Medical Memoranda

Survival After Cardiac Arrest

The purpose of this report is to show that cardiac massage for cardiac arrest can be successfully carried out elsewhere than in a properly equipped hospital.

CASE REPORT

A primigravida aged 22 had been delivered normally at 41 weeks of a living male child by her own doctor in a nursing home at 10.20 a.m. on December 3, 1957, after a short labour of three and a half hours.

At 11.20 a.m. there was a sudden brisk blood loss of 40 oz. (1,140 ml.) while the placenta was still retained *in utero*. Obstetric aid was summoned. Ergometrine had not been given. On receipt of a call for assistance, 2 bottles of group O rhesus-negative blood and transfusion apparatus were taken to the nursing-home.

On arrival at 11.52 a.m. the patient was found to be pale and shocked, with a blood pressure of 86/50 mm. Hg. The foot of the bed was raised, ergometrine, 0.5 mg., was given intravenously and morphine, $\frac{1}{2}$ gr. (10 mg.) by hypodermic injection; blood was taken for grouping, and this was dispatched to a laboratory for urgent cross-matching.

Meanwhile a blood transfusion was set up in each arm and two bottles of unmatched group O rhesus-negative blood was given. By 12.55 p.m. her condition had improved considerably and a measured blood loss of 46 oz. (1,300 ml.) had been replaced by two bottles of blood. The pulse rate was now 80 a minute and the pulse pressure was good, but the blood pressure could not be taken as there was a drip set connected to each arm.

It was now learned that the patient's blood group was AB, rhesus not known, and two bottles of group A rhesus-negative blood had arrived from the laboratory.

As the placenta could not be removed by Brandt-Andrews technique, it was decided to remove it manually under anaesthesia. Atropine, 1/100 gr. (0.65 mg.) was given intravenously via the transfusion needle and a further $\frac{1}{2}$ gr. (10 mg.) of morphine was given hypodermically because the patient was restless.

Chloroform was administered by open mask at 1.30 p.m. but laryngeal spasm occurred almost immediately. The mask was therefore removed; the patient soon took a breath of air and started breathing again with a slight stridor. The mask was replaced and more chloroform was given to deepen the level of anaesthesia and to get the patient past this stage of excitation, but her pulse, which had been good, became thready and irregular. She became pale and cyanosed, and her heart stopped beating at 1.34 p.m.

Nikethamide, 2 ml., was given intramuscularly, but auscultation of the heart and palpation of the carotid arteries confirmed that the heart had stopped beating. The chest wall was therefore opened by an incision in the fifth left intercostal space through the skin, muscle, and parietal pleura, which did not bleed. The left lung immediately collapsed and exposed the heart, which was arrested in diastole. After squeezing the heart three times, it began to beat four minutes after cardiac arrest, but soon stopped again. Then 1 ml. of a 1 in 1,000 solution of adrenaline was injected into the heart muscle and further cardiac massage was carried out.

By 1.39 p.m. the heart was beating spontaneously at 108 a minute, but tended to fail as the patient was not breathing. At 1.40 p.m. artificial respiration was started by external chest compression; but its efficacy was doubtful, as the left lung had collapsed and the mediastinum had shifted over to the right. Means of intubation and inflation with oxygen were available, but in the heat of the moment these could not be found. Fortunately, the patient began

spontaneous deep respiration about eight minutes after cardiac arrest and the left lung began to flap in and out of the large chest wound.

The placenta was now removed manually without further anaesthesia, as the patient was quite unconscious. This brought the total measured blood loss to 3 pints (1,700 ml.), which had been replaced by three bottles of blood.

A further injection of ergometrine, 0.5 mg., was given intravenously before the hand was removed from the uterus and there was no more frank vaginal bleeding.

At 2.15 p.m. the hospital anaesthetist and surgeon on duty arrived at the nursing-home in answer to our urgent call. The patient was intubated and positive-pressure ventilation with oxygen was carried out while the chest wall was closed. At 2.55 p.m. the patient was transferred by ambulance to University College Hospital.

In hospital the chest wound was reopened without anaesthesia, the patient being inflated with oxygen through an endotracheal tube. The pericardium was incised to release any haematoma which might be present, but only a small quantity of straw-coloured fluid escaped; the pericardial wound was left open to drain, and a rubber tube was inserted into the base of the pleural cavity through a separate stab wound low down in the axillary line. This tube was connected up under water for siphonage to assist expansion of the left lung and to drain away pleural exudate.

The patient was returned to the ward unconscious, but just responding to painful stimuli. The respiratory rate was 40 a minute with an increased tidal volume; blood pressure was 170/90; limbs spastic, with very brisk tendon reflexes and bilateral extensor plantar responses. The endotracheal tube was removed and a Guedel airway was well tolerated. Tracheotomy was not performed.

Intravenous triple-strength plasma, started in the theatre, was continued in order to reduce the cerebral oedema resulting from the anoxic episode. Two bottles were given in two hours, followed in the next 24 hours by 300 ml. of sucrose 50% in four divided doses. Surface cooling, with ice packs to the exposed skin surface, was carried out to prevent hyperpyrexia resulting from the cerebral anoxia. The rectal temperature was maintained at 34-35° C. for seven days.

The Guedel airway was removed after eight hours. Consciousness was regained quite suddenly after 48 hours, and the patient began to speak and take food by mouth.

The only serious complication during the puerperium was a large right-sided pleural effusion which was treated by aspiration. Despite the unsterile cardiac massage, no infection occurred in her chest and the wound healed well.

The spasticity in her limbs gradually disappeared and by the ninth day all C.N.S. signs were completely normal and she was continent of both urine and faeces. She was walking well without assistance on the 14th day. An electroencephalogram taken on the 15th day revealed an abnormally slow dominant rhythm. She was seen by a psychiatrist on the 21st day, and, although he detected slight mental retardation, her parents declared that they could find no change in her personality.

COMMENT

Cardiac massage is feasible even when a patient is not in an operating theatre; there should be no hesitation in opening the chest when the heart beat has ceased.

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On June 1 the Ministry of Health took over from the Ministry of Agriculture, Fisheries, and Food responsibility for the production of vitamins A and D, hydrolysed proteins (used for intravenous therapy and other medical purposes), and magnesium glycerophosphate.