Penetrating wound of the heart manifested with peripheral embolism – case report

Ustrelna povreda srca manifestovana perifernom embolijom


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Abstract

Introduction. Heart injuries can be classified as penetrating and non-penetrating (blunt). Penetrating wounds are usually caused by stabbing with a piercing object, weapon or projectiles – missiles. The right atrium is damaged in most cases, because of its anatomical position – making the most of the anterior side of the heart. Morbidity caused by stabbing injuries to the heart is 20%–30%, while piercing wounds cause 30%–60% of deaths.

Case report. A 28-year-old patient was admitted to our clinic with acute ischemia of the extremities. Angiography revealed a bullet in the right common femoral artery, occluding it. The patient denied having any piercing or shooting wound to his leg, but he said that four years before he had been shot to his chest. Echocardiography revealed an atrial septal defect of secondary type. An event reconstruction revealed that, four years after shooting, the bullet was displaced from the heart to the right common femoral artery.

Conclusion. This case report is unique because of the rare type of injury, time that passed from the injury, the way bullet entered the artery (via atrial septal defect) and especially the success of both surgical procedures (embolectomy and repair of atrial septal defect).

Key words: wounds, penetrating; embolism, paradoxical; heart septal defects; leg; diagnosis; embolectomy; treatment outcome.

Introduction

Heart trauma presents one of the most serious and often fatal conditions in cardiac surgery. The first heart trauma described was by the Egyptians 5,000 years ago in the Edwin Smith Surgical Papyrus. Heart injuries had always and still do present a great challenge for surgeons and other doctors.

The number of heart injuries has grown widely over the years mainly due to the growing number of traffic and industry accidents, increased violence with the use of fire weapons. The frequent use of invasive cardiology procedures
in every day clinical practice has also led to the increased number of heart injuries. In the USA, heart injuries became the third cause of overall mortality, after malignant and cardiovascular diseases, about 30,000 people die every year due to injuries of the heart and large blood vessels, which accounts for 25% of all deadly injuries 2, and nearly 10% of these die from the penetrating heart injuries 3.

The first successful suture of the stabbing wound of the heart was performed in Germany by Billroth’s assistant L. Rhen in 1896, while the first successful treatment of the heart wound in the USA was performed by Hill in 1902 4, 5.

Case report

A 28-year-old patient was admitted to our clinic with the acute ischemia of the right leg. He complained of pain, loss of motor activity and sensibility, which developed suddenly few hours prior to admission. Clinical evaluation revealed a cold, pulseless leg, with the loss of motor activity and sensibility. A pedal pulse, as well as popliteal and femoral pulse, could not be palpated. Cardiac examination showed no atrial fibrillation, personal history did not reveal any cardiac morbidity.

Due to unknown etiology of ischemia, angiography was indicated, which revealed a bullet in the right common femoral artery (Figure 1). There was no penetrating bullet wound of the leg. The patient said that he had been wounded four years ago at the battlefield, that is, he had been shot by a sniper to the right side of the chest. He was then admitted to the army hospital and treated for the right hemothorax, which was subsequently drained. During his hospitalization, the chest x-ray disclosed the bullet (Figure 2). After the drainage of the hemothorax, patient was feeling well and discharged. Now, four years after the shooting, he was admitted for the acute ischemia of the right leg, and an angiography revealed a bullet in the right common femoral artery. By the time-event reconstruction we concluded that the bullet entered the brachiocephalic vein, and then reached the right atrium through the superior vein cava. The transthoracic echocardiography showed the atrial septal defect type secundum, so it was evident that the bullet passed through the atrial septal defect, entered the left heart and was dislodged to the right common femoral artery. The bullet was in the heart 4 years before and it caused paradoxal embolization of the right common femoral artery.

Following admission, surgical embolectomy of the bullet from the right common femoral artery was performed, and 10 days after embolectomy, an atrial septal defect was repaired on-pump using the patch technique. The recovery was uneventful and the patient was discharged.

Discussion

The incidence of heart trauma has increased eight times in the past 30 years. About 70% of penetrating injuries are caused by stabbing, out of which 11% are alive at the arrival to hospital. The use of firearms is the cause of 30% of heart injuries, and about 40% of gunshot wound victims come to hospital alive 1, 4–6. Due to the anatomical position of the heart, penetrating injury affects the right ventricle in 40%–45% of patients, the left ventricle in 30%–35%, the right atrium in 15% and the left atrium in 5% 3.

Clinical presentation of penetrating heart injuries includes hypovolemia due to bleeding and sings of cardiac tamponade (hypotension, elevated central venous pressure and muffled heart sounds) 7. Some of the patients with penetrating injuries do not have symptoms that point to cardiac involvement 8, especially when patients are as young as our patient was, doctors do not consider the possibility of a heart problem. Therefore, prompt and adequate diagnostics and surgical intervention are essential. Preoperative diagnostics depends on hemodynamic stability of the patient, i.e. ade-
quate diagnostics is possible only in hemodynamically stable patients, while unstable patients, with growing hemothorax, heart tamponade, or active bleeding require urgent thoracotomy or medial sternotomy. Echocardiography, as fast, accurate and noninvasive procedure, is essential in early diagnosis and evaluation of heart injury, while heart catheterization is a valuable but time-consuming diagnostic tool, and is not necessary in the initial phase of the heart injury diagnostics. In this case report, leg ischemia of unknown etiology led us to perform angiography, which revealed the true cause of the problem – bullet in the artery, and then with the time-event reconstruction and performed echocardiography examination we were able to successfully establish proper order of events which led to this complication and its successful treatment. We think that echocardiographic examination is necessary not only in all stable patients with heart injuries in initial assessment and planning further management, but also in patients with chest trauma as signs of heart injury might not be visible at the beginning.

Foreign body embolization is a rare complication of penetrating wounds with bullets being the commonest of them. A bullet accesses the vessel lumen either by direct propulsion or by erosion of vessel wall. Arterial bullet emboli are four times more frequent than venous. All this emphasizes the rare nature of our patient who had embolization from the brachiocephalic vein through the superior vena cava to the right atrium and then paradoxical embolization through atrial septal defect. By now only a few similar cases have been reported in the literature.

Conclusion

This case report is unique because of the rare type of injury and a long interval (four years) from the injury to paradoxical embolism and surgical treatment. A bullet embolus should be suspected in any patient who has a gunshot wound without an exit wound. If by any chance the shooter had been closer to the target – our patient – or if the bullet’s caliber had been bigger or the bullet had entered at a different angle, this wound would have been fatal. Fortunately, all these unusual circumstances were in favor of the presented patient and helped him survive.

REFERENCES
