1913, two cases occurred in each of two districts nearly two miles apart, Stapleton Road and Bedminster; two cases occurred in the same street. In April five occurred close together in another poor district near Stapleton Road, and two further cases occurred in this district in July, 1913, and February, 1914 respectively. From December 5th to February 28th there was an outbreak of 12 cases in Bedminster—a district about two miles distant from the others, and of three more in the Stapleton Road district. The contiguity of the individual cases in the groups is interesting, yet although the patient was often one of a family of children, there is, so far as was ascertained, no instance of a second case from the same house. Besides these cases 6 others occurred in outlying parts of the city, in healthy districts on high ground; their distribution is curious as they occurred in pairs, the houses being within about 200 yards of each other. Two cases occurred in each of three districts widely separated from each other and the other parts of the city previously or subsequently affected; the interval between the two cases in each district was one, two, and six months respectively. In two of these instances the families were certainly not acquainted with each other. The contiguity of cases in groups in adjacent streets, and yet the absence of spread in families in the same house is certainly remarkable. Most of the patients were young children; moreover, in more than one case the child was at school, and no other case occurred in that school; one patient was 45 years of age, two just over 30, and of the remainder twenty were 10 years of age or under.

Turning now to the 20 cases under our own immediate observation, the disease was of the ordinary acute type rather than either of the malignant or mild type; four days was the shortest duration of illness. In several cases there was a prodromal illness consisting of cold or sore throat preceding by an interval of ten to fourteen days the attack of cerebro-spinal fever. In one case there was a history of a fall on the head at about the same interval.

As to the early symptoms, in several the illness began with fever, intense headache, vomiting, and speedy delirium. In other cases the signs were more general, with pains in the limbs, and drowsiness or slight wandering at night, the condition then closely simulating influenza, or, in two instances, enteric fever. In all there was fever from the first, and in nearly all a rigor either at onset or within the first three days, most often not repeated. In most cases the symptoms were very indefinite. There were no symptoms or grouping of symptoms which conferred any peculiar character upon this epidemic. The first pathognomonic sign was generally slight deviation of the head and neck to one or other side, less often some retraction. When the disease was well established the chief points in these cases as compared with the accepted descriptions of the disease were the pain in back of head and neck with muscular rigidity; absence of any marked degree of retraction of head; absence of complete paralysis of any muscles, though there was great muscular weakness; marked retraction of abdomen with absence of abdominal reflexes; rigidity of leg muscles, and Kernig's sign constantly present; knee-jerks present, no clonus; plantar reflexes indefinite, not obtained or flexor, very rarely of extensor type; optic neuritis in 3 cases only; absence of affection of cranial nerves; pupils dilated and equal; external strabismus in 2 cases; urinary incontinence present after the first few days. The rapid and profound emaciation was one of the most striking features in all cases. Delirium, generally mild and muttering, occasionally more violent, was also constant; and the continual restlessness was a characteristic sign. There was rarely difficulty of swallowing until the last stage, and vomiting soon ceased to be urgent after admission to hospital. Purpuric spots or patches sparsely scattered were seen in a few patients, herpes in six, so that skin rashes were infrequent. One case was a typical example of posterior basic form, and recovered after a long illness of several months' duration.

The cerebro-spinal fluid in these cases varied from being merely turbid to an appearance like pus. In most cases, but not all, it escaped under considerable pressure. Frequently rapid accumulation of fluid was found when a second lumbar puncture was done on the following day; in one case 50 c.cm. of cerebro-spinal fluid escaped at the second puncture, made thirty-six hours after the first. In all cases the fluid contained albumin, and a reducing body (sugar). The cellular exudate consisted almost entirely of polymorphonuclears in proportion of 90 to 98 per cent., but in one case which recovered the cell count on the fourth day of the disease showed polymorphs 32.5 per cent., lymphocytes 67.5 per cent. Meningococci were mostly very abundant, both intracellular and free in the fluid. In some of the cases a leptothrix bacillus was also present; the bacteriology of this organism is dealt with in Mr. Veale's note. The cultural characteristics of the organisms present were determined in every case.

In one instance no organisms were found in the cerebro-spinal fluid from the first puncture made two days before death, but a fair number of meningococci were seen in the fluid obtained on the following day. In three typical cases, all fatal, no organisms could be found in film preparations, nor could they be cultivated from the cerebro-spinal fluid, which was purulent or semi-purulent, with a high percentage of polymorphs. In the posterior basic case no organisms were found at any time on repeated examination of the cerebro-spinal fluid.

In the younger patients it was found necessary on three or four occasions to give an anaesthetic for the lumbar puncture on account of active delirium and restlessness. This was done without any unfavourable symptoms resulting. Seven cases out of the 20 under our care besides the posterior basic case recovered; of these, one was left absolutely deaf, one blind in one eye, and one mentally defective.

The treatment consisted in frequent lumbar puncture and the intraspinal injection, after running off some of the cerebro-spinal fluid, of antimeningococcal serum (Lister Institute). After the injection the pelvis was raised, so that the patient lay on an inclined plane, with the head lowermost. In one patient (Case iv), desperately ill on admission, the serum was also injected intradurally through a small trephine opening in the temporal region of the skull, and this was also done in another case, in whom three full intraspinal doses had had little effect, and in whom the symptoms indicated that the brain was chiefly affected. Both these patients died. The full dose of the serum was given, except in the case of very young children, when half-doses were used. The interval of administration varied from twelve to forty-eight hours, according to the condition of each case. The total quantities of serum given in six cases of recovery were 105, 75, 61, 60, 20, and 20 c.cm. respectively.

In the seven cases of recovery, in one improvement in all symptoms followed the second injection, and in two days from this his state had entirely changed for the better; in another there was marked improvement after two doses, then a relapse, and finally steady and rapid progress after a third dose. In the fatal cases the serum seemed to give temporary relief to symptoms or to produce no effect; in several there was a rise of temperature of 2° to 4° after injection, but where the temperature was so irregular as in these cases it was difficult to say that it was a direct effect of the serum. A number of the cases had also urotropin, gr. v, every hour or two hours.

All the cases of recovery were seen and treated within ten days, three much earlier, of the commencement of the illness. Others, however, treated equally early, died, but no cases recovered which came under treatment late, and the serum seemed to have little or no effect on them. All recent work points to the necessity of early treatment if the serum is to be successful, and this leads us to speak of the difficulty of early diagnosis in this group of cases. In a few the symptoms were characteristic of meningitis from the first, but in several they were not so. The disease which it most closely resembled in the early stage was influenza, with its abrupt onset, accompanying fever, and severe pains in head, back, and limbs. Less commonly when there is drowsiness at the onset with disturbance of the bowels enteric fever may for some days be suspected. The diagnosis is especially difficult in infants. In one case with bronchopneumonia there were no clinical symptoms of meningitis for at least ten days. In the cases in this outbreak the symptoms and course were entirely unlike those of tuberculous meningitis, and there was therefore little risk of confusing the two. In many cases the diagnosis cannot be made without lumbar puncture, or, at any rate, until too late to be of any use. Nowadays, it should not be necessary to say that in any case where meningitis is suspected the simple and safe procedure of lumbar puncture should be done at once. The determination of the nature of the meningitis rests almost entirely on the findings in the cerebro-spinal fluid—for instance, the cases of pneumococcal meningitis given below could not otherwise be distinguished clinically from those of cerebro-spinal fever.

More remarkable than the difficulty of early diagnosis is the fact that sometimes the diagnosis cannot be made from clinical symptoms alone, even towards the end of the illness. In 3 cases of infants of about 12 months there was a history of two to three weeks' illness—in 2 of bronchopneumonia—and the children were admitted pallid, without optic neuritis, muscular rigidity, head retraction, or loss of deep reflexes, and lay in a dull, listless state, with dilated, equal pupils and swallowing with difficulty. No other signs were present, except those of a resolving patch of pneumonia in one of them, and had it not been for the prevalence of epidemic cases meningitis would not have been suspected. A lumbar puncture, however, showed the presence of semi-purulent cerebro-spinal fluid containing the meningococcus, and death occurred a day or two later.

A note is appended on a leptothrix bacillus found in association with the meningococcus in 4 cases by Mr. P. J. Veale; its significance consists in its possible symbiotic relationship to the latter, to which it may have acted as an adjuvant. There were no distinctive clinical features in these cases.

It has been already mentioned that in one case no organisms were found in the cerebro-spinal fluid removed at the first lumbar puncture, whilst they were found on a second puncture the next day. Heiman and Feldstein¹ especially note this point, and state that the presence of clear fluid does not necessarily exclude the presence of a meningococcal infection. If such a result were found in a suspected case of the disease, the lumbar puncture should be repeated shortly. It has been mentioned that in 3 cases the organism was absent on more than one examination.

Note on a Leptothrix Bacillus isolated from Cases of Cerebro-spinal Meningitis.

This organism was observed in smears from the cerebro-spinal fluid of four cases of cerebro-spinal meningitis, in association with *Micrococcus meningitidis*, in which it appeared as a fine Gram-negative leptothrix bacillus.

Cultivation in the first instance was undertaken on blood agar plates, from which, after six days' incubation, it was recovered in pure culture and subcultured on to ordinary agar. Growth on agar is very slow, requiring six days for the colonies to appear, and the organism grows better at room temperature than at 37° C., producing an opaque, raised, dry, crimped growth along the inoculation track, and here and there individual colonies rise above the general surface of the smear; in the presence of moisture the growth is hard, smooth, and white, with no wrinkling; on removal with a platinum loop the colonies are soft and gelatinous, and can be broken with difficulty. Individual colonies have a sharply cut margin, the edge raised, with a tumulate centre and a depression between it and the edge.

In broth the organism produces a fine flocculent deposit, no pellicle is found, and the supernatant medium remains clear; the growth occurs in gelatine along the track without liquefaction.

In a hanging drop the organism appears as a non-motile filamentous rod with an occasional bright point at one end, due probably to the organism being bent, and therefore being viewed in part of its length.

On staining the organism is Gram-negative, and with blue it stains well and uniformly; no beading or spores. It is not acid-fast.

Inoculation on sugar-broth media produced no reaction, neither acid nor gas being produced in glucose, laevulose, lactose, maltose, saccharose, raffinose, arabinose, inulin, salicin, glycerine, mannitol, dulcitol, sorbitol, erythritol. Indol production was negative.

The serum of one of the patients did not clump this organism in dilutions of 1 to 20 or higher.

The organism above described differs from a similar organism isolated by McDonald in association with *Micrococcus meningitidis*² which was motile and produced slight acid in milk and glucose, and from a leptothrix bacillus, isolated from the blood, urine, and cerebro-spinal fluid by Mr. Scott Williamson from a case of Dr. Michell Clarke's,³ resembling enteric fever, but which gave moist, flat, discrete, even colonies on agar, and produced acid in milk, glucose, laevulose, galactose, maltose, glycerine, and mannitol broths.

The clinical histories of a few cases presenting special features may be of interest.

CASE I.—Cerebro-spinal Meningitis; Prodromal Sore Throat; Death on Fourth Day of Onset of Meningitis.

Arthur X., aged 13, schoolboy. No previous illness, and no ear discharge. On March 19th he was laid up with a slight cold and sore throat. On the 27th he returned to school feeling much better, but still with a slight cold. On the 28th he had a severe headache and vomited. On the 29th the headache was worse, and he was light-headed and restless. On the 30th he tried to get out of the window to go home and vomited several times.

He was admitted to hospital on April 1st, and when seen was lying curled up on his left side, conscious but delirious, and plucking at bedclothes; head retracted, muscles of neck rigid; abdomen retracted, the legs rigid; there was opisthotonos, and twitchings of left arm and leg occurred from time to time; Kernig's sign positive; superficial reflexes absent; knee-jerks present; pupils dilated, acted to light; no optic neuritis, no squint. There were purpuric spots on shoulders, buttocks, and ankles, and large haemorrhagic extravasations on dorsum of right hand and on right ankle. Pulse 140, very feeble; tongue dry and brown; constipation; incontinence of urine; cerebro-spinal fluid was semi-purulent, milky, and not under pressure. There was an abundant exudation of polymorphonuclears,

with meningococci in enormous numbers in the cells and free in the fluid.

The temperature was 104° on admission, and went up to 107° at 2 a.m. the same night, when he died.

There were other cases at the school.

Post-mortem Examination.—Leave to examine the head only. There was well-marked hyperaemia over the whole surface of the brain, with diffuse pus formation over the anterior surface of the pons, medulla, upper part of spinal cord, interpeduncular space, and inferior surface of cerebellum.

CASE II.—Prodromal Attack of "Influenza"; Resemblance of Early Symptoms to Enteric Fever; Treatment by Intraspinal and Intracranial Injection of Serum.

Arthur Y., aged 34, blacksmith, always strong and healthy. At the end of April, 1913, he was laid up for a fortnight with what appeared to be influenza, and recovered. On May 24th he complained of headache and was feverish; during the following week the headache and fever continued; he was drowsy, took no notice of surroundings, vomited several times; obstinate constipation, profound anorexia, with somewhat rapid emaciation. His condition clinically suggested enteric fever. On May 29th there was incontinence of urine, spasm of the neck muscles came on, and his head was turned to the left; passive movement of the neck or limbs then caused great pain; muscular twitchings were noticed. On admission, May 30th, he was emaciated, with sordes on lips and teeth; drowsy and semi-conscious, but answered when addressed; he lay on his back with extended limbs; there were slight twitchings of muscles of face, arms, and hands, with plucking at the bed-clothes. The head was rigidly fixed to left, and somewhat retracted; passive movement of it was very painful. Temperature 102° F.; pulse 100 regular; respiration, 38; constipation, incontinence of urine. The chest was normal; the abdomen retracted and hollow; liver and spleen not enlarged; urine normal. There was no rash on the skin; no deafness, the ears normal. Pupils dilated, right larger than left; both acted well. No nystagmus, squint, or optic neuritis. Limbs much wasted, all movements very feeble, but no actual paralysis. Knee-jerks brisk; ankle-jerks exaggerated, slight ankle clonus; abdominal reflexes absent, plantar reflexes flexor. Kernig's sign was well marked. On lumbar puncture the cerebro-spinal fluid escaped under great pressure; it was turbid, due to polymorphonuclear exudate, and contained abundant meningococci, both free and intracellular; 25 c.cm. of antimeningococcic serum injected intraspinally. On May 31st and June 1st further doses of 25 c.cm. each were injected after withdrawal of cerebro-spinal fluid. On the latter day he was somewhat better, the temperature fell, and the spasm of the neck muscles relaxed.

CASE II.—A, Admitted to hospital; B, injection of 25 c.cm. serum intraspinally; C, injection of 25 c.cm. intracranially; D, died 6 a.m.

On June 2nd he was much worse—marked retraction of head, very drowsy, and swallowed with great difficulty. The urine now contained albumin; the pulse was 100 and feeble. On the evening of this day he was almost unconscious, with irregular breathing of Cheyne-Stokes type. His expression was, however, intelligent. Six-hourly enemata containing dextrose, somatose, and brandy were given. As the symptoms pointed to the brain as now the chief localization of the disease, 25 c.cm. antimeningococcic serum were injected intradurally through a small trephine opening in the temporal region of the skull. This seemed to cause little disturbance, and had no effect on his general condition. Feeds were given by a nasal tube on June 3rd, as rectal enemata were not retained. On the 4th he was comatose, with a failing pulse, and he died early on the 5th. Leave for a post-mortem examination was refused.

CASE III.—Acute Onset and Course; Meningococci and Leptothrix Bacillus in Cerebro-spinal Fluid; Intraspinal and Intracranial Injection of Serum; Death on Eighth Day.

Sidney W., aged 10 years. Has had usual diseases of childhood. No discharge from ears. He went to bed well on night of January 17th, 1914; had a restless night and got up very early, but was noticed to be unwell and sent back to bed. He

was quiet, but complained of pains in the limbs during the day and in the evening became feverish and delirious. During the 19th he was delirious and often shrieked out with pains in head. No rigors; twitchings of arms and legs. Some dark purple spots were noticed at the elbows and on the back. From this time until the 22nd he remained drowsy, with intervals of delirium, and frequently cried out. The temperature varied between 100° and 102° F., except on evening of 20th, when it rose to 105°. There was profound anorexia, but no vomiting; the bowels were constipated; no incontinence. There was great and rapid emaciation.

On admission, January 21st, fifth day of disease, he was drowsy but not delirious, very restless, lay on his side with limbs drawn up; if moved, he cried out with pain in back of neck. Face pale, mouth and lips dry, tongue foul with blackish fur; pulse 136, compressible; respirations 30. Slight retraction of head and rigidity of neck muscles. The limbs were not paralysed, but all movements very weak. Speech normal. Over knee-joints and ankle-joints were patches of purpuric spots and lines.

Urinary incontinence. The thoracic organs were normal; the abdomen very hollow and retracted; the spleen not enlarged.

Reflexes: Abdominal absent, plantar flexor; knee-jerks present. Kernig's sign well marked. Pupils equal, reacted well; optic discs reddened slightly, but no distinct neuritis. Trace of albumin in urine. On lumbar puncture cerebro-spinal fluid was semi-purulent, escaped under great pressure, and contained the meningococcus together with a short rod-shaped organism, which was Gram-positive. A differential cell count gave polymorphs 98.5 per cent. On the same evening 20 c.cm. of antimeningococcic serum were injected into the spinal canal, and a small trephine opening was made in the temporal region of the cranium, and a further 20 c.cm. injected under the dura mater. The temperature rose to 102° at 6 a.m., but fell to 99° by 10 o'clock. On January 22nd he was very delirious and dusky; the other signs were unaltered. A further 20 c.cm. serum was injected intraspinally, the cerebro-spinal fluid, which was semi-purulent and not now under pressure, being allowed to drop away first.

On January 23rd he had a rigor. He was extremely weak and very drowsy. Urotropin gr. v was ordered every hour, and 20 c.cm. serum were again injected under the dura mater through the trephine opening. He died at 7 a.m. on January 24th. No post-mortem examination was allowed.

CASE IV.—Recovery, with Total Deafness, after Six Weeks' Illness; Lymphocytosis in Cerebro-spinal Fluid.

Dennis R., aged 44. Family and previous history good. On November 29th and December 1st he fell down, on the first occasion striking the front and on the second the back of his head. On December 6th he was strange in manner and delirious, and his temperature was said to have been 103° F. He complained of headache, and was delirious at intervals until December 8th, when he was admitted. From the 5th to 8th there was no action of the bowels, and he took no food. He did not recognize his parents. There was no discharge from the ears.

On admission, December 9th, face flushed, head slightly retracted, with rigidity of muscles of neck. The boy was emaciated and extremely restless; there were numerous small sores covered with scabs on back of head and limbs. Thoracic and abdominal organs normal except for soft systolic murmur at base of heart. No squint. No paralysis. The limbs were somewhat rigid and tremulous on movement. Kernig's sign present. Pupils equal, dilated, acted briskly. No optic neuritis. Abdominal reflexes absent, plantar present, and flexor; knee-jerks not obtained. There was some tenderness over the vertebral spines and of the muscles.

On lumbar puncture the cerebro-spinal fluid escaped under considerable pressure; it was turbid, contained albumin, and reduced Fehling's solution; differential count of cells gave polymorphs 32.5 per cent., lymphocytes 67.5 per cent. The meningococcus was present.

On December 10th, 10 c.cm. of antimeningococcic serum were

CASE III.—A, Injection of 20 c.cm. serum intraspinally; B, injection of 20 c.cm. serum intracranially.

injected into the spinal canal, temperature rising shortly after to 100.8°; the following day the temperature had fallen to normal, and a further 10 c.cm. was injected, the temperature rising to 101.5°.

Two days later he was better and began to talk and took food. He pointed to the occipital region as the seat of pain. Kernig's

CASE IV.—A, Injection of 10 c.cm. serum.

sign was less marked, there was now a double extensor plantar response. Obstinate constipation continued.

On the 20th the knee-jerks were obtained, and the plantar reflexes were again flexor. On December 25th it was first noted that he was stone deaf. The subsequent progress was uneventful, and he walked out of the hospital well, except that he was absolutely deaf, on January 14th.

CASE V.—Sudden Onset; Meningococci associated with *Leptothrix Bacillus* in Cerebro-spinal Fluid; Slow Pulse throughout Illness; Attacks of Tachycardia during Convalescence; Complete Recovery.

William F., aged 19. Previous history good, except that he suffered from occasional tonsillitis. Whilst in good health he was taken ill suddenly on December 29th, 1913, with slight shiverings and repeated vomiting, pains and stiffness in the back and limbs, pains in the head and fever. During the following six days the pains in head and limbs continued, there was general loss of power, but no actual paralysis; he was extremely restless, often very delirious, vomited occasionally, took little food, and emaciated rapidly. There was no deafness and no aural discharge.

On admission, January 6th, 1914, he was very weak and helpless, but there was no paralysis. He was emaciated, very restless, cried out from time to time with pains in his head, was very delirious and drowsy. He lay mostly on his back; when lying on his side there was retraction of the head. He was very tender over the occiput and cervical spine. Pulse 72, respira-

CASE V.—A, Injection of 25 c.cm. serum; B, rigor.

tions 20, shallow, irregular; temperature 102° F.; tongue dry and brown. Obstinate constipation. No urinary incontinence. Except for a soft systolic murmur over heart, thoracic and abdominal organs normal. The spleen was not enlarged. Urine contained no albumin or sugar. No purpuric spots on skin.

Pupils small, equal, reacted well, no squint. The optic discs were reddened, and there was a small haemorrhage below the right disc. Abdomen retracted and hollow; abdominal

reflexes absent, and plantar extensor. Knee-jerks not obtained. There was rigidity of leg muscles, and Kernig's sign was well marked. The cerebro-spinal fluid, under great pressure, was very turbid and semi-purulent. The cellular exudate consisted almost entirely of polymorphonuclears, there were numbers of meningococci, intracellular and free in the fluid, and also a short bacillus.

Twenty-five cubic centimetres of antimeningococcic serum were injected intraspinally on January 8th and again on 10th; on the latter day 50 c.cm. of turbid cerebro-spinal fluid escaped under pressure before the injection of serum was made. On January 11th he was quieter and less delirious, the abdominal reflexes were present, and the plantar flexor.

On January 12th and 13th he was noisy, crying out with pain, and had a rigor on each day. Urotropin gr.v was given every two hours, and on the 14th a third intraspinally injection of 25 c.cm. serum. On January 16th the temperature fell to normal and remained so; from this day he made slow progress towards convalescence, which was interrupted by several attacks of tachycardia, and was discharged well on February 10th, the cerebro-spinal fluid being normal. The pulse-rate in this case was never above 80, and generally between 60 and 74 during the first period of the illness.

CASE VI.—Bronchopneumonia with no Clinical Signs of Meningitis for Two Weeks; Absence of Meningococcus in Cerebro-spinal Fluid at First Puncture.

M. L., aged 2 years. No previous illness. Slight discharge from left ear of six weeks' duration.

On February 6th was feverish with bronchitis; following this a patch of bronchopneumonia appeared at the base of the left lung and developed into patchy consolidation of lower lobe, and she was very ill with ordinary signs of bronchopneumonia until the 14th. She vomited frequently, and there was considerable difficulty in feeding her. During the whole course of illness no retraction of head; convulsions, pains or rigidity of neck, rash, difficulty in swallowing, or paralysis appeared.

On admission, February 28th, the child was almost unconscious and practically moribund; pupils much dilated, equal, and reacting to light; pulse 120, temperature 99.2°, respirations 42; typical Cheyne Stokes breathing with retraction of lower ribs in inspiration. Abdomen not hollow or retracted; no rigidity of neck or limbs, and Kernig's sign absent. Over the lower lobe of the left lung behind there was loss of resonance, with scattered rales, and bronchial breath sounds. Knee-jerks were present; plantar reflexes indefinite. No optic neuritis.

On lumbar puncture the cerebro-spinal fluid was slightly turbid, containing a few cells and albumin, but no organisms were found. As the child was no better the next day, and in spite of the negative finding, cerebro-spinal fever was suspected. Puncture was repeated, and 10 c.cm. antimeningococcic serum run in after withdrawing the fluid, which had the same appearance as before. In this second specimen meningococci were found in plenty, and a cell count gave polymorphs 90 per cent., lymphocytes and endothelial cells 10 per cent. The temperature rose to 104.2° that night, and the child died early on February 25th.

During the same period three cases of primary acute pneumococcic meningitis came under observation. This is an unusual number, as, apart from cases in which the meninges are secondarily involved in pneumococcic infections of other organs, pneumococcic meningitis is uncommon. The occurrence of such cases has been noted in the course of other epidemics. The organisms were identified by their cultural as well as by their staining characteristics. Two of the cases were treated with doses of antipneumococcic serum intraspinally.

CASE VII.—Pneumococcic Meningitis.

Nellie H., aged 21, single, post office clerk. She had always enjoyed good health and had never suffered from sore throat, deafness, discharge from the ears, nor from cough.

On July 18th, 1913, whilst in her usual health, she was suddenly seized with severe and general headache, followed by a rigor. She went to bed, slept well, and next morning on rising her neck felt stiff, and she vomited. She went to work, but returned home at 11 a.m., suffering from diarrhoea and constant vomiting. The same evening, and during the next forty-eight hours, she was frequently vomiting, and at intervals

CASE VII.—A, Injection of 7 c.cm. serum intraspinally; B, injection of 5 c.cm. serum; C, rigor.

screaming with pains in head and neck. Any movement, even swallowing, increased the pain.

She was admitted late on July 21st, and when seen next day she lay on her right side with legs drawn up and head retracted; the neck muscles were rigid; she was conscious but drowsy, quite intelligent, occasionally screaming out with pain. There was no paralysis, but she did not attempt to move herself. Temperature 103°, respirations 28, pulse 108, feeble. Bowels constipated since initial diarrhoea. Throat healthy, ears normal, no herpes, no purpuric spots. Teeth very carious, tongue foul. Lungs healthy; a systolic murmur at cardiac apex. Abdomen not retracted; no ascites; liver and spleen normal. The urine contained albumin. No muscular tenderness or wasting; Kernig's sign not present. Knee-jerks absent; abdominal reflexes present; plantar, left extensor, right flexor. Oppenheim's reflex well marked. Pupils small, equal, reacted well. No squint. No nystagmus. Optic discs normal. On lumbar puncture 20 c.cm. of cerebro-spinal fluid dripped out slowly; it contained albumin, a moderate number of cells, chiefly polymorphonuclears, and abundant pneumococci in pure culture. Urotropin gr. iij was given every hour.

On July 23rd she had not vomited since admission; she was delirious, and talked incessantly when awake. On July 24th there was incontinence of urine, the pulse was more feeble, and her general condition worse. She was more drowsy. At 11 p.m., under an anaesthetic, 7 c.cm. antipneumococcic serum was injected into the spinal canal, and on the 24th another 5 c.cm.; the latter dose was followed by a prolonged rigor some hours later, and the temperature rose to 106.8°, falling rapidly to 103° on sponging with cold water. On the 25th she was drowsy and delirious, pulse 160, running; breathing laboured, and pupils dilated. She had emaciated very rapidly since admission.

She became comatose, and died early on July 26th.

CASE VIII.—*Pneumococcic Meningitis.*

A second case of pneumococcic meningitis was admitted in a moribund state on September 19th, 1913, and was of the fulminating form. The patient was a girl, aged 10, who had never had pneumonia or any serious illness, was not deaf, nor had any discharge from the ears. After suffering from headache for the previous two days, she was taken suddenly ill with high fever, intense headache, and delirium, about 8 p.m., and was brought up to the hospital about 11 p.m. unconscious, with a temperature of 103.5°, a very rapid, feeble pulse, and died a few hours later. On lumbar puncture the cerebro-spinal fluid gave an abundant cellular exudate of polymorphs and lymphocytes, the former being in the proportion of 70 per cent., together with numerous pneumococci.

CASE IX.—*Pneumococcic Meningitis.*

The third case of pneumococcal infection was in a man of 32 years; he was given 90 c.cm. antipneumococcic serum by intraspinal injection, and recovered after a long convalescence.

REFERENCES.

- ¹ *Meningococcus Meningitis*, J. B. Lippincott, 1913, page 167.
- ² *Journal of Bacteriology and Pathology*, 1908, vol. xii, p. 447.
- ³ *BRITISH MEDICAL JOURNAL*, 1912, vol. i, January, 1913.

A METHOD OF ANAESTHETIZING THE LARYNX.

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ANAESTHESIA of the larynx is a necessary preliminary in many laryngological procedures, especially in the removal of tumours and in the use of the actual cautery. In the majority of cases the application of cocaine, with brush and syringe, in 10 or 20 per cent. solutions, suffices to render the larynx insensitive. There are, however, not a few patients in whom for various reasons cocaine will not produce the requisite anaesthesia. An inflamed or infiltrated mucous membrane does not respond to cocaine as does a normal healthy one, and it is not surprising, therefore, to find that in tuberculous and other inflammatory states of the larynx anaesthesia by the instillation of cocaine is frequently inadequate. Moreover, if it be desired to make a deep puncture with the actual cautery the superficial anaesthesia produced by cocaine is often insufficient. And again there are larynges, not necessarily inflamed, but so irritable that they cannot with cocaine be brought to that complete insensibility which is so essential for exact manipulation. Not infrequently I have, over a period of half an hour or more, applied as much as 10 to 15 grains of cocaine to the larynx without obtaining full anaesthesia, and finally have had to desist from fear of serious toxic symptoms. It is of course understood that in such cases the palate, fauces, pharynx, and base of the tongue were anaesthetized at the outset, while most of the

patients had received an injection of morphine and atropine.

For some years the practice has been in vogue of relieving the pain in tuberculous laryngitis by injections of alcohol around the internal laryngeal nerves. Considerable success has attended this procedure, the pain becoming abated for a time, varying from several days to several months. It occurred to me that, as the sensory nerves of the larynx were so accessible, it might be a useful device, in very inflamed and irritable conditions, to inject a solution of novocain around these nerves, and thereby induce anaesthesia of the larynx. This idea, I have recently ascertained, is not original. It was proposed by Frey as long ago as 1906, but so far as I am aware it has not yet become adopted by laryngologists. For the past two years, at the Liverpool Consumption Hospital, I have been practising this method in suitable cases. In all I have so treated 55 patients, and while it is true that success was not invariable in the earlier cases, with the improvement of the technique my results have become uniformly satisfactory. A preliminary injection of morphine and atropine is advisable, and it is of course necessary to apply cocaine to the palate, fauces, pharynx, base of the tongue, and epiglottis (the last-named structure is supplied by the glossopharyngeal nerve, as well as by the internal laryngeal). In cases in which the palate was extremely sensitive I have occasionally, with great advantage, injected novocain in the neighbourhood of the posterior palatine foramina, and several times I have been obliged similarly to anaesthetize the epiglottis and base of the tongue, puncturing just above the hyoid. The 55 cases referred to included 9 with new growths of the larynx, 2 with singers' nodes, and 1 with lupus. The remainder of the patients suffered from tuberculous laryngitis requiring the use of the actual cautery.

If, after injection of novocain around the nerves, the larynx is still sensitive, the technique has been at fault. As a rule, in such cases, the conductivity of the nerves is interfered with, but not completely blocked, as shown by the fact that a small application of cocaine will now

Fig. 1.—A, Internal laryngeal nerve; B, point where needle strikes the great cornu of the hyoid bone; C, small cornu of hyoid bone; D, bare area of the thyro-hyoid membrane; E indicates line followed by the needle during injection.

quickly induce full anaesthesia. The branches of the internal laryngeal which are most likely to escape the novocain are those which supply the arytenoid cartilage and upper part of the epiglottis respectively. I wish particularly to emphasize the fact that novocain injection, even when not fully adequate, is always a valuable adjunct to cocaine, considerably reducing the amount of