

Cardiac Arrest. A Report of Application of External Cardiac Massage on Three Patients

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ABSTRACT

Three patients who were resuscitated with external cardiac massage are reported, who recovered completely without any neurological damage. In all cases, cardiac and respiratory resuscitation was started not later than 2 minutes after arrest, respiration and heart beat returned within 7 minutes. Hypothermia was done in two cases after resuscitation to promote easier recovery. All cases recovered completely without any neurological damage or complications, thus showing a 100% survival rate. Closed cardiac massage proved to be effective in these cases of cardiac arrest.

Recently Kouwenhoven and his coworkers (1960) described a technique for cardiac massage without opening the chest. Now this method of resuscitation is widely used, because the technique is simple and requires no special training and equipment. Also, external massage can be instituted immediately after diagnosis. The fixation of the heart in the mediastinum and the flexibility of the chest wall in an unconscious patient permit effective massage of the heart by external compression. The sternum is compressed 60 to 90 times per minute with sufficient force to move it 3 to 5 cm. toward the vertebral column. Although this procedure provides some pul-

monary ventilation, it is not sufficient, and artificial respiration is necessary to maintain sufficient oxygenation (Baringer et al 1961). According to the report by Jude et al (1961), the survival rate after external cardiac massage in patients who developed cardiac arrest in the operating room was 64%, while in cardiac arrest developed outside the operating room, including terminal cases, it was 24%.

REPORT OF CASES

Case 1.

A 27-year-old housewife took 9 tablets of quinine sulfate to attempt artificial abortion at 7:00 A.M. on May 31, 1962. She was brought to the Severance Hospital Emergency Room at 10:20 A.M. complaining of headache and dizziness. At first she was conscious, but during gastric lavage, the heart beat and respiration stopped suddenly. One of us was called to the emergency room immediately. Mouth-to-mouth respiration was instituted, accompanied by external cardiac massage begun 2 minutes after the arrest. Then 3 cc. of 1:10,000 adrenalin solution were injected directly into the heart. Endotracheal intubation was carried out, and intermittent positive-pressure respiration was started. After 5 minutes, the heart beat appeared, together with spontaneous shallow respiration. Seven minutes later, the blood pressure returned to 120/75 mmHg. The

patient was moved to the recovery room, where hypothermia was carried out with ice bags, and assisted manual respiration was continued. In the recovery room, 5% D/W and oxygen were given continuously. Convulsions, which developed during hypothermia, were controlled with luminal. The patient became semiconscious 29 hours after the cardiac arrest. Three days after admission, she returned to a conscious state. She was discharged 6 days later without any neurological signs or symptoms and appeared entirely normal.

Case 2.

A 15-year-old boy was admitted on September 24 1962, to undergo iridectomy for leukoma cornea. After premedication with 100 mg of Seconal, 50 mg of Demerol and 0.4 mg of atropine sulfate, he was taken, one hour later, to the operating room, where anesthesia was induced with pentothal sodium and succinylcholine and he was intubated. Induction was smooth; anesthesia was maintained with ether and oxygen and respiration was controlled. About 5 minutes after induction of anesthesia, cardiac arrest developed suddenly. About 2 minutes later, external cardiac massage was started accompanied by intermittent positive-pressure respiration with 100% oxygen. After 4 minutes of external cardiac massage, spontaneous shallow respiration and heart beat started; the blood pressure returned to 120/80 mmHg. and the pulse rate to 120/min. The patient was moved to the recovery room, where hypothermia at approximately 34°C. to 35°C. was given for 23 hours. Tracheostomy was performed in the recovery room. The patient returned to a conscious state 3 days after cardiac arrest and showed no residual central nervous system damage.

Case 3.

A 3-year-old boy was admitted to the Pediatric Department on September 3, 1962 under the diagnosis of a Guillain Barré Syndrome. He had been well except for paralysis of the lower extremities for 4 days and then suddenly developed ascending paralysis. With the ascending paralysis, respiration ceased, causing cardiac arrest. Mouth-to-mouth respiration with external cardiac massage was begun immediately, continuing for 7 minutes on a bed which

had a fracture board under it. (Jude reported 1 to 5 minutes). Seven minutes after the start of external cardiac massage, artificial respiration by endotracheal tube was begun. Assisted respiration continued for 30 minutes, and finally the patient became semiconscious. Two hours later, this patient was transferred to another hospital to be put in to a respirator.

COMMENT

Cardiac arrest developed once in the emergency room, once in the operating room, and once in the ward. In all cases, cardiac arrest was diagnosed within 2 minutes, and artificial respiration, including mouth-to-mouth respiration accompanied by external cardiac massage, was instituted immediately. A cardiotonic drug was used in only one case. All cases responded well to external cardiac massage, and respiration and heart returned within 7 minutes. In all cases, no cardiac fibrillation developed during massage and there was no need to apply defibrillation. On all three occasions, external cardiac massage was stopped when the systolic blood pressure reached 120 mmHg. Rapid return of the heart beat and respiration was probably due to prompt institution of resuscitation and partly to the patient's good condition before cardiac arrest. In two cases, hypothermia was continued in the recovery room until the patient reacted to stimuli; it probably helped toward recovery. All patients recovered completely without any evidence of neurological damage. Morgan(1961) reported ruptured liver and Baringer et al (1961) reported cases of fractured ribs, hemothorax, hemopericardium, liver injury and bone marrow emboli as complication but in our cases no complication was encountered in any case, which we felt was due to gentle handling during cardiac massage.

In some cases, external cardiac massage is not sufficient for resuscitation, and internal cardiac massage is then necessary. Direct cardiac massage is indicated in the absence of an external defibrillator when cardiac fibrillation has developed or when adequate circulation cannot be maintained with external massage only. In cardiac arrest which develops

after severe blunt or penetrating trauma to the chest wall, direct cardiac massage is definitely indicated, because in these cases cardiac arrest may be due to tension pneumothorax, cardiac puncture, pericardial tamponade, or laceration of a major vessel. Direct massage is, of course, also indicated in cases where the cardiac arrest developed during thoracotomy. The survival rate after internal cardiac massage was 34.1% as reported by Cole, 28% by Stephenson and 17% by Turk and Glen. These rates are almost the same as that of external cardiac massage, which is

reported by Jude as being 24%,

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