Treatment of Cardiac Arrest by Closed Chest Massage*

Introduction

CLOSED CHEST compression of the heart is an effective method of restoring circulation following cardiac arrest. Simplicity makes this method a significant advance over cardiac massage through open thoracotomy. The purpose of this communication is to report four cases in which closed chest compression of the heart was carried out and to encourage familiarity with this technique.

Report of Cases

Case 1. C. W. (#192-830), a twelve year old colored female developed cardiac arrest while undergoing a minor procedure in a remote area of the Hospital (5 October 1960). For several reasons a long delay ensued and after an estimated nine minutes closed chest cardiac massage was begun. The heart beat was readily restored but there was early evidence of severe brain injury and despite institution of hypothermia this child died four days later, apparently as a result of central nervous system injury.

Case 2. J. L. (#179-412), a fourteen year old white male underwent surgical correction of severe mitral insufficiency on 2 November 1960. Despite a satisfactory repair, cardiac arrest occurred four hours after operation and closed chest massage was begun immediately. Good pulses were palpable while sternal compression was carried

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out and the effect of sternal compression on blood pressure was measured through an indwelling arterial catheter, strain gauge and recorder. Although this boy failed to survive, closed chest resuscitation was effective in restoring heart beat on several occasions.

Case 3. J. R. (#300-212), a 28 year old white female was prepared for bronchoscopy in the Outpatient Department on November 23, 1960. Following transtracheal injection of topical anesthetic agent the patient became cyanotic, respirations ceased and the peripheral pulse disappeared. Closed chest compression was immediately successful in restoring peripheral pulse and after a period of intratracheal respiration, administration of epinephrine, and hydrocortisone, the vital
signs returned to normal. The patient promptly regained consciousness and was discharged 24 hours later apparently entirely well.

Case 4. L. N. (#305-566), a 36 year old colored male was admitted to the Hospital on 8 December 1960, 33 hours following multiple gunshot wounds. After a few hours of preoperative preparation, laparotomy with repair of perforations of the bladder and multiple perforations of the small intestine was carried out. The patient's condition remained critical throughout the operative procedure and two hours following operation absence of pulse was noted in the recovery room. Closed chest resuscitation and endotracheal intubation were promptly carried out and heart beat was restored after a very few minutes of chest compression. The patient recovered consciousness slowly and although the postoperative period was stormy, his eventual recovery was satisfactory.

Discussion

The phenomenon of cardiac arrest is of interest to every physician. It is becoming more frequent in occurrence and remains a serious consideration in advising any procedure involving an anesthetic agent. The mechanism by which cardiac arrest occurs is unknown although the recently reported work of Porter and French may well lead to better understanding of this problem. Although considerable data has been accumulated regarding the situations in which cardiac arrest may be expected, the fact remains that cardiac arrest is a ubiquitous catastrophe.

The principles involved in the management of the patient in whom cardiac arrest occurs have been well established for many years. These include first, establishment of an airway and resumption of ventilation of the lungs and second, restoration of circulation. The long established method of restoring circulation has been manual massage of the heart through the open chest. It is well known that the heart beat can usually be restored after circulatory arrest but the limiting factor in survival of the patient is the extent of brain injury. Though subject to a number of variables, it is generally stated that if the circulation is arrested for longer than three to four minutes, fatal brain injury will occur. Obviously, any procedure which will permit rapid restoration of circulation without the necessity of performing open thoracotomy will represent a significant advance in technique. Closed chest compression of the heart appears to furnish an ideal solution to the problem of delaying treatment due to inadequate equipment or relatively untrained personnel. Although restoration of the circulation without opening the chest is not a new idea, great credit should be accorded Kouwenhoven, Jude, and Knickerbocker for their efforts in establishing an experimental and clinical basis for and describing a simple technique by which this can be accomplished. The technique described by these investigators involves placing the hands on the chest of the patient in the manner illustrated in Figure 1. Forceful compression of the chest in an antero-posterior direction with complete release of pressure at a rate of 60 to 90 per minute is begun as soon as the diagnosis of circulatory arrest is made. The criterion of adequate sternal compression is the ability to palpate a peripheral pulse during this maneuver. The following points should be emphasized.

1. The initial consideration in treating a patient after circulatory arrest is restoration of an airway. Closed chest compression produces some ventilation but this is inadequate for resuscitative purposes. Any readily available method of artificial ventilation is suitable.

2. The patient must be on a firm surface such as an operating room table or the floor. Closed chest resuscitation can not be carried out on a yielding surface.

3. Although this method is equally applicable to adults and children a great deal of force may be required in older patients and usually this will involve having the person applying resuscitation well above the patient.

4. The indications for the use of drugs are unchanged from those already existing.

5. In instances where the cardiac arrest is ventricular fibrillation rather than ven-
tricular standstill, electrical defibrillation will be necessary to restore heart beat. The diagnosis of ventricular fibrillation depends, of course, upon the electrocardiogram or direct visualization of the heart. External compression of the fibrillating heart will maintain circulation while the diagnosis is established and while defibrillating equipment is readied.

This method is simple and reliable. There seems to be little reason why it should not be instituted promptly and it is reasonable to promise that considerable improvement in the present mortality rates from cardiac arrest will be achieved with its widespread application.

Summary

1. Four patients with cardiac arrest and treatment with closed chest compression encountered in a single three month period are reported.

2. The technique of closed chest cardiac massage is simple and effective and its widespread use will almost certainly result in improvement in existing mortality rates in cardiac arrest.

REFERENCES


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ABSTRACTS

Inhibition of Vitamin B-12 Absorption by Bile

P. C. JOHNSON,* T. B. DRISCOLL** and W. L. HONSKA***
1. In the intact rat the presence of bile in the small intestine inhibits B₁₂ absorption.
2. The inhibitory effect of bile is prevented by simultaneous addition of rat gastric juice.

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The Effect of Amphotericin B on the Respiration of Cryptococcus

EVERETT R. RHODES* and HAROLD G. MUCHMORE**
Antibiotics Annual, 619-631, 1959-1960

Amphotericin B in concentrations of 1.0 to 10.0 ug./ml. will decrease the oxygen uptake of resting C. neoformans cells below endogenous levels. The increase of oxygen uptake produced by the addition of glucose to the resting cells is hindered by the presence of amphotericin B in the same concentrations.

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