Another form of this trouble is when the bulbar conjunctiva is affected with a sort of brown, brawny infiltration surrounding the cornea near the limbus. Lately, Mackenzie Davidson has claimed to be able to cure such cases fairly rapidly with the aid of radium. The conjunctivitis associated with phlyctenules, herpes, and pemphigus is, no doubt, neuropathic in origin. The phlyctenular type presents marked injection of the bulbar conjunctiva, without or with very little conjunctival discharge. Sometimes there may be no phlyctenules, and the characteristic I have mentioned will suggest the condition. Herpetic vesicles on the conjunctiva are not very common, but they do occur, and give rise to a great deal of trouble. In connexion with herpetic vesicles on the cornea or conjunctiva or skin, it is interesting to note that you always, I think, find enlargement of the auricular glands, suggesting from that symptom alone that the cause might have been micro-organisms; but this is only an instance of how wrong conclusions may readily be drawn, and are so often drawn, from our insufficient knowledge of this new branch of medical research. It is obvious, I think, in this case, that the necrotic tissue formed at the seat of the vesicle has been an effective nidus for the growth of organisms which have in this way affected the lymphatic system. Phlyctenular conjunctivitis, though not due to tubercle, as has been very clearly shown by Mr. Stephenson, is frequently associated with it. The *causa causans* of pemphigus is more or less wrapped in mystery. Radcliffe Crocker suggests that it is due to the action of toxins on the nerve-centres. Be this as it may, the condition described as essential shrinking of the conjunctiva is doubtless a later stage of it. The condition of xerosis is often produced and xerosis bacillus found in it, but it is not at all probable that the trouble is originated by its presence.

I should mention the attacks of irritative conjunctivitis that occur in those who are liable to be irritated by the pollen of flowers, the intolerable "itching," and the desire to "tear the eyes out," the only real cure being to get away from the cause by going to the sea where the wind is not off the land. I have noticed that those who suffer from hay fever are often, though certainly not always, of the neurotic type, the same sort of people who get erythropsia after cataract extraction, and I have noted, too, that "hay fever" subjects are at other times particularly free from mucous secretion—people who do not soil their handkerchiefs much—and I have wondered whether the incidence of hay fever may not have something to do with insufficiency of the secretion of mucus. I throw this out as a suggestion but not as an established observation. One word in connexion with this subject upon a rare form of individual intolerance of certain flowers, not due probably to their pollen, I think, but to other characteristics. The two flowers that I have associated with patients are primulas and dahlias. It is an interesting type of inflammation which affects also the skin of the face something like erysipelas and the fact is well worth remembering.

I will just mention a conjunctivitis, a condition in which, however, the salient symptoms depend more on the corneal coaffection: it is that due to exposure to a naked arc light. The patient goes to bed apparently unaffected and after a few hours wakes up in intolerable pain from the shedding of the corneal and conjunctival epithelium.

In conclusion, I will say a few words about treatment. The main point in treatment is a "masterly inactivity." The infective condition gets well by a power of self-immunisation, not because you have irrigated the eyes with astringents. I kept statistics of a large number of cases treated with astringents, with boric lotion, and with plain water. The astringents came last, the boric lotion and water were about equal in time of recovery. The one exception to these general remarks is the diplobacillary infection which is promptly destroyed by sulphate of zinc. Sometimes the conditions relapse or may become chronic, immunity not being completely gained, and then stimulation seems to answer, more blood is brought to the part, old cells are cast off, and the micro-organism is more effectually dealt with by the leucocytes. Phlyctenular conjunctivitis only requires fresh air under all conditions and in all weathers; it rapidly gets well, but it seems impossible to secure this in the patient's own home, and talk as you will to the parents and do what you will to the child the cases go on for weeks. They just will not carry out instructions. I remember the case of a child in a good social position who for weeks and weeks

suffered from all the usual train of symptoms, intolerance of light, &c., for whom I gave the usual instructions, regular healthy diet and to get out of doors twice a day for long periods. Eventually the family medical attendant took part against me and I, perhaps rather rashly, said, "Let me have the child in the hospital and I will undertake to cure her in three days." The child, however, went home practically well on the fourth day, and I had done nothing more than I had previously suggested.

Other local conditions will more or less suggest the line of treatment that should be adopted, and for particulars of the details of treatment I will refer you to the standard textbooks.

Cavendish-square, W.

INFLUENZAL MENINGITIS.¹

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Introduction.—Influenzal meningitis is probably a rare infection, but its rarity in the past is very likely due to the difficulty in recognition of the organism, and even at the present time it is by no means certain that the organism described in some cases as the influenzal bacillus is identical with that described by Pfeiffer. Until November, 1908, no known case of influenzal meningitis had occurred in the Hospital for Sick Children, Great Ormond-street. Since that date 5 cases of influenzal meningitis have been admitted into the hospital—1 in November, 1908; 1 in December, 1909; and 3 in the earlier months of 1910. Of these cases 4 patients have died and 1 has recovered.

CASE 1.—On March 11th, 1910, a female child aged 1 year and 2 months was admitted to the hospital under my care. She was the second of two healthy children, the mother and father being quite healthy. There had been no miscarriage. The child had been quite well till Feb. 23rd, when the mother noticed that she was feverish and that the head was retracted. She had been under the care of a medical man for 14 days before being brought to the hospital, and at times had seemed better and at other times worse. She had never been unconscious, nor had she had convulsions. She had taken her food well, she had not vomited, and the bowels had acted regularly. On admission the child was quite conscious, well nourished, lay quite still if undisturbed, and apparently saw well. No change was noted in the fundus. The head was somewhat retracted, and the neck muscles were rigid, but there was no arching of the back and the limbs were not spastic. The fontanelle was prominent. The temperature during the first five days varied from 101° to 103° F. The knee-jerks were active, the plantars gave an extensor response, and the abdominal reflexes were not obtained. Kernig's sign was not present. Lumbar puncture yielded a very turbid fluid which flowed out under considerable pressure. It contained a considerable amount of albumin, and on cytological examination the cell deposit was composed almost entirely of polymorphonuclear cells, among which both extra- and intra-cellular organisms were found. On culture a very scanty growth of diplococci resembling meningococci was found. The child was then treated with injections of 10 cubic centimetres of antimeningococcal serum of the Lister Institute, repeated every day for six days, but without effect. On March 12th Dr. J. Graham Forbes reported that the organism present in many respects resembled the bacillus influenzae. A subculture was planted, and on the 14th he presented the following report:—

The cerebro-spinal fluid is turbid, yellow in colour, and yields, of course, granular clot. There is a heavy deposit of albumin, and dextrose is absent. There is a dense cell deposit, composed chiefly of polymorphonuclear cells. Scattered groups of bacilli are present, some in diplococcal form, intracellular, and Gram-negative. There is no visible growth on serum, but films taken from the surface of the serum show numerous bacilli of variable length, some in diplococcal form, and all Gram-negative. Subcultures on blood agar show an abundant growth of bacillus influenzae.

The growth and cerebro-spinal fluid were now submitted to Dr. J. A. Arkwright at the Lister Institute, who reported that 5 cubic centimetres of the cerebro-spinal fluid injected intravenously into a rabbit produced no effect. The growth of one

¹ Notes of a lecture delivered at the Hospital for Sick Children, Great Ormond-street, on May 19th, 1910.

blood agar tube was also injected intravenously into a rabbit without effect. A guinea-pig was injected intraperitoneally with the cerebro-spinal fluid and another injected intracerebrally, and a mouse subcutaneously with large doses of the culture without effect. It is therefore evident that the organism was not pathogenic to animals.

Having arrived at the conclusion that the organism was not the meningococcus and was in all probability the bacillus influenzae, the injections of antimeningococcal serum were stopped, and having in mind the recent observations of Crowe, 10 grains of urotropin were given every four hours. The child took the drug well, but the temperature did not fall to normal till March 25th. The organisms could still be cultivated from the fluid on March 22nd, but on April 8th, when the next lumbar puncture was performed, the fluid was clear, contained a fair number of lymphocytes, a few polymorphonuclear cells, and was sterile.

The temperature was normal on March 28th, and the child seemed much better, but took but little notice of her surroundings. On the other hand, she heard well, said a few words, and knew her mother. On May 18th she could feed herself, but could not sit up in bed alone, and could not stand. She could not see, the pupils reacted to light, but not very actively, and there was no ophthalmoscopic change. With regard to the ultimate fate of the mental condition of the child I think it is impossible at the present time to foretell. That she may yet recover her sight is possible, for I have seen a child who, though blind for four months after an attack of meningococcal meningitis, yet recovered perfect vision. Since the above note was written the child has partially recovered sight and can now sit up and stand alone.

Four other cases of influenzal meningitis have been in the hospital under the care of my colleagues, Dr. A. E. Garrod, Dr. A. F. Voelcker, and Dr. W. S. Colman, to whom my thanks are due for permission to refer to them. The first case was admitted to the hospital on Nov. 25th, 1908, under Dr. Colman's care.

CASE 2.—The patient, a female child 6 months old, was quite well until four weeks before admission, when she had ear discharge. On Oct. 21st there was some retraction of the head and the eyes were turned up. On the 24th the child presented some signs of pneumonia. On Nov. 11th she became drowsy and there was twitching of the right arm. She was admitted to the hospital on the 13th. On examination she was a well-nourished child and was quite conscious but drowsy. All the limbs were stiff, and Kernig's sign was present. A lumbar puncture was performed and three drachms of fluid were removed. Dr. Forbes reported that the fluid was clear, containing a soft flocculent clot and small shreds of lymph. The majority of the cells were polymorphonuclear and a scanty number of diplococci were seen resembling the pneumococcus. On the 14th the child was unconscious. On the 17th twitching of the left side commenced, and on the 19th there was twitching of all the limbs. A further lumbar puncture was done and Dr. Forbes furnished the following report:—

The cells are polymorphonuclear and short cocci are seen, some of which are in pairs. On culture a very short Gram-negative bacillus, presenting some coccoid forms and occurring in pairs, was observed. Some long bacilli were also present. This organism is probably the bacillus influenzae.

On Nov. 20th the child was injected with a vaccine of 25,000,000 organisms. On the 24th a further injection was given of half this number, but no improvement took place and the child died on the 25th. There was no necropsy.

CASE 3.—The third case of this group of five cases is that of a male child, aged 7 months, who was admitted under the care of Dr. Voelcker on Nov. 29th, 1909. The child had been quite well till Nov. 27th, when he was taken ill with a fit and had retraction of the head whilst lying in his mother's arms. The next day the child vomited and the fontanelle was noticed to be prominent. On the following day he was admitted to the hospital. The neck was rigid, the fontanelle was prominent, and the child was drowsy, but there was no rigidity of the limbs and Kernig's sign was absent. The patient evinced no sign of pain. There was no squint, the pupils reacted well, and there was no neuritis. The knee-jerks were active and equal, and the plantar response on the left was extensor and on the right no response was obtained. Lumbar puncture yielded a turbid fluid containing a thick viscid flake of purulent lymph. Dr. Forbes reported

that the fluid contained albumin and a trace of dextrose. The cells composing the lymph were chiefly polymorphonuclear. A small number of Gram-negative organisms were seen. Culture on blood serum yielded a scanty growth of small Gram-negative bacilli resembling Pfeiffer's bacillus influenzae. On Dec. 4th an injection of a vaccine of 2,500,000 bacilli influenzae was made, and on the 6th and 7th the child seemed better. The cerebro-spinal fluid on the 7th had the same characters as on the first occasion, and a pure culture of bacillus influenzae was obtained. The organism was both free and intra-cellular in the cerebro-spinal fluid. On the 8th a further injection of vaccine was given. On the 13th the child was worse; he had conjugate deviation of the eyes to the left, and died on that day.

At the necropsy thick pus was found covering the whole of the cerebral hemispheres and surrounding the spinal cord. All the other organs were normal.

CASE 4.—The fourth case was that of a female infant, aged 7 months, who was admitted under the care of Dr. Garrod on Jan. 27th, 1910. She was quite well till Jan. 14th, when she vomited continuously for two days. After one week she became dull and the temperature varied from 101.5° to 99.5° F. On examination she was found to be a well-nourished child. The anterior fontanelle was open, the head was retracted, and there was a marked Kernig sign. The knee-jerks were present. Lumbar puncture showed a turbid fluid, which on examination yielded a coarse clot with numerous slender Gram-negative bacilli and a very scanty growth of bacilli resembling bacillus influenzae. On the 29th an injection of a vaccine of 5,000,000 influenzal bacilli was given. On the 31st the child seemed better, but on Feb. 1st she developed convulsions, the head became more retracted, and she died on the 4th.

Dr. Forbes's reports on the cerebro-spinal fluid were as follows:—

Jan. 27th: The cerebro-spinal fluid is turbid and forms a clot; there is a heavy cloud of albumin, dextrose is absent, and there is a marked excess of polymorphonuclear cells, numerous small, slender Gram-negative bacilli resembling bacillus influenzae. The culture was sterile.

Feb. 1st: Numerous bacilli resembling bacillus influenzae. A scanty growth of bacillus influenzae.

No necropsy was obtained in this case.

CASE 5.—The last case of this group was that of a child aged 1 year and 4 months, who was admitted on Feb. 13th, 1910, under the care of Dr. Voelcker. Sixteen days previously to admission the child developed a cold, and six days later had a fit, during which the face, the arms, and the legs twitched; a similar fit affecting the left side occurred on the next day. Since then the fits had become more frequent. On admission the child was pale but well nourished; the temperature was 101.4° F. There was slight retraction of the head, and the neck was stiff. The patient was blind, and the eyes were constantly deviated to the left. The optic discs were pale. Both arms were rigid, and the legs were fully extended. The knee-jerks were present. On the 14th severe convulsions came on and the child died.

A post-mortem examination was performed on the following day, and on examination of the brain the whole of the anterior part of the cerebrum was found to be covered by a layer of pus, which also extended over the base. The ventricles also contained pus. The posterior surface of the cord was also covered with pus. On the anterior aspect of the body of the third dorsal vertebra was a small abscess cavity containing thick yellow pus. The pus and fluid from the cerebral ventricles and meninges were examined. The films showed numerous bacilli of varying size and length which were Gram-negative and resembled the bacillus influenzae. On culture a pure growth of the bacillus influenzae was obtained.

Symptomatology.—From a consideration of the cases just recorded it is possible to obtain a clinical picture of the disease. The symptoms are exactly similar to those which occur in the meningococcal forms of meningitis. In fact, it is impossible on clinical grounds alone to distinguish an influenzal meningitis from a meningococcal meningitis. Neither the acuteness of the onset nor the character of the symptoms nor the duration of the disease will in any way serve to differentiate these conditions. It is only possible to arrive at the diagnosis of influenzal meningitis by a careful bacteriological examination of the cerebro-spinal fluid obtained by lumbar puncture, and the cases just recorded would easily have escaped recognition except for the careful

examination of the cerebro-spinal fluid conducted by Dr. Forbes.

Historical.—Cases of influenzal meningitis have been reported from the year 1892, some three years after Pfeiffer had discovered the organism, but owing to the difficulty of identifying the organism and the presence of other organisms it is doubtful if any case can be accepted as influenzal meningitis before those recorded by Fraenkel in 1898—who found the organism in two cases of meningitis in infants. Slawyck in 1899 is stated to have been the first to establish the diagnosis of influenzal meningitis during life by means of lumbar puncture. Since that time several cases have been recorded.

An extremely good digest on this subject is given by Cohoe, who has collected 26 cases which he accepts as undoubted influenzal meningitis. He points out that since a precise diagnosis is only possible by a bacteriological examination of the cerebro-spinal fluid, the reports of many of the earlier cases are worthless in a statistical study of the disease. Of the 26 cases 14 (56 per cent.) occurred in children under one year of age, all of whom died, and the mortality for the whole series was 85 per cent. Langer records the case of a boy, aged 9 years, who recovered, which is the youngest age at which recovery has taken place. Douglas in 1907 recorded a case of influenzal meningitis in an infant, aged 10 months, who died on the eighth day, and Dudgeon and Adams in the same year recorded another fatal case in an infant also 10 months old. Mya, Bertini, Jundell, and Fraenkel have all reported cases in infants. These 14 cases, together with the 5 here recorded, give a total of 19 cases in children under 2 years of age—18 of these patients died and 1 recovered, giving a mortality of 94 per cent.

Diagnosis.—The essential difficulty in the diagnosis of these cases is the recognition of the organism. Unless routine cultures are made on some blood medium the organism may be easily overlooked and the fluid reported as sterile. In the present series of cases Dr. Forbes, in his reports states that both morphologically and culturally the organism has all the characteristics of the bacillus influenzae, and Dr. Arkwright in one case has shown that the organism is not pathogenic to animals. Cohen has described an organism which he says has been confused by former observers with the Pfeiffer bacillus, which it resembles most closely morphologically and in staining reaction, but which is pathogenic to guinea-pigs and rabbits and against which it was possible to vaccinate an animal and obtain an antitoxic serum. The organism present in the first case reported cannot have been of this nature, for it was shown not to be pathogenic to animals.

The symptoms produced by influenzal meningitis in infants do not differ from those which are present in meningococcal meningitis, and the diagnosis of influenzal meningitis from other forms depends upon the bacteriological examination of the cerebro-spinal fluid. The cerebro-spinal fluid obtained by lumbar puncture may in some cases of influenzal meningitis be somewhat viscid, and such an observation may suggest the possibility of an influenzal infection. It can, however, hardly be regarded as a point on which alone the diagnosis could be made.

Treatment.—Lumbar puncture has been performed in most of the cases recorded, but it can hardly be regarded as a therapeutic measure, although recovery has followed this procedure in some cases. In the case under discussion the child was for six days treated with the anti-meningococcal serum of the Lister Institute, as the case was at first regarded as one of meningococcal infection. When the nature of the infection was recognised the serum was stopped, and 10 grains of urotropin were given every four hours for three weeks. The rationale of the administration of urotropin is based upon the observation of Crowe, "that after doses of urotropin within therapeutic limits a sufficient amount of the drug appears in the cerebro-spinal fluid to exercise a decided inhibitory effect on the growth of organisms, and will markedly defer, and in some cases prevent, the onset of a fatal meningitis." The favourable result obtained in this case cannot with certainty be attributed to the treatment with urotropin, but the fact that all other cases of this nature in children under two years of age have proved fatal, whereas this child recovered, makes the treatment worthy of further trial.

Conclusion.—Although the cases above recorded differ

somewhat in the degree to which the bacteriological examination has been carried, yet they may all be accepted as cases of influenzal meningitis. The diagnosis of an influenzal meningitis must depend solely upon the bacteriological examination, for it is impossible clinically to distinguish influenzal meningitis from other forms of meningitis. In the only case of recovery which has taken place in an infant urotropin was given in large doses, and it would seem that this treatment is worthy of further trial.

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Harley-street, W.

A COMPARISON MADE BETWEEN THE SIMPLE GASTRO-CIRCULATORY SEIZURE AND THE ANGINA PECTORIS ATTACK.

By WALTER VERDON, F.R.C.S. ENG.

"THE symptom-complex called angina pectoris belongs to the class of reflex protective phenomena." So writes Dr. James Mackenzie in his work upon *Diseases of the Heart*, after putting forward a reasoned argument in favour of the view that angina pectoris is a cardiac reflex.

In the course of this article evidence opposed to the latter inference is laid before the reader, and proofs are adduced tending to show that the anginal seizure is a gastric reflex, that it is evolved from the painless type of simple gastro-circulatory seizure, and that the entity pain is not an essential content of the syndrome but an excrescent appendage. Much attention is bestowed by writers on angina pectoris in the investigation of the pain symptom, while other symptoms holding a constant place among the contents of the syndrome are allowed to pass unnoticed. By this attitude on the part of observers I am reminded of the tale of the student who, when asked by his examiners to describe an operation, spoke only of the extent of the hæmorrhage. In the anginal attack there is much else worthy of consideration besides pain. Indeed, if pain be eliminated altogether from the field of contemplation the symptoms remaining are observed to constitute a complete and harmonious category.

When the anginal attack is considered in regard to its place among paroxysmal seizures, it is found to resemble a class associated with functional disorders of the stomach, of which the simple gastro-circulatory seizure commonly known as a vomiting attack is a strong example. The dual syndrome of the simple gastro-circulatory attack represents a series of operations organised for the purpose of protecting the stomach from the effects resulting from the intrusion of a noxious body. The gastric group of operations have for their object neutralisation of the offensive properties of the irritant and its ejection from the gastric cavity; the circulatory group the defence of tissues of the gastric wall and the repair of its lesions.

The gastric operations are divisible into three groups—namely: (a) Operations for furnishing a direct and open path between the cavity of the stomach and the exterior of the body for the rapid discharge of the gastric contents. These operations are accompanied by an abundant flow of saliva to dilute and neutralise the contents of the stomach and to lubricate the passages. (b) Operations for the provision of a firm and fixed diaphragmatic cushion against which the stomach may be compressed. (c) Operations determining the compression of the stomach against the inflated diaphragmatic cushion, and the ejection of the gastric contents.

The circulatory syndrome represents operations engaged in with the object of counteracting the effects produced on the tissues of the gastric wall by the presence of an irritant body in the stomach. These operations consist of two groups:—1. The provision of an abundant supply of blood to the splanchnic region. 2. The establishment of compensatory constriction of the stream bed in the somatic and thoracic regions.

When the gastric crisis approaches, as that arising from