There is, however, probable justification in these records for the following statement. Cyclopropane has, in our hands, resulted in no increase in death rate from anaesthesia, as such, over the older agents in common use. It certainly has carried its share of bad risk cases. It has, in our hands, a definitely lower major respiratory morbidity than we have experienced after ether or spinal anaesthesia. Due to the difference in operative procedures for which other agents and methods are used further comparison is difficult.

Conclusion

After six years' experience with cyclopropane in laboratory and operating room we still consider it an experimental drug. There are many things about it which are yet to be learned. At the same time, we feel justified in continuing its clinical use and recommending it to others who are competent to study its effects and recognize its dangers.

The author regrets injustice to several of his associates as well as inconvenience to readers through failure to cite references to published papers in every case. Much of the work here presented in outline has been accomplished during recent months, and is either incomplete or in manuscript only at this time.

REFERENCES

- ¹ Stiles, J. A., Neff, W. B., Rovenstine, E. A., and Waters, R. M.: *Anesth. and Analg.*, 1934, xiii, 56.
- ² SeEVERS, M. H., Meek, W. J., Rovenstine, E. A., and Stiles, J. A.: *Journ. Pharm. and Exper. Therap.*, 1934, li, 1.
- ³ Waters, R. M., and Schmidt, E. R.: *Anesth. and Analg.*, 1935, xiv, 1.
- ⁴ Idem: *Journ. Amer. Med. Assoc.*, 1934, ciii, 975.
- ⁵ SeEVERS, M. H., DeFazio, S. F., and Evans, S. M.: *Journ. Pharm. and Exper. Therap.*, 1935, liii, 90.
- ⁶ Rovenstine, E. A.: *Anesth. and Analg.*, 1935, xiv, 270.
- ⁷ Taylor, I. B., and Waters, R. M.: *Ibid.*, 1935, xiv, 276.
- ⁸ Kurtz, C. M., Bennett, J. H., and Shapiro, H. H.: *Journ. Amer. Med. Assoc.*, 1936, cvi, 434.
- ⁹ Rovenstine, E. A., and Taylor, I. B.: *Amer. Journ. Med. Sci.*, 1936, xcvi, 807.
- ¹⁰ Lucas, G. H. W., and Henderson, V. E.: *Can. Med. Assoc. Journ.*, 1929, xxi, 173.
- ¹¹ Orcutt, F. S., and SeEVERS, M. H.: *Solubility of Cyclopropane in Water, Oils, and Human Blood.* (In Press.)
- ¹² Freund, von August: *Monats. f. Chemie*, 1882, iii, 625.
- ¹³ Orcutt, F. S., and Waters, R. M.: *Anesth. and Analg.*, 1933, xii, 45.
- ¹⁴ Levy, A. Goodman: *Heart*, 1913, iv, 319.
- ¹⁵ Rovenstine, E. A.: *Anesth. and Analg.*, 1934, xiii, 122.
- ¹⁶ Peoples, S. A., and Phatak, N. M.: *Proc. Soc. Exp. Biol. and Med.*, 1935, xxxiii, 287.

L. B. Ellis and Soma Weiss (*Arch. Neurol. and Psychiat.*, August, 1936, p. 362) have continued the discussion on vasomotor disturbances and oedema associated with cerebral hemiplegia. They have compared the arterio-venous oxygen difference, obtained from measurements of the oxygen tension of blood from an artery and from the ante-cubital and femoral veins of thirty-five cases of hemiplegia. The position of the lesions causing the hemiplegia was not mentioned. In all the cases the arterio-venous oxygen difference was decreased in the paralysed arms, and in many of the cases in the legs also. There was no significant difference in blood pressure, venous pressure, skin temperature, or capillary resistance between the two sides. In thirteen of sixteen cases examined oedema of varying degree was present in the affected side. Its absence on the normal side is not recorded. The authors assume that alteration in the arterio-venous oxygen difference implies an alteration in the rate of blood flow. This would be so if the metabolic requirements of the normal and paralysed limbs were identical. Using this assumption, they conclude that the rate of blood flow is increased on the hemiplegic side. They state that this "is due to a vaso-dilatation involving the arteries and arterioles, resulting from altered vasomotor reflexes of cerebral origin." Some of the very conflicting literature on the subject of cerebral vasomotor control is also discussed.

ACUTE RHEUMATIC MENINGITIS

BY

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Rheumatic meningitis is mentioned by the writers of older textbooks of medicine, but of recent years the condition is so rare that the occurrence of a case merits a detailed description. The fact that acute rheumatic fever is itself less common and less severe may account for the rarity of the condition, but it is curious that it is not more often seen. On the analogy of tuberculosis and pneumococcal infections, which have a predilection for the pleura, peritoneum, pericardium, meninges, and synovial membranes of joints, it would be reasonable to expect to find that the rheumatic inflammation which commonly attacks all of these except the meninges would also from time to time be found to affect the latter situation.

Case Record

The case here described was that of a man aged 34. He had previously been in good health, having never suffered from attacks of rheumatic fever, chorea, scarlet fever, or recurrent tonsillitis. There was, however, a marked history of alcohol for a few years previous to the present illness. He was suddenly taken ill. There was high fever; the joints of the wrists, the left elbow, the knees, and the right ankle were acutely inflamed; and there was profuse sweating. The joints became swollen in succession, not simultaneously. They were acutely painful and excruciatingly tender. They were reddened and warm to the touch, and the knee-joints contained some fluid. He was given 150 grains of sodium salicylate a day, and within three days the tenderness, swelling, and pain had completely disappeared. Fever, however, persisted at about 102°, and the case was investigated with a view to discovering the cause of this. The blood count was: red blood cells, 3,300,000; colour index, 0.94; white blood cells, 8,600. Blood culture was sterile, and the agglutination reactions were negative against the typhoid group, *B. abortus*, and *B. melitensis*.

It was on the seventh day of his illness that I was first asked to see him. He was mentally clear and had no headache, and his only complaint was of a slight pain felt centrally in the left chest and radiating to the back; this was worse on taking a deep breath. A slight cough was present. The only abnormal physical signs were those concerning the heart and the left lower lobe of the lung.

The apex beat was flabby, but localizable three-quarters of an inch outside the left mid-clavicular line in the fifth space. The area of cardiac dullness extended upwards to the second left space, and the cardio-hepatic angle was obtuse. In the fourth and fifth spaces a distant pericardial friction was audible. This disappeared in three days. At the apex of the left lower lobe posteriorly the percussion note was slightly impaired, and the respiratory murmur was broncho-vesicular in character. No rheumatic nodules were found. A diagnosis of rheumatic pericarditis was made.

Five days later the patient was again seen. He looked extremely flabby and ill. He had no mental or physical energy. The heart was still enlarged, and its rhythm suggested a partial heart-block. An electrocardiograph tracing proved the presence of this, the P-R interval increasing to 0.4 of a second before the dropped beat. It was assumed that this confirmed absolutely that the condition was one of rheumatic fever with a pancarditis. Five days later the patient was again seen. He had for the previous three days complained of pain at the back of the neck. This had come on gradually, and simultaneously there had developed a change in the patient's mental state. He was in a rambling, restless condition, but was not excited; indeed, at times he was semi-comatose. He was very confused. There were no hallucinations or delusions. Headache was not complained of, and there had been no vomiting.

On examination the cardiac condition was unchanged, heart-block being still present. Neck rigidity was very well marked, and Kernig's sign was strongly positive. There were no paralyses of the cranial nerves, and no loss of power or sensation in the limbs. The plantar responses were flexor. A lumbar puncture was performed, and the needle entered the theca without difficulty.

The cerebro-spinal fluid was very slightly yellowish, and was under pressure; the total protein was 0.5 mg. per cent., the sugar 0.05 per cent., and the chlorides 0.72 per cent.; the red blood cells were 240 per c.mm., and the leucocytes 78 per c.mm., 98 per cent. being polymorphonuclears and 2 per cent. lymphocytes; the fluid was sterile, and its Wassermann reaction was negative.

The patient made an uninterrupted but slow recovery. The central nervous system signs disappeared within about ten days, but the pulse irregularity due to the heart-block remained for four to five weeks. Four months after the onset of the illness the P-R interval was normal, but the T waves still were somewhat flattened in Leads I and II.

Differential Diagnosis

The rarity of the condition made it imperative to eliminate other possibilities before determining on the diagnosis of acute rheumatic meningitis. Each of the following was considered as an alternative: delirium tremens, meningitis of some other type, acute encephalitis, and subarachnoid haemorrhage.

Alcoholism.—There was a sufficient history of alcoholism to have produced an attack of delirium tremens, and the interval of three weeks between the cessation of alcohol ingestion to the commencement of symptoms was a possible one, although rather long. But there seems to be no record of such a high white cell count in the cerebro-spinal fluid as 78 in alcoholism; moreover, there were no hallucinations.

Meningitis, lit up by the acute rheumatism, was also considered at the time, for both a tuberculous and a syphilitic meningitis may become active during some other acute infection. The course of the disease eliminated the former, and the Wassermann reaction was negative.

Encephalitis is known to occur as an intercurrent disease during the course of measles, chicken-pox, and some other acute specific infections. Its occurrence during acute rheumatism is unknown, although certain encephalitic cerebral symptoms and pathological findings have been described.³ The prodromal meningeal irritation, the head retraction, and the positive Kernig sign, together with the high protein content of the cerebro-spinal fluid, all suggest a definite meningitis rather than a pure intercurrent encephalitis.

Subarachnoid haemorrhage does not cause the marked encephalitic symptoms seen in the present case; the quantity of blood is greater, and signs of some local cerebral lesion are usually found in such cases. Moreover, the onset of symptoms is less gradual.

On the evidence available, therefore, the most likely diagnosis is an acute meningitis occurring in, and presumably due to, an acute rheumatic infection. The presence of some blood cells and the high protein content are points in favour of an acute rheumatic inflammatory reaction of the meninges, for haemorrhage is fairly common in the rheumatic exudates into joints, pleura, and pericardium, and in such exudates the protein content is high.

The rarity of the condition is a point worthy of consideration. It is possible that some other factor is needed before the acute rheumatism can produce a definite meningeal reaction. Possibly such a factor is to be found in chronic alcoholism, for in the two other analogous cases found in the literature there was the same possibility.

Literature

Robin and Lyon-Caen¹ describe the case of a young man aged 37 who, in the third week of his third attack of rheumatic fever, developed severe mental confusion with visual hallucinations in which snakes were prominent. Three days later he had neck rigidity and a positive Kernig sign. No localizing nervous signs were present. The heart was normal, but the joints had been typically reddened, swollen, and painful. The cerebro-spinal fluid contained many red blood cells, 250 lymphocytes, and 200 polymorphonuclear cells per c.mm. The fluid was sterile, and its Wassermann reaction was negative. The patient recovered.

Constensoux and Henry² describe the case of a young man of 19 who developed chorea three months after an attack of acute articular rheumatic fever. The onset of the chorea was sudden, and it was later accompanied by neck rigidity and a positive Kernig sign. The cerebro-spinal fluid contained many polymorphonuclear cells, and the albumin content was 40 mg. per cent. But in this case a complicating factor was that the Wassermann reaction was positive in both blood and cerebro-spinal fluid. The patient recovered.

Winkelman³ reports five cases of acute rheumatism that during life had shown a severe delirium but no meningeal symptoms. In one case the cerebro-spinal fluid was normal and in the others was not examined. Post-mortem punctate haemorrhages and oedema were found in the brain, and the meninges showed slight oedema.

Gottsegen⁴ described two cases of mild acute rheumatism with symptoms of meningism; both recovered. One only was lumbar-punctured; the cerebro-spinal fluid was normal.

Summary

A case of acute rheumatic meningitis is described.

It is suggested that for the development of acute meningitis during acute rheumatism some secondary factor such as alcoholism is necessary.

REFERENCES

- ¹ Robin, A., and Lyon-Caen, L.: *Bull. et Mém. Soc. Méd. des Hôp. de Paris*, 1914, xxxvii, 717.
- ² Constensoux, G., and Henry, M.: *Ibid.*, 1918, xlii, 1128.
- ³ Winkelman, N. W., and Eckel, J. L.: *Arch. Neurol. and Psychiatry*, 1932, xxviii, 844.
- ⁴ Gottsegen, G.: *Sc. z. med. Woch.*, 1935, xvi, 280.

A. Bessemans and U. Thiry (*Bruxelles-Médical*, August 30th, 1936, p. 1601) maintain that the favourable effects of hyperpyrexia in human syphilis have a thermal basis, particularly when the treatment consists of hot baths, or of diathermy, or of short-wave currents of about 600 metres. This is exemplified by records of fifteen cases, mainly of chancres, and the various reactions to physical treatment are discussed. The results with local diathermy with short waves of about 18 metres were good, the heating being pushed to the limit of the patient's tolerance, erythema and even oedema following in some cases. Lesser degrees of heating were much less beneficial, and the authors are satisfied that it is not the electric current which avails, but rather the induced heat, with its action on the treponemata. They add that this confirms their previous conclusion with regard to the action of short-wave irradiation on testicular syphilomata in the rabbit, bacterial lesions, or Ehrlich's sarcoma in the mouse—in all of which any reduction of the temperature induced resulted in poorer amelioration. The time factor during which the heat is maintained is also important, and there must be no cooling by air currents or the application of cold water. It is concluded that the clinical benefit depends on the destruction of the infecting organisms concerned.