Case Reports

PULMONARY OEDEMA COMPLICATING ACUTE RENAL FAILURE

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It has frequently been emphasized, particularly by Alwall (1954), that despite careful management of acute renal failure, pulmonary oedema may occur requiring emergency measures to prevent a fatal outcome. Two cases of poisoning were admitted to the Liverpool Renal Insufficiency Unit with acute renal failure complicated by the sudden development of pulmonary oedema. A combination of conventional therapy with more specific treatment by the artificial kidney, ensured survival of both these patients.

Case Report No. 1

A healthy sailor, aged 24 years, drank 2 oz. of carbon tetrachloride in mistake for alcohol. Simple emetic measures were carried out on board ship, but acute renal failure ensued. When he was admitted to Sefton General Hospital five days later his general condition was good. Examination revealed slight sacral oedema, but there were no abnormal signs in the pulmonary or cardiovascular systems. An X-ray of the chest demonstrated minimal pulmonary oedema. Assessment of his fluid balance over the previous five days showed a positive accumulation of approximately 7½ litres.

A standard regime for anuric patients was instituted (Ross, Edwards and Watson, 1961), the oral fluids being limited to 400 ml. daily in view of the positive cumulative fluid balance. The following day dialysis was performed to correct biochemical abnormalities (Fig. 1). Over the next three days left ventricular strain became evident on the electrocardiographic recordings and increasing pulmonary oedema was shown on the daily chest films. The patient became dyspnoeic and began to expectorate large amounts of frothy pink sputum. Basal crepitations and an apical gallop rhythm were heard. Treatment with digoxin, aminophylline and morphia produced some clinical improvement, but on the next day a chest X-ray showed considerable increase in the amount of pulmonary oedema. As an immediate measure, 400 ml. of blood was removed by venesection and the patient was then dialysed a second time for six hours. Ultrafiltration carried out by the Skeggs-Leonards artificial kidney (1948) was effective, as on the next day there was no clinical or radiological evidence of pulmonary oedema (Fig. 2). His apical gallop rhythm, however, persisted.

Two days after the second dialysis the patient's condition was unchanged, but that evening he drank 2 l. of fruit juice provided by an over-solicitous relative. Shortly afterwards severe dyspnoea developed and crepitations were audible throughout the chest. An X-ray of the chest showed gross pulmonary oedema. Venesection, morphine and aminophylline improved his condition slightly and a third dialysis was begun as

FIG. 1.—Clinical course of Case 1.

soon as possible to remove excess fluid. The blood pressure, which had risen to 240/110 mm. Hg from 160/90, was lowered by an Arfonad infusion (Trimetaphan). Shortly after the start of the dialysis 4 pt. of blood were removed from the artificial kidney tubing and replaced by 2 pt. of packed red cells. By the end of dialysis the packed cell volume had risen from 19% to 26% and the haemoglobin from 42% to 49%. Examination of the patient six hours after dialysis showed no clinical or radiological evidence of pulmonary oedema.

Four days later, 17 days after the ingestion of carbon tetrachloride, diuresis commenced. Subsequent progress was uneventful and he was discharged from hospital one month later with no apparent residual renal, pulmonary, cardiac or hepatic damage.

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a. Pre-dialysis.

b. Post-dialysis.

FIG. 2.—Pre- and post-dialysis. Chest X-rays, Case 1.

FIG. 3.—Clinical course of Case 2.

Case Report No. 2

An unmarried girl, aged 16 years, took five 8½-gr. tablets of mercuric chloride (2.84 g.) as an abortifacient. One hour elapsed before gastric lavage was performed at her local hospital. Treatment was started at once with dimercaprol (BAL) 100 mg. six-hourly. Three days later transfer to the Liverpool Renal Insufficiency Unit was arranged, as she was anuric and the blood urea was rising rapidly. Her general condition on admission was good and there were no abnormal signs in the pulmonary or cardiovascular systems. Assessment of her fluid balance over the previous three days showed a positive accumulation of about 3½ l. The uterus was enlarged, consistent with a 15-week-old pregnancy. Sigmoidoscopy demonstrated a few small petechial hæmorrhages on the colonic mucosa. The standard regime for uræmic patients was instituted, restricting the fluid intake to 400 ml. daily. Three days after admission symptoms of an impending abortion developed and an emergency hysterotomy was performed, removing a dead fœtus. This eliminated the danger of a spontaneous abortion occurring during dialysis, which might have resulted in a grave hæmorrhage. Two days after the hysterotomy dialysis was carried out, during which 500 ml. of blood was transfused. Forty-eight hours later pulmonary œdema rapidly developed, the patient becoming extremely dyspnoëic and cyanosed, expectorating large amounts of blood-stained frothy sputum. 480 ml. of blood was removed immediately by femoral artery puncture with rapid clinical improvement, but an X-ray of the chest taken shortly afterwards still showed clear evidence of pulmonary œdema. Dialysis was delayed at this time because the patient had developed melæna and the diuretic phase was commencing.

Two days later, however, dialysis became imperative because of increasing pulmonary œdema. A 4½-hour

dialysis produced an effective biochemical adjustment and ultrafiltration of excess fluid. A chest X-ray subsequent to this dialysis demonstrated no evidence of pulmonary oedema. Diuresis commenced 14 days after the ingestion of mercuric chloride and an uneventful recovery ensued.

Discussion

Pulmonary oedema complicating acute renal failure is subsequent to hypervolaemia produced by overhydration. Clinically, pulmonary oedema is recognised by tachypnoea, dyspnoea, cyanosis, the expectoration of frothy blood-stained sputum and the development of widespread crepitations throughout the lungs. The diagnosis may be confirmed by the characteristic radiological appearances. Both patients had initially developed an apical gallop rhythm and electrocardiographic evidence of left ventricular strain.

The initial treatment of pulmonary oedema is to allay anxiety, reduce pulmonary capillary pressure and increase alveolar oxygenation. Morphine, aminophylline and oxygen were used with some benefit. If, however, the pulmonary oedema is due to hypervolaemia following overhydration, the blood volume should be reduced directly. The rapid removal of blood by venesection or arterial puncture may be sufficient but this procedure exacerbates the anaemia which invariably develops in acute renal failure. Its application is therefore limited as the resulting severe anaemia impairs myocardial efficiency. The blood removed can be replaced by a smaller volume of packed cells in

order to prevent the development of severe anaemia but such an exchange transfusion carries with it the danger of producing potassium intoxication. It is, however, possible to perform an exchange transfusion during dialysis, as in the first case, when the danger of hyperkalaemia is averted by the immediate removal of excess potassium. Hypervolaemia can be effectively corrected by ultrafiltration with the artificial kidney.

We found that ultrafiltration is best effected by the Skeggs-Leonards Artificial Kidney if the pressure in the blood circuit is artificially elevated to about 160 to 180 mm. Hg. on the venous side and if the dialysing fluid pressure is reduced by limiting its flow to about 400 to 500 ml/min.

The value of Dimercaprol given early in mercury poisoning has been pointed out by Longcope and Leutscher (1949). Augustine (1956) has found that the ingestion of more than 1 g. of mercuric chloride is fatal in 50% of patients. The survival of Case 2 after taking 2.84 g. of mercuric chloride was thought to be due to the early administration of dimercaprol and the use of the artificial kidney in the treatment of the pulmonary oedema.

Summary

1. Survival of two cases of poisoning producing acute renal failure complicated by pulmonary oedema is presented.
2. The management of pulmonary oedema by conventional methods, exchange transfusion and the artificial kidney is described.

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CRISIS FOLLOWING CORTICOTROPHIN IN ADDISON'S DISEASE WITHOUT PIGMENTATION

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A PATIENT with Addison's disease developed a crisis during a diagnostic corticotrophin test. This, and the absence of oral and skin pigmentation, are sufficiently unusual to justify a brief report.

Case Report

A 33-year-old housewife was admitted to Crumpsall

Hospital in August 1962. She gave a six-month history of lassitude and of loss of one stone in weight, but menstrual periods had remained regular. In 1957 she had a thyroidectomy for hyperthyroidism when examination of the excised gland showed a nodular colloid goitre with scattered small lymphadenoid foci.

On admission: Blood pressure 80/60 mm. Hg. There