Medical Memoranda

Addison's Disease in Identical Twins

Addison's disease in identical twins has been reported only once in the literature (Smith et al., 1963). This paper presents another example.

Case 1

A 46-year-old man was admitted to hospital in October 1967 with a six-week history of early morning vomiting, loss of 10 lb. (4.5 kg.) in weight, lassitude, and "attacks of weakness."

On examination he was seen to be thin, with slight pigmentation of the skin and lips, but not of the buccal mucosa. Blood pressure was 85/60 mm. Hg and the heart sounds were faint.

Investigations.—Urine normal on routine analysis; E.S.R. (Westergren) 22 mm. in first hour; Hb, W.B.C., M.C.H.C., and film all normal; serum sodium and chloride levels repeatedly below normal—for example, 126 and 88 mEq/l. respectively; serum potassium, urea, calcium, phosphate, cholesterol, and liver function tests all normal; random blood sugar 55 and 71 mg./100 ml.; x-ray examination of chest showed a narrow heart shadow; plain x-ray film of abdomen was negative; barium-meal examination normal; E.C.G. low voltage; 24-hour urinary 17-ketosteroids 6.6 mg./day and 17-hydroxycorticosteroids 6.8 mg./day in a normal urinary output; these levels are low and showed no response to standard intravenous A.C.T.H. infusion test; plasma cortisol levels (11.5 μg./100 ml. at 9 p.m. and 13.5 μg./100 ml. at 9 a.m.) showed no diurnal rhythm, and no response to Synacthen (10 μg./100 ml. was the post-Synacthen level).

The patient made a rapid clinical recovery on treatment with cortisone acetate 12.5 mg. twice daily and fludrocortisone 0.1 mg. twice daily. At follow-up four weeks after initiation of therapy he was asymptomatic, with a blood pressure of 115/80 mm. Hg, and had gained weight. Detailed questioning revealed that his identical twin brother had died very suddenly in 1955 in the same hospital. This twin brother is the subject of the following case report.

Case 2

In January 1955 a 33-year-old man was admitted to hospital as an emergency case, having suddenly collapsed at home. For some months he had complained of lethargy.

On examination he was conscious, with generalized muscle weakness but no neurological deficit; blood pressure and pulse were unrecordable; he failed to respond to resuscitative measures and died soon after admission.

Positive findings at necropsy were faint pigmentation of the skin, a very small heart (170 g.), and macroscopic absence of adrenal tissue. However, microscopic examination of suprarenal fat tissue showed a gross degree of atrophy of the suprarenal cortex on both sides. Death was thought to be due to primary suprarenal cortical atrophy.

Comment

Adrenal hypofunction was proved in both cases—in Case 1 biochemically, in Case 2 histologically. In neither case was there clinical or laboratory evidence of secondary adrenal failure, for example, due to tuberculosis, candidiasis, histoplasmosis, or a reticulosis. It seems reasonable to accept both as proved cases of primary Addison's disease.

The patients were always accepted by their relatives and family doctors as identical twins; chromosome studies are impossible because one twin is dead.

The familial occurrence of Addison's disease was noted by Wilkins (1965), who recorded 41 cases in 15 families, and confirmed preponderance in males. There is evidence of a hereditary basis in Addison's disease associated with polyglandular disease (cf. Mershon and Dietrich, 1966). In children Addison's disease of the familial type is often associated with hypoparathyroidism, with or without candidiasis. In 71 cases of Addison's disease Blizzard and Kyle (1963) found 36 with antibodies to adrenal tissue.

All these reports suggest a genetic basis in some forms of Addison's disease, but more examples are necessary.

I am grateful to Dr. S. G. McAlpine and Mrs. S. Carson for assistance with these case reports, and would like to thank the staff at the Steroid Laboratory, Glasgow Royal Infirmary, for performing the adrenal function tests.

H. Heggarty,* M.B., M.R.C.P., M.R.C.P.GLASG., Medical Registrar, Royal Alexandra Infirmary, Paisley.

* At present: Paediatric Registrar, York “A” Group Hospitals.

REFERENCES


Air Embolism and Babinski Reflex

This paper describes a case of air embolism which was treated in a hyperbaric recompression chamber. Alterations of a well-defined neurological sign (Babinski reflex) could be related to changes in the relative volume and/or pressure of the bubble causing the sign.

There are two major conditions under which free inert gas may appear in body tissues. (1) Decompression sickness—too rapid decompression in divers and flyers may set free inert gas which was earlier dissolved in the tissues, including blood. (2) Traumatic air embolism, occurring, for instance, during lung rupture, open heart surgery, or transfusion accidents.

The absolute amounts of free gas necessary to cause different kinds of symptoms in decompression sickness and air embolism are at present unknown. Even when known volumes of air are injected into the circulation for experimental purposes the results may differ greatly, depending on where the gas happens to lodge. However, once signs and symptoms are produced the relative changes in pressure and volume of the free gas with which the signs and symptoms vary become accessible for study. The gas volume may be influenced to a known extent by changing the atmospheric pressure in a recompression chamber. Though observations in human subjects are more accurate than in animals, the risks involved seriously limit experimentation. Most signs and symptoms are gradual in onset and disappearance—for example, unconsciousness, paralysis, sensory disturbances, bends. Subjective factors in both the patient and the examiner can further bias the accuracy of the
observed. However, in the present case these difficulties were minimal.

**CASE REPORT**

A woman aged 20 was subjected to open heart surgery. When closing the heart the surgeon noticed that some air escaped into the general circulation. On completion of the operation the patient did not wake up normally. She remained in a stuporous state and gradually developed a left-sided spastic hemiplegia with considerable rigidity. The left foot showed a "spontaneous Babinski reflex" with constant dorsiflexion of the great toe and fanning of the other toes.

About 30 hours after the operation she was brought by ambulance in a three-hour drive to a recompression chamber at a naval base. During the journey generalized convulsions lasting one to two minutes developed, reappearing at intervals of 5 to 10 minutes. Repeated injections of barbiturates had only a limited effect. Recompression was made to 6 atmospheres (atm) absolute pressure in the course of about four minutes. The left-sided rigidity was at once greatly reduced and the toes of the left foot assumed a normal position and a normal flexor plantar reflex was obtained. She was still stuporous and had recurring fits of convulsions. No further change was observed during the next 10 minutes at 6 atm. After this period it was found necessary to reduce the pressure because of difficulties in keeping the lungs expanded by a manually operated suction pump attached to the pleural drainage, etc. Decompression was made at the rate of about 0.2 atm/min. At the pressure of 1.4 atm the Babinski reflex could again be elicited. The pressure was then increased by 0.1 atm. At the new pressure level of 1.5 atm no plantar response whatever could be evoked. A further rise in pressure by 0.1 atm to 1.6 atm resulted in reappearance of the normal plantar reflex.

In order to check the observation the pressure was again gradually lowered to 1.4 atm and then increased to 1.6 atm, and this was repeated. Each time the plantar response went through the sequence of normal→no response→Babinski reflex→no response→normal. The reflex testing was made by the two medical officers staying with the patient in the chamber. Subsequently the pressure was increased well above the level necessary to keep the plantar response normal. Decompression to 1.0 atm was made in the course of three hours, after which the plantar response was still normal, the patient's condition in other respects remaining more or less unchanged. She was brought back to the surgical ward and woke up gradually in the course of 24 hours. The final outcome was complete recovery.

**COMMENTS**

The surgeon's observation that air had escaped into the blood stream, together with the patient's condition, made the diagnosis of C.N.S. air embolism certain. It is well known that bubbles may remain in the body for several days—for example, Case 23 described by Campbell Golding, Griffiths, Hemplene, Paton, and Walder (1960). The diagnosis was also confirmed about 30 hours after the operation, when recompression to 6.0 atm reduced the rigidity and re-established the downward-going plantar response. Furthermore, the recurrence of the Babinski reflex on the first attempt at decompression suggested that free gas still remained in the C.N.S.

The distinct changes in plantar response as the pressure was varied between 1.6 and 1.4 atm can be related to the relative changes in pressure and volume of the gas in the C.N.S.

**Gas Pressure.**—One may assume that the structures around an aggregation of free gas would offer some resistance to the expansion of the gas when the pressure was reduced. Blockage of the vessels by vasospasm and sludging of blood cells could decrease the degree of gas expansion, and such phenomena are known to be induced by free gas in vessels (Villaret, Cachera, and Fauvert, 1937; Wagner, 1945; Birch, 1950). The resistance to flow of the gas distally may be further raised by repeated branching of a vessel to a point at which the diameter of the vessel is small enough for surface tension to become an important factor. The pressure that the gas exerted on surrounding structures after decompression from 1.6 to 1.4 atm in the present example would be 0.2 atm.

**Gas Volume.**—(a) If the gas could expand as the atmospheric pressure was reduced the volume would increase freely. An increase in volume on decompression could cause disturbances by bulging of the vessel wall if expansion could not occur along the vessel for the reasons discussed above. Such bulging would distort surrounding structures and compress other vessels near by. On the other hand, the gas may have been free to expand in a proximal direction in the vessel, thereby occluding the orifices of further branches. In the present case the volumetric increase of the gas was 17% (according to Boyle's law), (b) If the bubble was spherical the changes in radius related to the decrease in chamber pressure would be 5.4%. (c) The increase in surface area of a spherical bubble growing freely would be 11%. If a cylindrical form is assumed the increase is potentially greater—for instance, in a cylinder 10 times as long as its diameter the increase in area would be 16%.

The relative importance of changes in gas pressure, volume, and surface area in the present case cannot be judged. Whichever factor one considers, the change necessary to induce or relieve the sign was small.

These observations emphasize the need for a particularly close watch for signs and symptoms towards the end of recompression treatment when normal atmospheric pressure is approached. The effect that a given pressure reduction has on the gas volume is then greater than at higher pressures.

**REFERENCES**