Medical Memoranda

Exchange Transfusion in Severe Toxaemia

The principle of exchanging bad blood for good activated the early transfusionists of the seventeenth century, venesection preceding transfusion (Leikin *et al.*, 1959). Probably the first successful exchange transfusions of this century were given in carbon-monoxide poisoning in 1916 by Robertson (1921). Later Robertson (1924) claimed good results with this procedure in children with burns, erysipelas, malignant scarlet fever, septicaemia, "intestinal intoxication," and drug poisoning, the object being the removal of bacteria and their toxins, or of poisons, from the blood. Exchange transfusion was occasionally used in the 'twenties and 'thirties in poisonings, infections, and burns (where the object was removal of toxins), but did not become widely used until Wallerstein (1946) described its efficacy in haemolytic disease of the newborn, since when it has also been used in poisoning with salicylates, carbon monoxide, iron salts, boric acid, aniline dyes, and barbiturates.

CASE REPORT

While playing near a pile of gravel on a country road at 11.30 a.m. on October 4, 1961, a 3½-year-old boy complained of discomfort in his shoe. His mother found a small red "pimple" on his right thigh, which 30 minutes later had become larger and painful. On returning home he was put to bed and vomited about 2.30 p.m.; he got up some time later, but by 5 p.m. was drowsy, and between 6 and 6.30 p.m. he fainted on two occasions and again vomited. His doctor found a small black "head" in the centre of the inflamed thigh, inserted a sinus forceps, and released a minute amount of fluid; when questioned about a sting, neither mother nor child could recall seeing any insect.

In hospital at 8 p.m. he showed moderate cyanosis, dehydration, and shock, and was very drowsy but could be roused. His temperature was 104° F. (40° C.), heart rate 180 per minute, respiratory rate 54, and blood-pressure 100 mm. Hg systolic. About half of the medial aspect of the right thigh was involved by an intense cellulitis with a necrotic central oval area about 7 by 6 cm., in the centre of which was a small black punctum; there was considerable homolateral inguinal adenitis and periadenitis. Intramuscular penicillin (500,000 units six-hourly), streptomycin (500 mg. 12-hourly), and an intravenous plasma infusion were begun. 50 mg. of soluble hydrocortisone being given intravenously. By 8.30 p.m. the blood-pressure had fallen to 80/50 mm. Hg and the heart rate risen to 200 per minute, when 0.25 mg. of digoxin was given intramuscularly. By 10.15 p.m. the blood-pressure was normal and the heart rate almost so; 25,000 units of mixed anti-gas-gangrene serum was given intravenously. Following 500 ml. of plasma, ¼ isotonic multiple electrolyte solution with 5% dextrose was given to a total of 1,365 ml. in the first 24 hours, a further 50,000 units of anti-gas-gangrene serum being given during the same period.

By 10 a.m. on October 5 (22½ hours after onset) he was comatose, responded only slightly to painful stimuli, and was vomiting bilious fluid; the serum electrolytes were normal. At 11.30 a.m. clonic movements of the left side occurred; blood-pressure was 120/80 mm. Hg. At 12.30 p.m. the thigh was widely incised, deep coma rendering anaesthesia unnecessary. Centrally there was necrosis of the skin and subcutis, and elsewhere considerable oedema without formation of pus or gas. A swab from the depths of the wound gave a profuse growth of group A haemolytic streptococci, sensitive to all commonly used antibiotics except streptomycin; no clostridia grew on anaerobic culture.

At 1.45 p.m. (26 hours after onset), in view of persisting coma, an exchange transfusion using group O Rh-negative blood was begun, blood being withdrawn from the left radial artery and injected simultaneously through a catheter already in a right arm vein. After one hour, when 600 ml. of blood had been exchanged, consciousness gradually returned, the child beginning to talk and take sips of water. When 900 ml. had been exchanged the transfusion was terminated owing to a great improvement in his general condition and clotting in the arterial cannula. Although some pyrexia and tachycardia persisted for six days, we had little further anxiety about him; chloramphenicol replaced streptomycin during this period. On the fourth day the necrotic tissues were excised; a subcutaneous test dose of scarlet-fever antitoxin was given before operation, but a moderate local reaction dissuaded us from giving further antitoxin. The wound was skin-grafted on the 13th day with a satisfactory result, but the hospital stay was prolonged owing to infection of the donor site. Biopsy at the first operation showed necrosis of epithelium and acute inflammation of the subcutis, with exudation of fibrin and polymorphs. Culture of about 0.5 ml. of blood drawn on admission was sterile. On the second day there were 20,000 leucocytes per c.mm. with 87% polymorphs; the haemoglobin was 58% (8.5 g./100 ml.), this rising to 74% (11 g./100 ml.) before discharge. The antistreptolysin titre was less than 100 Todd units on the 6th, 30th, and 69th days. Serum proteins on the 69th day were 6.4 g. with approximately 960 mg. of gamma-globulin (paper electrophoresis).

DISCUSSION

The cause of the intense necrotizing cellulitis in this case must remain speculative. If the initial lesion was a sting, the most likely aggressor would be one of the wasp family, as cellulitis has been described following the sting of these insects and infection is also possible owing to the scavenging habits of the wasp (Marshall, 1957). It seems unlikely that a superficial streptococcal infection alone could have produced such a fulminating illness. Whatever the cause, the illness and coma were presumably due to a severe toxaemia, and it seems likely that the dramatic recovery of consciousness and great improvement during the exchange transfusion were due to reduction in the level of circulating toxins, although this cannot have been very great since the volume of blood exchanged was little more than three-quarters of the child's presumed blood volume. Exchange transfusion may therefore still have a place in the management of fulminating infections and toxaemias not responding to more usual treatments and where the aetiology is uncertain, particularly in the younger age-groups where the amount of blood needed would be relatively small.

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