


# Right ventricle injury without tamponade symptoms with massive haematoma in anterior mediastinum as a result of stabbing – case report

Rana kłuta prawej komory bez objawów tamponady, z masywnym krwiakiem śródpiersia przedniego w wyniku dźgnięcia nożem – opis przypadku

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## Abstract

**Introduction.** Heart injuries can be divided into penetrating and blunt traumas. Penetrating injuries most often result from stabbing or gunshot wounds and typically involve the right ventricle of the heart. Most heart injuries carry serious life-threatening complications, such as cardiac tamponade and cardiogenic shock. Even though the wound may be small, it can have significant consequences. The following report presents a case of a patient with a right ventricle heart injury following a stab wound to the chest.

**Case report.** A 46-year-old patient, under the influence of alcohol, was admitted to the Emergency Department after being stabbed in the anterior chest wall. An urgent contrast-enhanced computed tomography (CT) of the head and chest was performed, which revealed a massive haematoma in the anterior mediastinum with a small amount of blood in the pericardial sac. The CT of the head showed no intracranial bleeding. Despite the absence of cardiac tamponade symptoms, the patient was scheduled for immediate cardiothoracic surgery. After a sternotomy and the opening of the pericardial sac, a hole in the pericardial sac was noticed. The pericardial sac was then opened, and 150 ml of blood was aspirated. The penetrating wound in the right ventricle of the heart was sutured with 5.0 stitches and backing material. Following the surgery, the patient was transferred to the cardiothoracic intensive care unit for further management. During the stay in the unit, the patient remained haemodynamically stable and had good respiratory function. Consultations with psychiatry and neurology were ordered. After two weeks of hospitalization, the patient was discharged home with appropriate recommendations.

**Discussion and Conclusion.** The cause of the injury was a stab wound from a knife attack. Mortality from heart injuries is high, especially in the case of stabbing wounds. However, prompt surgical intervention significantly reduces mortality and increases the patient's chances of survival. In the presented case, the absence of cardiac tamponade was remarkable, likely due to the perforation of the pericardial sac and the blood draining into the anterior mediastinum, as evident in the CT scans. This clinical scenario did not lead to haemodynamic instability in the patient. Despite the lack of typical signs of penetrating heart injuries causing cardiac tamponade, the swift surgical procedure to assess the depth of the penetrating wound and the subsequent repair saved the patient's life.

Key words: cardiac trauma, cardiac tamponade

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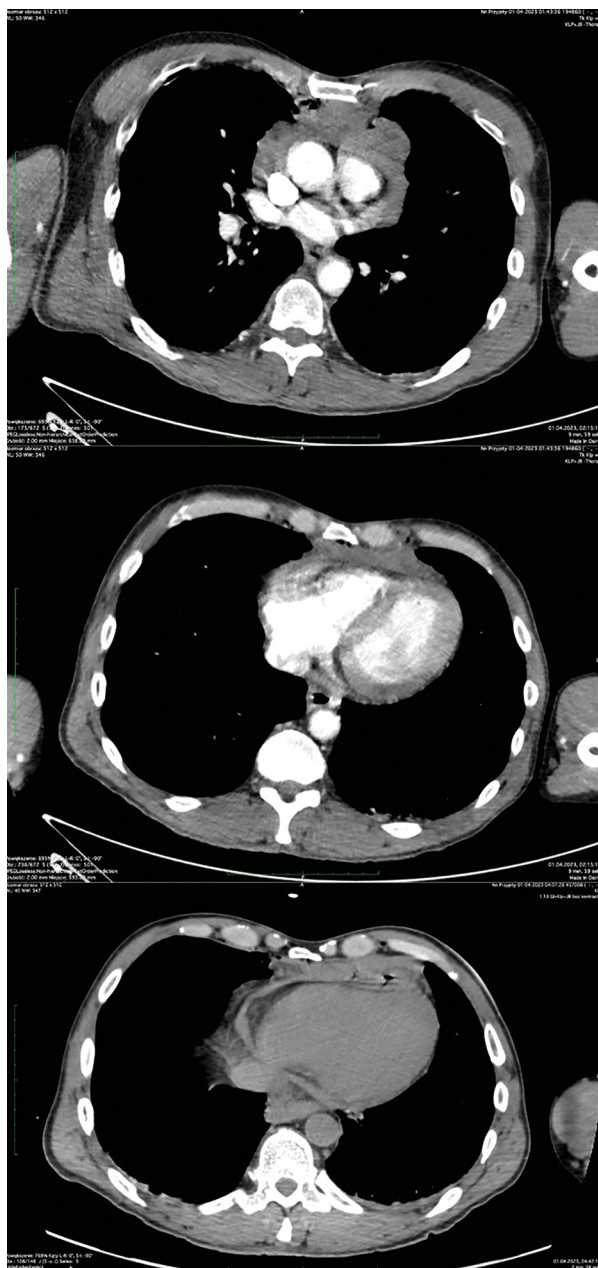


Figure 1.

## Background

Penetrating heart injuries are rare and represent only a small percentage of all penetrating traumas. The actual frequency of such injuries is difficult to estimate, and different centres report different statistics [1]. The first successful surgical intervention for heart trauma was performed by Ludwig Rehn in 1896. He did so against public opinion that believed the heart should not be operated on [2]. Since then, significant progress has been made in

medicine. The development of cardiothoracic surgery has enabled thousands of successful life-saving operations, yet stabbing heart injuries are still associated with high mortality. A key role in improving the treatment outcomes for these critical patients is played by rapid transport to the nearest hospital, swift diagnosis, and competent and expedited surgical intervention. In the case of patients with a stabbing heart injury, the time from the trauma to the start of the surgery is incredibly important, and any delay can increase the risk of mortality [3, 4]. Here, the report describes the situation of a 46-year-old man who suffered a stab wound to the chest, leading to sudden cardiac arrest (SCA) and damage to the right ventricle of the heart. After a swift diagnosis, the patient was immediately scheduled for surgery.

## Case report

A 46-year-old was brought to the emergency room after a brawl in which he was stabbed. The stab wound, measuring 1.5 cm, was located in the 5th intercostal space along the left sternal border. A cardiac arrest occurred at the scene of the incident, probably due to low blood pressure. The heart rhythm was restored by the resuscitation team. In the medical history of the ambulance team, no ventricular fibrillation or ventricular tachycardia was noted. The ECG on admission showed sinus rhythm without changes in the ST-T segment. To assess for other injuries, a computed tomography (CT) scan of the head and chest was performed (Figure 1). This examination revealed a haematoma in the anterior mediastinum. The patient was immediately scheduled for surgery. Under conditions of complete asepsis and after general anaesthesia, a median sternotomy was performed. Upon opening the pericardial sac, a massive haematoma was observed in the anterior mediastinum overlying the heart (Figure 2). After aspirating approximately 150 ml of fluid, damage to the right ventricular muscle was evident (Figure 3). The surgery was performed on the beating heart. After ensuring adequate haemostasis, the muscle was sutured with non-absorbable 5.0 stitches using a pericardial patch (Figure 4a). To improve haemostasis, tissue sealing, and reinforce the sutures, Tachosil was applied (Figure 4b).

The pericardial sac was closed with a continuous suture. Two drains were placed in the mediastinum, and one was inserted into the left pleural cavity. The patient's sternum was closed in a standard manner, using a gentamicin-soaked sponge. The patient received a transfusion of 3 units of blood. The patient was transferred to the Clinical Cardiac Intensive Care Unit (CCICU) for further treatment, and then subsequently moved to the Cardiac Surgery Department. Appropriate antibiotic therapy and antipsychotic treatment were administered. During the stay in the Cardiac Surgery Department, the patient remained haemodynamically

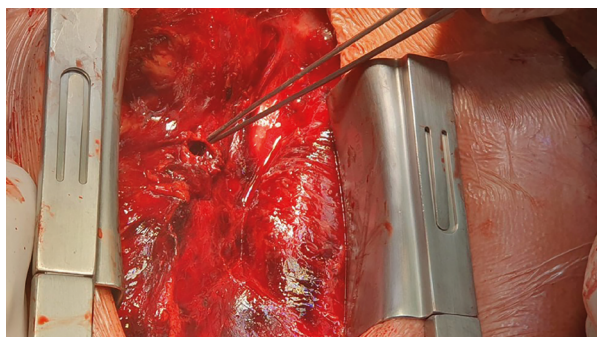


Figure 2.

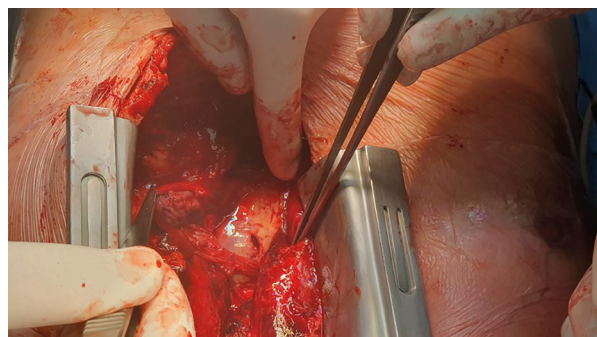


Figure 3.

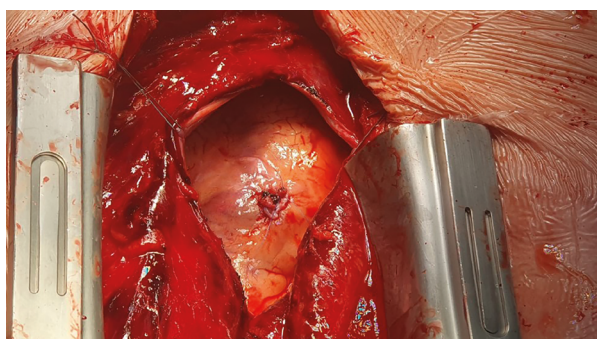
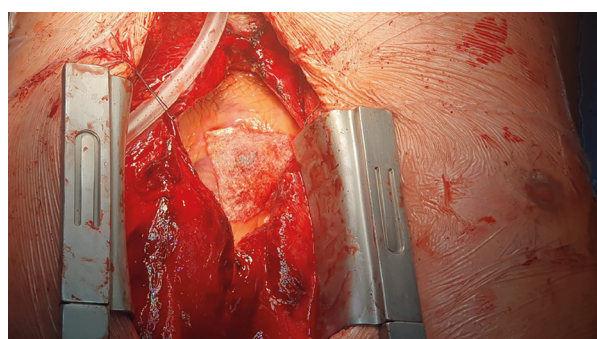


Figure 4.



stable and had good respiratory function. Due to disturbances in consciousness, a neurological consultation was performed. The patient was conscious, and able to introduce themselves but had limited verbal communication. No limb weakness was observed, and there were no signs of intracranial bleeding. Specific neurological recommendations were not prescribed. While walking, the patient denied chest pain symptoms. Subsequently, the patient was transferred to the Rehabilitation Department and was discharged upon their request.

## Discussion

Cardiac injuries can be divided into two groups: blunt injuries, resulting from sudden high-speed deceleration, such as motor vehicle accidents or falls from heights, and penetrating injuries, caused by stab wounds from knife attacks, as in the present case [5]. Stab wounds to the heart are severe, life-threatening injuries, most commonly caused by knife wounds, with less frequent use of screwdrivers or ice picks [6]. Another cause of cardiac penetrating injuries can be rib or sternum fractures [6]. The literature reports that 50–81% of patients with cardiac injuries die shortly after the trauma before reaching any medical facility [7]. Hence,

rapid transport to a trauma centre with appropriately qualified medical personnel capable of surgically managing such injuries is crucial. Penetrating injuries can lead to conditions such as hypovolemia, tension pneumothorax, or cardiac tamponade. Key clinical symptoms in patients with cardiac tamponade are hypotension, jugular vein distention, and muffled heart sounds (Beck's triad). In this case, the patient did not exhibit any typical symptoms; nevertheless, routine CT scans of the head and chest were performed. After a stabbing injury to the chest, cardiac tamponade can often be observed, and the chosen treatment method is drainage. Typically, after penetrating chest trauma, cardiac tamponade can be observed, and the treatment method is drainage. This is an effective technique in approximately 90% of penetrating chest trauma cases; the remaining cases require surgical intervention [8]. In the present case, the CT scan revealed bleeding in the anterior mediastinum with a small amount of blood in the pericardial sac. Despite the absence of cardiac tamponade symptoms and the small amount of blood in the pericardial sac, a decision was made to perform a surgical procedure to verify the depth of the wound. It revealed a perforation in the pericardial sac, explaining why the patient remained haemodynamically stable. Due to the performed activity, it was possible

to save the patient's life. The most frequently damaged cardiac structures in such injuries are the right ventricle, less commonly the left ventricle, or multiple chamber involvement. This is likely due to the anatomical position and greater exposure of the right ventricle, considering the axis rotation of the heart [9]. The right ventricle, as it occupies a larger portion of the anterior heart surface, is the chamber most vulnerable to penetrating injuries. The estimated relative frequency is 43% for the right ventricle and 34% for the left ventricle [10].

## Conclusions

In the presented case, the patient experienced a penetrating heart injury, which typically involves the occurrence of symptomatic cardiac tamponade. This was caused by the perforation of the pericardial sac and the accumulation of blood in the anterior mediastinum, as observed in the CT scan. Swift surgical intervention was crucial in verifying the depth of the penetrating wound, allowing for an accurate diagnosis of the injury and its surgical management, ultimately saving the patient's life.

## Streszczenie

**Wstęp.** Urazy serca można podzielić na penetracyjne i tępe. Urazy penetracyjne występują najczęściej w wyniku ran kłutych lub postrzałowych i najczęściej dotyczą prawej komory serca. Większość urazów serca niesie za sobą poważne komplikacje zagrażające życiu, takie jak tamponada serca i wstrząs kardiogeny. Pomimo tego, że rana jest niewielka, może mieć poważne konsekwencje. Przedstawiamy raport przypadku pacjenta z urazem prawej komory serca po ranie kłutej klatki piersiowej.

**Opis przypadku.** 46-letni pacjent, będący pod wpływem alkoholu, został przyjęty na SOR po dźgnięciu nożem w przednią ścianę klatki piersiowej. Wykonano pilną tomografię głowy i klatki piersiowej z kontrastem, która wykazała masywne krwiaki w przednim śródpiersiu z nieznaczną ilością krwi w worku osierdziowym. TK głowy nie wykazało żadnego krwotoku śródczaszkowego. Pomimo braku objawów tamponady pacjent został zakwalifikowany do natychmiastowej operacji kardiochirurgicznej. Po sternotomii i wypreparowaniu worka osierdziowego z masywnego krwiaka zauważono dziurę w worku osierdziowym. Następnie otwarto worek osierdziowy, z którego odessano 150 ml krwi. Rana penetrująca prawej komory serca została zszyta szwami 5.0 z podkładekami. Po operacji przetransportowano pacjenta na oddział intensywnej terapii kardiochirurgicznej w celu kontynuacji leczenia. Podczas pobytu na oddziale chory był stabilny krążeniowo i wydolny oddechowo. Zlecono konsultacje psychiatryczną i neurologiczną. Po dwóch tygodniach pobytu w szpitalu pacjent został wypisany do domu z zaleceniami.

**Dyskusja i wnioski.** Przyczyną urazu była rana kłuta po ataku nożownika. Śmiertelność z urazów serca jest wysoka, zwłaszcza w przypadku ran kłutych, jednak próba pilnej operacji znacznie zmniejsza śmiertelność i zwiększa szanse pacjenta na przeżycie. W przedstawionym przypadku wyjątkowy był brak tamponady serca spowodowany perforacją worka osierdziowego i wynaczynieniem się krwi do przedniego śródpiersia co widać w skanach CT. Taka sytuacja kliniczna nie spowodowała destabilizacji hemodynamicznej pacjenta. Mimo braku charakterystycznej dla urazów penetrujących tamponady serca, szybkie przeprowadzenie operacji chirurgicznej w celu weryfikacji głębokości rany penetrującej a po dokonaniu rozpoznania urazu serca zszycie pozwoliło uratować jego życie.

Słowa kluczowe: uraz serca, tamponada serca

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## Additional information

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### Author contributions

All authors worked together on the final image of the article.

### Conflict of interest

The authors declare no conflict of interest.

### Ethics statement

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