cocci. His general condition remained extremely poor until sulphapyridine was started on November 5, 1 gramme being given four-hourly. A very decided improvement was evident in the course of a few days. The sulphapyridine was reduced on the 14th to 0.5 gramme thrice daily, but was increased on the 21st to 0.5 gramme four-hourly because of a return of fever. It was stopped on December 6, as persistent anorexia developed, but was restarted in doses of 0.5 gramme thrice daily on December 9 and was maintained continuously at this level until February 25, 1941.

During this time the improvement in the patient's condition continued, although it was interrupted temporarily on several occasions by minor upsets (see Chart). Four successive blood cultures were negative. The fifth unfortunately was contaminated, but the sixth was again negative. There was a striking decrease in the frequency of Osler's nodes while sulphapyridine was being given. A blood count on December 3 showed red cells, 4,400,000 per c.mm.; haemoglobin, 70%; colour index, 0.8; white cells, 8,600 per c.mm.—polymorphs, 74%; eosinophils, 1%; lymphocytes, 24%; monocytes, 1%. On March 1 the readings were: red cells, 4,530,000 per c.mm.; haemoglobin, 85%; colour index, 0.9; white cells, 21,800. Leucocyte counts, made at frequent intervals throughout, varied between 7,000 and 22,000 per c.mm. (see Chart). The blood concentration of sulphapyridine while 0.5 gramme was being given thrice daily was: free 1.2 mg., acetylated 1.3 mg. per 100 c.cm. The sulphapyridine was discontinued on February 25 in view of the very decided improvement. As fever returned it was restarted on March 10 and was continued until discharge.

By the date of discharge the patient was up for the greater part of the day, and was out for several hours in the afternoon. He insisted on being discharged because he felt so well.

Comments

The outstanding result of the treatment was the change in the patient's condition. From a miserable tired young man bathed in sweat he became cheerful and active and had long periods free from fever. An advanced case of subacute bacterial endocarditis was arrested and very decidedly improved. As occurred in Whitby's (1938) cases the anaemia also improved. Another interesting result was the striking diminution in the number of Osler's nodes while sulphapyridine was being given.

A total of 241.5 grammes of sulphapyridine was administered. Apart from transient nausea and anorexia, no toxic effects were noted. Whitby (1938) states that resistance to the drug may develop. That this did not occur in the case reported here is suggested by the fact that when the drug was discontinued after 226.5 grammes had been given the fever that followed was readily controlled by further small doses.

The case is unusual in that the streptococcus isolated was of the haemolytic type, and the encouraging results obtained may have been due in part to the fact that this organism is more readily destroyed by sulphapyridine than is the *Strep. viridans*. The outstanding problem, however, in the treatment of subacute bacterial endocarditis is the inaccessibility of the organisms in the heart valves rather than the sterilization of the blood stream, and it is probable, therefore, that, as has been argued above, cases in which the infecting organism is a *Strep. viridans* will also show a good response to similar treatment.

Summary

Published cases of subacute bacterial endocarditis treated with sulphapyridine and heparin and with sulphapyridine alone are reviewed briefly.

The encouraging results in those cases treated with sulphapyridine alone are noted.

A scheme of treatment is suggested, and a case so treated with considerable benefit is described and briefly discussed.

I am indebted to the Department of Health for Scotland for permission to publish this case. My thanks are also due to Dr. A. A. F. Peel for helpful criticism throughout.

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HYPERVENTILATION TETANY IN TROPICAL CLIMATES

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It seems clear that tetany is only one of the many clinical manifestations which can result from hyperventilation. The early experimental and clinical observations of Haldane and Poulton (1908), Vernon (1909), Henderson (1909-10), Hill and Flack (1910), Henderson and Haggard (1918), Collip and Backus (1920), Grant and Goldman (1920), Davies, Haldane, and Kennaway (1920), Barker and Sprunt (1922), and Goldman (1922) established the importance of hyperventilation as a cause of tetany, and the subject has been widely discussed in recent years. Its literature has now become tremendous, but an excellent review of the then known facts was published by Thomson and Collip in 1932.

It is now recognized that there are many aetiological factors, of which psychic changes and pain would seem to be the most important. McCance (1932) showed that in certain persons tetany could be induced by attacks of overbreathing which were scarcely perceptible to casual observation; he considered that these persons must be peculiarly susceptible to an alkalosis. It is widely agreed that there are great variations in individual susceptibility to hyperventilation, and in this connexion the work of Schultzer and Lebel (1939) is of interest. Serum calcium is generally accepted to be normal in these cases, while Fowweather, Davidson, and Ellis (1940) have shown that immediately after the attack the serum inorganic phosphorus may be considerably below the normal level. All the evidence at present goes to show that overbreathing produces an alkalosis by washing out carbon dioxide from the blood. The mode of production of tetany by alkalosis is still in doubt. The conclusion of Fowweather and his colleagues (1940) that it is due to tissue alkalosis seems to be fairly well founded.

Effect of Temperature upon Ventilation

Bazett and Haldane (1921) described the effects of the immersion of four men in hot baths for a long period. They noted that sweating occurred early, and that a rapid rise of temperature produced hyperpnoea, which was accompanied by faintness, mental confusion, and tingling. They also observed that these symptoms could be relieved by breathing mixtures containing high percentages of carbon dioxide. The secretion of a large amount of highly alkaline urine was also recorded. This work was confirmed by Landis and others (1926), who noted the occurrence of tetany and found that the degree of change in the blood pH did not appear to be in direct relation to the onset of tetany. One of the cases recorded by McCance (1932) was that of a nursing sister whose first and only spon-

taneous attack occurred in an operating theatre, where the temperature may have been considerably above the normal met with in this country and where the clothing is often excessive.

It is a little surprising that no work appears to have been done upon the subject of hyperventilation tetany in tropical climates. In this connexion the following case report is of interest.

Case Report

A ship's engineer aged 27, in good general health, gave a history that while in intense heat in the Persian Gulf he suffered from profuse perspiration leading first to tingling and cramps and, after "a few minutes," to spasm of hands and feet. He was seen by a doctor after this attack, and was found to have a slow pulse but no other abnormal physical signs. He reported that a similar attack had occurred in a hot climate seven years previously. It was thought that the tetany might have been produced by hyperventilation, since the conditions appeared to resemble closely those produced experimentally by Landis and others (1926). He was therefore instructed to breathe quickly and deeply, and after approximately two and a quarter minutes he reported that tingling of the hands and feet had started; overbreathing for a further thirty seconds produced a typical *main d'accoucheur*. The blood calcium was determined almost immediately after this and gave a value of 8.3 mg. per 100 c.cm. On subsequent occasions two further attacks of tetany were deliberately produced. The resting blood calcium on another occasion was 9.7 mg. per 100 c.cm., and the blood chlorides estimated at the same time were within the limits of normal.

Discussion

The identity of attacks of tetany produced by deliberate overbreathing and of those which occurred spontaneously in the Persian Gulf seems certain. This appears to be the first clinical description of overbreathing tetany due to heat. Further investigation will probably lead to the recognition of more cases due to this cause.

I wish to record my thanks to Dr. Arthur Davies for the pathological investigations, and to Dr. R. A. McCance for his very helpful criticism.

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Medical Memoranda

Paralysis accompanying Herpes Zoster

The articles by Drs. Barham Carter and J. B. W. Dunlop and by Major Spillane in the *Journal* of February 15 (pp. 234, 236) prompt me to record two cases from my practice.

Case 1.—An active, healthy, and muscular man aged 70, who had been subjected to great anxiety in August, had intense pain of right fifth cervical distribution for three days, culminating in a typical eruption of herpes zoster on September 16, 1940. On the 19th two complications ensued; first a generalized rash which became vesicular and indistinguishable from varicella; secondly, weakness of the right shoulder and arm. The chicken-pox rash ran a normal course, the patient being very ill for two days. The paralysis was complete in the deltoid, biceps, brachialis, triceps, scapular muscles, and clavicular head of the pectoralis major. The forearm and hand, including the brachio-radialis, were unaffected. After consultation with Dr. Booth of Wolverhampton with reference

to treatment, a radiograph was taken on November 7; this showed advanced osteo-arthritis of the cervical vertebrae, particularly of C3, C4, C5, and C6. Examination on March 3, 1941, revealed a fairly strong triceps (this showed early improvement) and definite though very weak contraction in the biceps. The paralysis of the deltoid and infraspinatus muscle is complete and seems unlikely to recover.

The features of this case are: (1) the severity of "infection" evinced by the varicella; (2) the association of three factors similar to those in Case 1 of Drs. Barham Carter and Dunlop—namely, posterior root ganglion infection, marked osteo-arthritis of the neighbouring vertebrae, and infection of the grey matter of the corresponding spinal segment. It seems to me that the infection is not likely to spread to the cord except in the presence of an accessory factor.

Case 2.—An active man aged 75 had intense pain over the right side of the face and head for three days, followed by a typical herpetic eruption over the area supplied by the second and third divisions of the fifth nerve on March 1, 1941. There was some vesiculation in the external auditory meatus, but no evidence of otitis media. This was followed by a typical right Bell's palsy on March 4, but I am unable to say if the taste sense of the right half of the tongue was affected. This case followed so closely the course of those reported by Major Spillane and later by others as to need no comment. It does, however, help to outline a definite clinical entity which seems not to be excessively rare at the present time.

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Acute Intestinal Obstruction caused by Twisted Ovarian Cyst

The following case is reported because it presents some unusual features.

CASE REPORT

The patient, a 7-para African woman, was admitted to the Bahamas General Hospital on November 3, 1940, with a history of absolute constipation for six days, neither faeces nor flatus having been passed for that time. There had been vomiting for four days, the vomitus still being clear on admission to hospital. The abdomen was distended and tympanic. There was no visible peristalsis. The temperature was 98.4° F., the respirations 40, and the pulse 160. A turpentine enema produced a few scybala, the return otherwise being clear. Rectal and vaginal examinations showed the rectum to be quite empty following the enema. A diagnosis of acute intestinal obstruction probably due to a volvulus was made.

Under spinal anaesthesia the abdomen was opened by a subumbilical paramedian incision through which the distended intestines immediately protruded. 1 c.cm. of pitressin somewhat reduced the trouble due to the distended gut. The abdominal cavity contained a small quantity of blood-stained fluid and a few small blood clots. Further investigation revealed a plum-coloured necrotic mass in the pelvis; this was identified as an ovarian cyst which had twisted on its pedicle and involved the corresponding Fallopian tube. The tube and ovary were removed *en masse*, and the abdomen was closed in layers. Ephedrine sulphate, 1/2 grain, was given subcutaneously, followed by 1 c.cm. of pituitrin. The patient's condition was poor at the termination of the operation, and on return to the ward 1,000 c.cm. of a 5% solution of glucose in normal saline was given intravenously. The next day she began to pass flatus per rectum, and thirty hours after operation a spontaneous bowel movement took place. Neoprontosil in doses of 5 c.cm. was given daily for three days. Convalescence was uneventful, and the patient was discharged fifteen days after admission to hospital. The cyst was an ovarian dermoid containing the usual greasy material and hair.

It would seem that the obstruction was caused by a reflex nervous paralysis of the lower part of the gut due to the twisting of the ovarian pedicle. Later, absorption of toxins from the strangulated and necrotic tubo-ovarian mass and from the distended and inactive intestines would have tended to aggravate the condition.

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