



Intracardiac foreign bodies: Diagnosis and management

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Abstract

Introduction: As a result of gunshot wounds due to a bullet or shrapnel entering the system of arteries or veins, direct wounds of the heart or vascular structures, as well as embolisms may occur. After entering one of the systemic veins, the bullet or shrapnel can enter the right heart or the pulmonary artery. Shrapnel embolism is a rare condition, usually asymptomatic and is detected accidentally during routine examinations. Due to the fact that the intensity of occurrence of this type of cases is quite rare, it was decided to present such clinical cases.

Material and methods: This article reports about 3 patients with intracardiac foreign body. All 3 patients took part in the battles during the Second Karabakh War and were hospitalized as a result of shrapnel wounds received in different parts of the body. In each of the patients, the lesion area was different, but as a result of venous migration, the movement of a foreign body (metal fragment) in the heart cavity was noted. In two patients, the foreign body was removed by open surgery (connection to a heart-lung machine) due to the presence of symptoms, but one patient was under observation due to the absence of symptoms.

Results: Bullet or shrapnel embolism is a very rare complication of gunshot wounds, occurring in about 0.3% of cases. These emboli often cause antegrade migration into the arterial system. However, in about 20% of cases, migration into the venous system can also occur. Venous embolism often results in foreign body migration into the right heart or the pulmonary artery. The diagnosis in these cases is often established by chance, but in some cases, arrhythmias and valve defects can occur due to exposure to a foreign body. The identification of such cases depends on the symptoms. A foreign body can be removed by an open method, as well as by invasive methods. In some cases, it is possible to keep the foreign body under control when it does not cause any symptoms.

In the clinical cases we mentioned, we also mentioned the management of cases of foreign bodies entering the venous system from peripheral zones of penetration.

Key words: cardiac trauma, intracardiac foreign body, foreign body migration

Introduction

The presence of foreign bodies in the heart resulting from migration is extremely rare, and there are very few reports on this. These foreign bodies can enter the heart either due to direct penetration during trauma or through intravenous migration during medical procedures. Foreign bodies typically found within the heart's cavities include bullet or splinter particles. Parts of the catheter or needle that have entered the venous system can also migrate and get into the cavities of the heart. The most

widely used examination methods for detecting foreign bodies are X-ray examination methods [1]. Furthermore, more detailed information about cardiac foreign bodies can be obtained through computed tomography and echocardiography studies. This article presents information about cases of intracardiac foreign bodies that arose during the Second Karabakh War, which took place between September 27, 2020 and November 10, 2020. Timely diagnosis and appropriate treatment measures for such cases in wartime conditions are mentioned here.

Case presentation 1

The first clinical case relates to a 19-year-old patient who received multiple injuries as a result of a mine explosion in October 2020. So, after initial interventions, the patient was taken to the nearest medical center, and then transferred to a military hospital. A few days later, the patient was sent home to recover. According to the patient, about 5-6 days after the injury, there were minor pains and discomfort in the heart area. However, after about 2 months, his complaints intensified, arrhythmias began to be noted. For this reason, the patient was re-hospitalized and examinations were started.

During CT examination, a small metal shrapnel was found on the pericardium at the bottom right in the region of the cardiodiaphragmatic sinus (Figure 1). However, the exact localization of the shrapnel in the metal artifact has not been established. In addition, three small metal shrapnel were found on the right in the area of the shoulder joint.

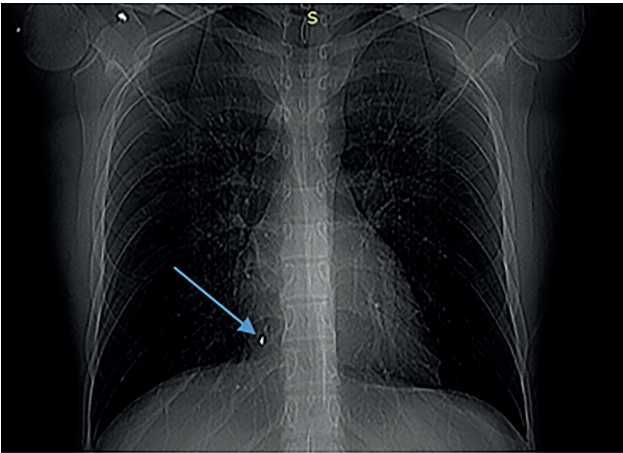


Figure 1 - Computed tomography showing a foreign body (indicated by a blue arrow).

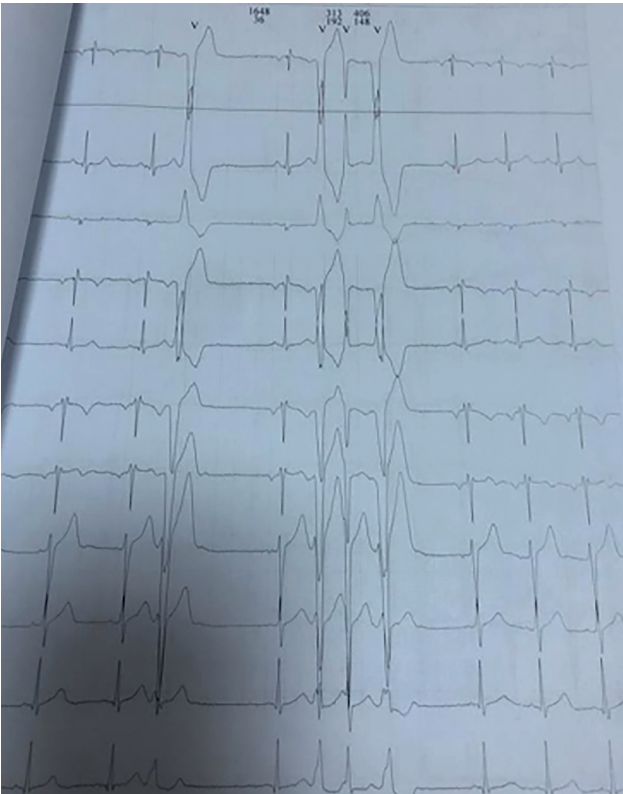


Figure 2 - Results of Holter examination of the patient (ventricular extrasystoles are noted, approximately 9-10 times per minute).

Since the patient had arrhythmias, a 24-hour Holter apparatus was connected and the presence of ventricular extrasystoles was determined approximately 9-10 times per minute (Figure 2).

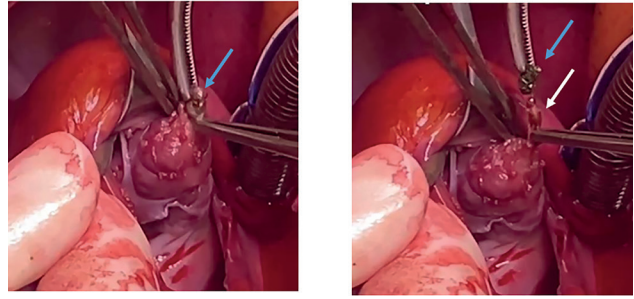


Figure 3 - Removal of an encapsulated foreign body in the right ventricle during surgery. A foreign body is indicated by a blue arrow. (A capsule with a foreign body is indicated by a white arrow).

Because of the patient's severe symptoms, the decision was made to surgically remove the foreign body. In order to avoid migration cases that may occur during the operation, it is considered advisable to perform the operation in a hybrid operating room. Median sternotomy was performed and the pericardium was examined, but no foreign body of the pericardium was found. For this reason, the heart was stopped and a right atriotomy was performed after appropriate aortic-bicaval cannulation.

During the examination of the right ventricle, an encapsulated metal shrapnel was found and removed behind the tricuspid valve flaps (Figure 3). The patient was discharged home in satisfactory condition, no complaints have been recorded yet.

Case presentation 2

The 25-year-old patient received numerous bodily injuries as a result of a mine explosion in battles during the Second Karabakh War and was hospitalized. During a CT scan of the patient, 2 shrapnel were found, one in the suprarenal region and the other around the heart. The patient underwent an X-ray examination in order to accurately determine the localization of the shrapnel (Figure 4) and it was found that the shrapnel is located inside the cavities of the heart due to the movement of the shrapnel along with the heart. In connection with the patient's complaints of rhythm disturbance, pain and discomfort in the chest, an open-heart operation with the removal of a shrapnel was planned. The operation was successfully performed, and the patient was discharged home in a state of recovery. To date, no complications have been noted in the patient.

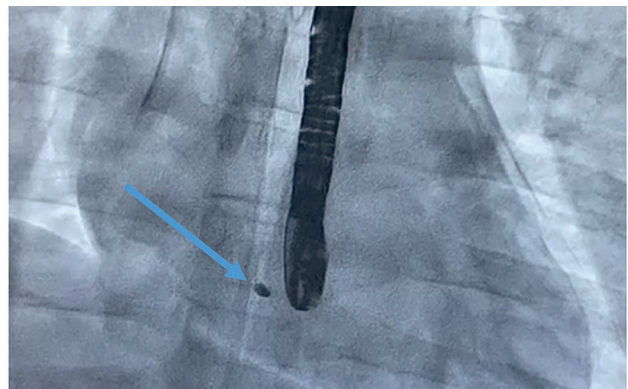


Figure 4 - An X-ray examination revealed a foreign body (indicated by a blue arrow).

Case presentation 3

A 30-year-old patient was hospitalized due to multiple injuries as a result of a mine explosion on the eve of the end of the Second Karabakh War (November 2020). Shrapnel wounds were found on many parts of the body, including the lower limbs and back. Initially, the patient was shown the necessary interventions, and the patient was sent home in a satisfactory condition.

Approximately 25 days after the injury, during a follow-up echocardiographic examination, suspicion arose regarding a foreign body (metal shrapnel) in the right ventricle of the heart. An X-ray examination of the patient was performed to determine the localization of the shrapnel (Figure 5). During the examination, it was confirmed that the metal shrapnel was inside the heart. In addition, foreign bodies were found in other parts of the patient's body (Figure 6). A decision was made to observe the patient due to the absence of complaints in the anamnesis, and also due to the fact that no pathology was detected during echocardiography and Holter examination.

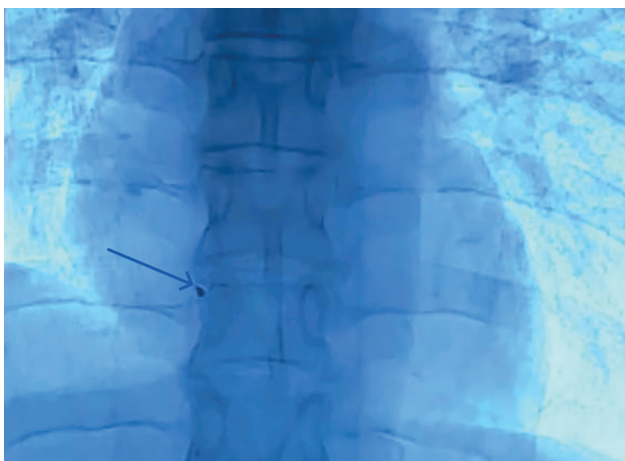


Figure 5 - X-ray examination shows a foreign body corresponding to the projection of the right ventricle of the heart (indicated by a blue arrow).



Figure 6 - X-ray examination shows a foreign body (metal shrapnel) in the right part of the chest (indicated by a blue arrow).

Discussion and conclusions

Bullet or shrapnel embolisms are rare complications of gunshot wounds and occur in 0.3% of cases [2]. Embolisms in most cases form anterograde migration in the arterial system, and in 20% of cases are detected in the venous system [3]. In 120 cases of venous embolism reported between 1900 and 1990, 83%

of foreign bodies migrated to the right heart or the pulmonary artery, and only 4% remained in the peripheral veins [4].

As mentioned above, foreign bodies enter the heart as a result of direct penetration or as a result of migration into the venous system [5,6].

Patients with direct heart injuries are typically in critical condition. These patients may experience complications such as pericarditis, pulmonary or systemic embolization, arrhythmia, local infections, the formation of blood clots around a foreign body and local erosion of the surrounding bronchi or intracardiac structures [7,8].

Although X-ray and tomographic examinations are effective in these cases, echocardiographic examination is one of the most important methods of examination in determining the localization of intracardiac foreign bodies, as well as in determining the subsequent stages of treatment [9]. In such cases, a hyperechoic image is detected during ECHO examinations.

Treatment tactics in these patients varies depending on the size of the foreign body, its localization in the heart, the risk of infection, the risk of systemic embolization and the presence of arrhythmia. In some cases, surgical or transcatheter removal of the fragment may be required in these patients, and in asymptomatic patients, intervention may not be required.

The widely used mechanism of approach to the choice of therapeutic tactics is as follows [10]:

1. Symptomatic foreign bodies (if they cause infectious complications, arrhythmias or neurological problems) should be removed regardless of their localization.
2. It is necessary to remove foreign bodies that cause hemodynamic disorders, damage to intracardiac structures or serious problems with valves.
3. Asymptomatic foreign bodies should be removed if they are detected shortly after injury and it is suspected that they cause infectious complications, systemic embolization or erosion.
4. Asymptomatic cases of foreign bodies with a low probability of additional complications can be managed conservatively. This is especially true in cases where a foreign body has penetrated deeply into the myocardium or pericardium.

Conclusion

Our article reports about 3 patients with intracardiac foreign bodies. Each of these patients was offered an appropriate approach to the indicated therapeutic tactics. Thus, in 2 patients, due to the fact that an intracardiac foreign body caused critical symptoms, a surgical operation was performed and the foreign body was removed. In the postoperative period, both patients were treated with double antibiotic therapy, and after removal of a foreign body during surgery, the area was washed with antibiotic solutions. No complications were noted during the postoperative examination of each of these patients. Since the intracardiac foreign body in another patient did not cause any symptoms during the clinical and instrumental examination, it was decided not to remove the foreign body and leave the patient under observation.

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