

Liver rupture as a complication in cardiopulmonary resuscitation for cardiac arrest after vaginal hysterectomy

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Summary

Liver rupture is a rare, yet life-threatening complication of cardiopulmonary resuscitation. It occurs as a complication in 0.6-3% cases of cardiopulmonary resuscitation. Its early diagnostics and urgent surgical treatment is thus very important in order to prevent an undesired outcome for the patient. This paper presents diagnostics and treatment of liver rupture resulting as a complication of cardiopulmonary resuscitation (CPR) due to cardiac arrest in the early postoperative period after vaginal hysterectomy performed for uterine myomatosis in a 50-year-old patient.

Key words: Liver rupture; Cardiac arrest; Cardiopulmonary resuscitation; Vaginal hysterectomy.

Introduction

Cardiopulmonary resuscitation (CPR) is a set of emergency measures used to re-establish vital functions in a patient with cardiac arrest and/or respiratory arrest. The main aim of this procedure is to supply additional quantities of oxygen to the brain, heart, and other vital organs, while more complex medical procedures are used to establish adequate heart action and spontaneous respiration (breathing). One of the measures used in cardiopulmonary resuscitation is chest compressions. Compressions are performed on the lower half of the sternum. Compression frequency should be equal to 100-120/minute, while the depth of compression is adapted to body physique and age of the person being resuscitated. Pressure is exerted with sufficient strength to push the breastbone (sternum) at least 5 cm, but not more than 6 cm, in an average adult [1]. During reanimation, the chest compressions may cause complications such as breastbone and rib fractures, as well as injuries to parenchymal organs, i.e. rupture of spleen, liver, abdominal, and heart injuries.

CPR is a procedure used to re-establish vital functions and increase survival chances of a patient, but if performed incorrectly may lead to serious complications, followed by life-threatening hemorrhage that can cause death. Correct chest compression technique used in CPR reduces injuries and complications related to the procedure, making hand placement and pressure intensity during compression extremely significant in avoiding eventual complications.

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tion in 0.6-3% cases of cardiopulmonary resuscitation [2]. This paper presents diagnostics and treatment of liver rupture resulting as a complication of CPR due to cardiac arrest in the early postoperative period after vaginal hysterectomy performed because of fibroid uterus in a 50-year-old patient.

Case Report

A 50-year-old patient was admitted to the Clinic for surgical treatment of myomatous uterus. Medical history and relative medical data indicated that patient suffered from arterial hypertension, was regularly using anti-hypertension medications, and undergoing regular cardio checkups. Patient was surgically treated after adequate preoperative preparation performed according to current protocol. Operation started in regional anesthesia (spinal anesthesia) but after some 15 minutes patient had to be induced into general endotracheal anesthesia due to inadequate block. Vaginal hysterectomy with bilateral adnexectomy was performed. Patient handled anesthesia well and was awakened in the operating room. The early postoperative period was uneventful. In the morning hours of the first postoperative day upon returning to bed after first getting up, patient complained of severe chest pain and subsequently lost consciousness, became disпноic, then cyanotic, without a pulse in the magistral blood vessels, with dilated pupils non-reactive to light and accommodation. Reanimation was begun immediately. Heart massage was initiated. Patient was intubated, then defibrillated several times and sinus rhythm was established. Patient was put on mechanical ventilation of intermittent positive pressure ventilation (IPPV) type and advanced life support measures (ALS) were continued. Arterial pressure was maintained by using adrenaline. Heparin 5000 I.U. was administered as intravenous bolus and then continued as infusion of 25,000 I.U. Amiodaron 300 mg was administered intravenously and continued as 900 mg/24 hour mg in infusion. Intensive monitoring was per-

formed. Half hour after reanimation objective finding had shown that the abdomen was above the chest plane, distended, while the patient was distinctly pale. Urgent blood tests were performed: hemoglobin 85 g/l, hematocrit 26.2%, thrombocytes $170 \times 10^9/l$, leukocytes $19 \times 10^9/l$. Gas analysis indicated metabolic acidosis, pH 7.2, LAC 6.2 mmol/L, BE -16 mmol/L, and HCO_3^- 12.5 mmol/L. Ultrasonographic examination verified the presence of free abdominal fluid. Considering that the laboratory values showed deterioration and ultrasonographic findings showing presence of free fluid, urgent surgical treatment was ordered. Patient was introduced in the operating room with arterial pressure 75/45 mmHg and pulse rate 110 bpm. Ringer's solution was administered in a dose of 1,500 ml, fresh frozen plasma 950 ml, ten doses of thrombocytes, 14 doses of cryoprecipitate, vitamin K, tranexamic acid 2 grams, and 4 units of resuspended erythrocytes (total of 1,070 ml). Patient was induced in general endotracheal anesthesia. Presence of approximately 700 ml of blood was intraoperatively detected inside the abdomen. Ligatures from the previous surgery were explored and it was determined that hemostasis was correct. Liver exploration discovered a rupture between the right and the left lobe, which was sutured. The abdomen was rinsed several times with saline solution and fibrospun and surgicel were placed on the rupture. After that, a drain was introduced in right subhepatic space and another one in the Douglas pouch. Operative course was orderly. Patient endured anesthesia well. She was transferred to ICU on mechanical respiration type IPPV-a, arterial pressure 105/65, pulse 92/minute. In the later postoperative course, the patient was characterized by stable vital signs and good diuresis, without dopamine stimulation. Neurologist who was called for consult determined a normal neurological finding but ordered an endocranial CT scan because of previous events. That same day in the afternoon, control lab analyses were performed which showed a significant improvement. Hgb 119 g/L, Hct 35.6%, Plt $169 \times 10^9/l$, Wbc $12.61 \times 10^9/l$, Alt 3,631 J/L, LDH 4,801 J/L, UA 273 mmol/L, INR 1.03 seconds, fibrinogen 4.66 g/L, APTT 29 and 48, D-dimer 19, 29, and AT3 109. Cardiac-specific enzymes were also analyzed: CK 9.26 U/L, CKMB 82 U/L, and troponin 1,832 ng/ml. Continuous ECG monitoring indicated negative T in D3, AVF and V3. In the afternoon, the patient was extubated, conscious, well-oriented, and communicative. Due to ECG changes and elevated values of cardiac-specific enzymes, the patient was transferred to Cardiology Clinic for suspected acute myocardial infarction of inferolateral localization. Further diagnostics was performed according to a current protocol. Endocranial CT scan was performed with completely normal results. Chest X-ray was also normal. Multislice computed tomography (MSCT) of the pulmonary artery was also performed and pulmonary embolism was ruled out. Heart ultrasonographic exam showed good functioning of both heart ventricles. The diagnosis of acute myocardial infarction of posterolateral localization was confirmed. Patient reacted well to administered therapy (anticoagulant therapy, beta blockers, and ACE inhibitors). During hospitalization, no chest or any other discomforts were present. Surgical wound was dry and sutures were removed. Postoperative findings were normal. Patient was suggested antihypertensive and anticoagulative therapy and discharged from the clinic after eight days.

Discussion

Liver trauma during CPR are difficult and life-threatening injuries. They occur most frequently due to incorrect placement of the hands during compression. Most often the

left lobe of the liver is injured. It is considered to occur due to anatomical proximity of this lobe to the xiphoid process. Injuries to the right lobe have also been reported, yet the most frequent injuries occur at the medial line [3, 4]. It is considered that the length of time of compression does not increase the incidence of the injuries.

According to data by Meron *et al.*, the incidence of liver rupture occurring as a complication of CPR is equal to 0.6%, 73% in male patients and 27% in females. Complications are diagnosed after blood exams which in all patients show a drop in hematocrit, immediately calling for ultrasonographic exam, which in 88% of cases showed free intraperitoneal fluid. In the remaining 12% it was the case of subcapsular hepatic hematoma which was also diagnosed by ultrasonographic exam [5]. References show that a special problem is posed by subcapsular hematoma in the liver which, luckily, are extremely rare yet require urgent surgical treatment. Joseph *et al.* describe diagnostics and treatment of liver rupture due to subcapsular hematoma resulting from CPR complication in a 64-year-old patient caused by postoperative cardiac arrest after a surgery on ascending aorta. Subcapsular hematoma and consequent liver rupture were diagnosed intraoperatively i.e. by explorative laparotomy performed as an urgent procedure due to massive intra-abdominal hemorrhage expected to be a postoperative complication of surgical treatment of ascending aorta [6].

Fortunately, the incidence of liver trauma during CPR is low but the available data in references is also poor. Beydilli *et al.* describe two separate cases of liver rupture after CPR [1], while Camden and Carucci describe the diagnostics of intra-abdominal organ trauma by abdominal CT after CPR [7]. Rudinska *et al.* concluded that the injuries should be avoided if possible or distinguished from injuries of other origin if they cannot be prevented [8]. Liver injuries after cardiopulmonary resuscitation of patients after gynecological surgeries are extremely rare. This paper presents a case of a patient who suffered from myocardial infarction early in the postoperative period which led to cardiac arrest and need for urgent CPR in order to save patient's life; this led to an unexpected complication: liver rupture. Quick ultrasonographic evaluation assisted in discovering the presence of free fluid (blood) in the abdomen and urgent surgical treatment saved patient's life.

Conclusion

Intra-abdominal injuries are rare complications of CPR, making their diagnostics a serious and difficult task which requires careful and intensive clinical evaluation. Routine ultrasonographic evaluation of the abdomen after CPR is still not standard procedure, but the analysis of data from available references and descriptions of individual cases of liver rupture after CPR indicates that routine exam of the intactness of chest wall, abdomen, and parenchymal organs

after each CPR procedure is necessary for the early detection of potential complications and should be introduced as standard procedure after each CPR.

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