be returning to the normal level while the protein rise may hardly have begun. This observation lays stress on the importance of obtaining two specimens of fluid from each case, preferably at the end of the first week and in the middle of the third week. Such routine examinations should enable a case of acute anterior poliomyelitis to be picked out with ease from among the paralyses of childhood and young adult life.

Summary

The findings in a small series of cases in an epidemic of acute anterior poliomyelitis are reported. These show the typical early rise in cell counts and the late rise in protein content. The cases are recorded in detail on the chart.

An appeal is made for the taking of more than one specimen of cerebrospinal fluid in a case suspected of acute anterior poliomyelitis, and for the interpretation of the findings in the light of the changing picture presented in this disease.

It is stressed that a single specimen at the end of the second week may give findings approximating to the normal, as the cell rise is almost at an end and the protein rise may hardly have begun.

I would like to acknowledge the help of Prof. Perry, Drs. Birrell, Beryl Corner, and Lloyd Price, under whom these cases were treated and who called me in as their orthopaedic colleague; and of Prof. Davie, who was at the time professor of pathology at the University of Bristol, and whose staff carried out all the cerebrospinal fluid examinations. My thanks are especially due to Prof. Perry, who has stimulated me to publish this series from a small epidemic in an attempt to widen the recognition of the entirely typical picture here presented.

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TETANY IN BLOOD DONORS

BY

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The removal of blood from donors by the methods now in use has little effect on the great majority of them. A small proportion—about 5% according to Brown and McCormack (1942)—show certain vasomotor phenomena, commonly referred to as “faints.” But in addition to these manifestations we have found that a few donors have developed unmistakable attacks of tetany, with typical spasms of hands and feet and positive Chvostek’s sign. The number of donors affected in this way was small, amounting to 1 in every 1,000 on the average, but the condition is nevertheless of some importance, and we are not aware that it has been previously reported.

It is, of course, highly desirable that any untoward reaction occurring in a blood donor should be treated as promptly and efficiently as possible, not only for the sake of the subject of the attack but also, in centres where a number of donors are bled in the same room, to prevent the attention of others being drawn to the occurrence; for the observance of unusual reactions is apt to have a most disturbing effect on other donors, and the frequency and nature of the reactions tend to be greatly exaggerated by them. We have therefore attempted to ascertain the nature of the tetany we have observed and to apply a rational treatment.

Determinations of serum calcium in the first 2 of our cases proved that we were not dealing with low-calcium tetany; and gastric tetany was excluded by the entire absence of any history of attacks of vomiting. It was therefore concluded that the condition was probably a hyperventilation tetany, and in subsequent cases the serum inorganic phosphorus was determined, as well as calcium, and the appropriate treatment for hyperventilation tetany was instituted. This consists in supplying to

the patient air enriched with CO₂. In only one case was a cylinder of CO₂ immediately available; in the others the simple method of placing a paper bag over the patient’s nose and mouth, and so causing him to rebreathe his own expired air, was adopted. Details of the cases are as follows:

Case Histories

Case 1.—Woman aged 42. First donation. Blood taken, 60 c.cm. Tingling and numbness noticed first in hands and feet, followed by carpopedal spasm and laryngismus stridulus. Attack lasted 25 minutes. No history of similar attacks. Serum calcium in specimen taken *during* the attack, 10.8 mg. per 100 c.cm.

Case 2.—Woman aged 30, very obese. First donation. Blood taken, 540 c.cm. Tingling and numbness, followed by carpopedal spasm and positive Chvostek’s sign. Attack lasted 16 minutes. History of similar attack some years ago, after injection for varicose veins. Serum calcium in specimen taken *during* the attack, 11.2 mg. per 100 c.cm.

Case 3.—Man aged 34. Third donation. Blood taken, 540 c.cm. Full carpopedal spasm, laryngismus stridulus, positive Chvostek’s sign. Treated by paper-bag method, following the application of which the spasm began to pass off almost immediately, and symptoms had disappeared within 10 minutes. Serum calcium in specimen taken *during* the attack, 11.2 mg.; inorganic phosphorus, 3 mg. Corresponding figures for specimen taken *at the end* of the attack were: calcium, 12.2 mg.; inorganic phosphorus, 2.2 mg.

Case 4.—Man aged 26; suffers from migraine; very apprehensive and nervous. First donation. Blood taken, 540 c.cm. Carpopedal spasm, laryngismus stridulus, positive Chvostek’s sign. Spasm passed off very quickly after administration of air containing about 12% CO₂ through Minnitt’s apparatus. Serum calcium in specimen taken *at the end* of the attack, 11.2 mg.; inorganic phosphorus, 1.9 mg.

Case 5.—Woman aged 32. First donation. Blood taken, 540 c.cm. Carpopedal spasm and laryngismus stridulus very marked; positive Chvostek’s sign. Treatment by paper-bag method relieved the spasm, but patient would not co-operate, and persisted in hyperventilating; carpopedal spasm again supervened, lasting for a further 5 minutes. Serum calcium *at the end* of the attack, 11.3 mg.; inorganic phosphorus, 1.3 mg.

Case 6.—Woman aged 51. First donation. Blood taken, 400 c.cm. Tingling and numbness of hands complained of, and bleeding was stopped. Spasm developed in hands, but in feet there was only tingling and numbness. Treated by paper-bag method; symptoms disappeared after 10 minutes. Serum calcium *at the end* of the attack, 10.5 mg.; inorganic phosphorus, 3.1 mg.

Case 7.—Woman aged 23. First donation. Blood taken, 540 c.cm. Marked carpopedal spasm and laryngismus stridulus, with positive Chvostek’s sign. There was very noticeable overbreathing. Treated by paper-bag method; attack terminated after about 7 minutes. Serum calcium *at the end* of the attack, 10.8 mg.; inorganic phosphorus, 3 mg.

Discussion

The first point to be noted is that the onset of the attacks is not wholly dependent on the amount of blood withdrawn, for while in most cases the attack occurred after the full quantity of blood had been taken, in one it supervened after the removal of only 60 c.cm., and in another after 400 c.cm. The next point is the preponderance of females among the cases observed. This is in agreement with the general experience that spontaneous hyperventilation tetany occurs mainly in females.

So far as the blood chemistry is concerned, the findings agree in the main with those of Fowweather, Davidson, and Ellis (1940) in spontaneous hyperventilation tetany, and of Haldane, Wigglesworth, and Woodrow (1924) in experimental hyperventilation tetany. The latter authors found that on every occasion the blood inorganic phosphorus fell below 1.25 mg. per 100 c.cm.; moreover, this fall and the subsequent rise to normal values after the attack are rapid, and consequently minimal concentrations are present for only a very short time. Fowweather *et al.* found, in specimens of blood taken at the end of the tetanic attack, that the serum phosphorus was reduced (in 2 cases to only 1 mg. per 100 c.cm.), while the serum calcium showed a high-normal or even a definitely raised value. Other authors have mostly reported normal or slightly raised calcium figures, with low-normal phosphorus figures (2 to 3 mg.) in specimens taken during attacks. Fowweather *et al.* argued that the greater changes shown by them, compared with those of

other authors, indicated that such changes reach their maximum about the time when the attack ceases, and this conclusion seems to be supported by the findings of Haldane *et al.* It is also borne out by the results obtained in Case 3 of the present series.

Of the 5 cases of this series in which specimens taken at the end of the attack were examined, 1 showed a definitely raised and 2 a slightly raised calcium figure, while the other 2 were near the upper limit of the generally accepted normal range (9 to 11 mg.). In 2 the phosphorus was definitely low (below 2 mg.), 1 was only slightly higher (2.2 mg.), while the other 2 were within normal limits.

It is not surprising that uniform changes have not been found in all cases; such uniformity is rare in any condition. Moreover, failure to demonstrate changes from examination of one specimen taken at the end of the attack does not prove that these changes did not occur. It is probable that the time at which maximum changes do occur with reference to the tetanic attack is somewhat variable, and in any case the period during which these changes are marked is short. It is also likely that the duration, extent, and time of occurrence of the blood changes are related in some degree to the severity and duration of the attack, and these have varied considerably in our cases. Hence it is to be expected that specimens taken at a relatively fixed period of the attack should in a certain proportion of cases fail to demonstrate changes which do in fact occur. It can at least be said that the type of blood change which has been observed in certain of our cases corresponds to that found by other workers in hyperventilation tetany.

Hyperventilation tetany is of course due to an alkalosis resulting from excessive loss of CO₂ by overbreathing, and the treatment applied aims at making good this CO₂ deficit. It is impossible to make definite assertions regarding the effect of treatment in such a small series of cases, but we have the distinct impression that it shortened the attack and relieved the muscular spasm; the treatment applied to Case 4 seemed to be particularly effective. The observations made on the treatment of these cases therefore tend to support our views as to the real nature of the attacks.

There remain to be considered the reasons for hyperventilation in blood donors. It is well known that hyperventilation is a frequent response to nervousness, apprehension, fear, and pain, particularly in those of anxious or highly strung temperament, and the great majority of reported cases of hyperventilation tetany have occurred in persons of this type. It is not surprising that some donors should view the removal of their blood by a process of which they have little or no knowledge, and no previous experience, with nervousness and apprehension, and possibly some fear. A certain proportion of these will respond by overbreathing, and a few of them will develop tetany either because they are unduly susceptible to the effects of overbreathing or because the overbreathing is excessive. It would be expected, therefore, that attacks of tetany would be much more apt to occur in those making a first attendance at the transfusion centre than in others. This is seen in the present series, in which 6 of the 7 patients were giving blood for the first time, and nearly all admitted to some apprehension. It should be added that before bleeding takes place it is generally difficult to distinguish those who may be liable to an attack of tetany; for the overbreathing is in most cases far from obvious, and not at all easy to detect under the conditions usually obtaining at transfusion centres.

It has been suggested to us that another possible factor is the effect of adrenaline, since in all our cases a local anaesthetic (parasetic—Parke, Davis) containing adrenaline was used. The ability of adrenaline to increase the heart rate and depth of respiration, especially in those particularly susceptible to its action, might, it is thought, play some part in the development of the hyperventilation leading to the tetanic attacks.

Summary

Seven cases of tetany occurring in blood donors are described. The condition is believed to be a hyperventilation tetany.

The blood changes noted—namely, low inorganic phosphorus and high-normal or raised calcium—correspond to those found in other reported cases of spontaneous hyperventilation tetany.

Six out of the seven cases were in persons giving blood for the first time, and the principal factor concerned is believed to be overbreathing resulting from nervousness and apprehension.

The treatment recommended for the attacks is to supply air enriched with CO₂. This should be done from a special CO₂ supply, where available; otherwise the patient should be caused to rebreathe his own expired air by placing a paper bag over his nose and mouth.

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MENINGOCOCCAL SEPTICAEMIA

BY

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Two series of cases of chronic meningococcal septicaemia of moderate size have been reported by Stott and Copeman (1940) and Dickson, McKinnon, Magner, and McGillivray (1941), while several observers have subsequently published accounts of sporadic cases. In spite of this, however, the condition still appears to be regarded by most medical men as a rarity. That this is not so is shown by the fact that the cases recorded here (see table, p. 761) merely represent those seen in the wards of a military hospital from Sept., 1941, to March, 1942. All but one had been sent in under another diagnosis, but the blood cultures of 14 of the 15 cases were positive for the meningococcus, although not necessarily so at the first attempt.

Clinical Diagnosis and Treatment

Diagnosis is easy if the possibility of meeting with the condition is borne in mind. The onset is often sudden, with fever and, occasionally, sweating and a rigor. Severe pain in the muscles and joints, sometimes with effusion, is common, together with headache. Within a day or two the characteristic rash occurs—generally on the legs, often on the arms, and less frequently on the back and trunk. In some instances, however, this is so sparse that it may not be noticed even by the patient, who may therefore be unaware of its occurrence. In its commonest form it consists of pinkish papules, macules, and sometimes nodules, which may vary in size from a few millimetres to 3 cm. or more across. On pressure the colour fades, but a small haemorrhagic centre is often seen, whilst petechiae are frequently found. Successive crops appear in many cases, although occasionally only a few spots will occur singly and so may be missed. A somewhat characteristic feature of this rash is tenderness on pressure. If not treated with sulphapyridine or similar drugs the condition may last for months or even years, generally with remissions. The fever is usually of the intermittent type, rising to 104° to 105°. In no case in this series was the spleen palpable, although there was tenderness in that area in one instance. A curious feature of the disease was the absence of wasting, debility, or even a feeling of real illness throughout its course. It was chiefly of the muscle and joint pains and, when present, of sweating that the patients complained.

Sulphapyridine, 12 g. in the first 24 hours, will in most cases terminate the disease within this period, although dosage should be continued for at least a week after pyrexia has ceased. The patient then can convalesce rapidly and normally.

Comment

Meningitis was at no time epidemic in the areas from which these cases were derived. They did not appear to differ, however, from those reported by Stott and Copeman in 1940 as occurring in association with an epidemic of cerebrospinal meningitis. It is believed that meningococcal septicaemia is a comparatively common disease, although it is frequently misdiagnosed—generally as rheumatic fever or influenza, and as erythema nodosum when the rash is of the confluent type.

My thanks are due to Capt. R. Doll, G. Nesbit, E. Greaves, and P. Charlton for their assistance; to Majors A. Raper and W. Stewart for the pathological findings; and to Col. M. J. Williamson, M.C., for permission to publish.

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