



CASE REPORTS

Multiple Complications from External Cardiac Massage

Report of a Case

LAWRENCE H. COHN, M.D., and
WILLIAM J. SAYER, M.D., Menlo Park

CARDIAC MASSAGE by pressure on the outside of the chest is acclaimed as a simple and effective method of resuscitation⁵ and is receiving widespread endorsement and application.^{2,4,6,7} Infrequently, carrying out this procedure has caused rib fractures,^{1,2,4} fracture of the sternal body,^{2,4} hemothorax,^{1,4} hemo-pericardium, lacerations of the liver,^{1,2,4,6} rupture of the inferior vena cava near its junction with the right atrium,⁴ laceration of the spleen,² hemorrhage at the pulmonary hilum,² bone marrow embolization,^{1,4} rupture of the internal mammary vein,² and rupture of various abdominal or retroperitoneal blood vessels.²

The following experience illustrates the occurrence of the first six of these complications in a single patient, in whom laceration of the pulmonary parenchyma also was ascribed to the procedure.

REPORT OF A CASE

A 68-year-old white Italian-born married woman was admitted, comatose, to the emergency room of Sequoia Hospital at 1:45 p.m. on July 3, 1961. Three days before admission the patient had had severe precordial pain. Attributing it to "acute indigestion," she ingested baking soda and took a hot bath with some relief of symptoms. Medical care was not sought despite the entreaties of her husband. In the interim she had been free of significant pain until approximately an hour before hospital entry, when she collapsed while getting dressed.

Adequate past, social and family history could not be obtained, as the husband of the patient spoke very little English.

Upon physical examination the patient was observed to be cyanotic, comatose and breathing laboriously. The blood pressure was 132/78 mm. of mercury, the heart rate 112 and regular and respirations 30 per minute and labored. The heart sounds were only faintly audible and there were no murmurs.

From the Departments of Medicine, Stanford University School of Medicine, Palo Alto, and Sequoia Hospital, Redwood City.
Submitted September 20, 1962.

Oxygen, levarterenol bitartrate (Levophed®) and morphine sulfate were administered but the patient's condition worsened. The heart sounds became inaudible and the respirations ceased. Neither palpable pulse nor discernible blood pressure could be obtained 30 minutes after admission. An electrocardiogram revealed asystole.

Vigorous external massage was begun by the attending physicians and was continued unsuccessfully for approximately 30 minutes. The antemortem diagnosis was myocardial infarction, acute, fatal, with cardiac arrest.

Significant autopsy findings were limited to the thorax and abdomen. Anterior fractures of the left 3rd through 7th ribs and right 2nd through 8th ribs were noted. There was a recent transverse fracture of the upper portion of the body of the sternum. The pericardial cavity contained 100 cc. of recently clotted blood, the source of which appeared to be a tear in the inferior vena cava at the pericardial reflection. The heart weighed 480 grams. Generalized atherosclerosis of the coronary arteries was observed and the marginal branch of the circumflex artery was completely occluded by a fresh thrombus. There was an area, 2.5 cm. in diameter, of fresh anterolateral myocardial infarction of the left ventricle. The cardiac valves were within normal limits. The right pleural cavity contained 100 cc. of blood and the left pleural cavity 250 cc. There was a 2.5 cm. tear of the visceral pleura extending 8 mm. into the parenchyma of the anterior surface of the lower lobe of the left lung.

The peritoneal cavity contained about 1000 cc. of fresh blood. The liver weighed 2050 grams and along the edge there were several capsular tears at the margin of the right lower lobe and in the inferior portion of the quadrate lobe. These small tears extended into the underlying parenchyma and were the source of the peritoneal hemorrhage. The gallbladder contained numerous small mixed stones and slight mucosal cholesterosis was noted. There was no evidence of generalized bleeding.

DISCUSSION

The complications of external cardiac massage are caused either by excessive manipulative pressure or by improper anatomic application of resuscitative effort.⁴ The use of massive pressure is the probable cause of the rupture of the inferior vena cava and

vessels of lesser calibre. Pressure applied high on the sternum near the sternal angle can cause fracture of the body of the sternum, and pressure applied directly to the ribs may result in costal fractures. Force applied over the xiphoid process, epigastrium or lower thorax is the likely cause of hepatic or splenic injuries. The increased negative intrathoracic pressure which is created between compressions by the resultant expansion of the intact thorax is presumably the reason for bone marrow embolization from fracture sites to the pulmonary arteries.⁴

Prevention of complications from external cardiac massage can only be obtained by the application of appropriate pressure at the proper anatomical site—the inferior portion of the body of the sternum. As described by Kouwenhoven and Jude,⁵ appropriate pressure is that amount necessary to move the sternum 3 or 4 cm. toward the vertebral column. It is emphasized that the force sufficient to do this is influenced by two separate factors: the anatomical construction of the patient's chest and the strength of the person employing the procedure.

Slight pressure with one or two fingers will suffice in a newborn infant⁴ but in an adult, whose chest is less resilient, pressure with both hands in such a way that the pressure is transmitted through the heel of one, usually are required. The application of total body weight, recommended by some local heart association bulletins,⁶ can be avoided in the majority of cases, this extreme being necessary only when the thorax is extremely rigid. Undoubtedly, optimal use of external cardiac massage would include the least application of force at the proper site and the smallest excursion necessary to provide palpable pulsations in the carotid, femoral or brachial arteries that are accompanied by a reduction of the pupillary dilatation that accompanies cardiac asystole.⁶

The previous editorial comment,³ "A heavy hand on a frail chest is not without risk," might well be restated as, "A heavy hand improperly placed on a frail chest invites injury."

SUMMARY

In a case in which external cardiac massage was carried out, many complications reported in the literature occurred—multiple rib fractures, fracture of the sternum, hemothorax, hemopericardium, lacerations of the liver and rupture of the inferior vena cava near its junction with the right atrium. In addition a previously unmentioned complication, laceration of pulmonary parenchyma, was observed at autopsy.

The causes and prevention of complications from this procedure are discussed.

445 Burgess Drive, Menlo Park (Sayer).

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Jejunogastric Intussusception Following Subtotal Gastric Resection

ALEX GERBER, M.D., and
JACK J. PINSKY, M.D., Alhambra

RETROGRADE JEJUNOGASTRIC INTUSSUSCEPTION is a rare complication of gastroenterostomy or subtotal gastric resection. Irons⁵ reported the one hundredth case in the world literature in 1955, and a total of 26 cases reported in this country to 1959 were reviewed by Salem,⁷ who added a case of his own. In excellent reviews of this subject by Mason⁶ and Caudell³ it was pointed out that none of the reporting observers had seen more than two patients with this disease, and that the literature is made up almost exclusively of single case reports. The serious nature of this form of high intestinal obstruction with its uniformly fatal ending if untreated, and the almost universal delay in diagnosing this little-known condition prompts this single case report.

The clinical features of jejunogastric intussusception are classical, and the diagnosis, if thought of, can be made quickly and confirmed easily. In the cases reviewed by Foster⁴ he noted that the mortality was five times as high when operation was delayed beyond 48 hours from the onset of symptoms as it was when correction was carried out earlier. Unfortunately, the diagnosis has been established at autopsy in almost 30 per cent of the reported cases.

The earlier cases followed gastroenterostomy, but (understandably) in the more recent cases the precedent operation was gastric resection. Caudell³ attempted to settle the question of who first described this disease by naming it the Bozzi-Delfino-Steber syndrome. However, we agree with Caudell that an eponym is unnecessary for this medical rarity, and that the descriptive term jejunogastric intussusception has gained popular acceptance.

Shackman⁸ classified jejunogastric intussusception into three types: 1, Intussusception of the afferent loop; 2, Intussusception of the efferent loop (the most common type); and, 3, a combined afferent and efferent loop prolapse. Van Prohaska⁹ pointed out that only the type 2 efferent loop pro-

Submitted September 5, 1962.