

CASE REPORT

Preparing reports in cases with blunt trauma to the heart area: Three cases

 Hacer Yasar Teke¹,  Yasemin Balci²

¹Ordu University Faculty of Medicine, Department of Forensic Medicine, Ordu, Türkiye

²Muğla University Faculty of Medicine, Department of Forensic Medicine, Muğla, Türkiye

Received 23 October 2022; Accepted 13 November 2022; Available online 25 December 2022

Copyright@Author(s) - Available online at www.nofor.org

Content of this journal is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License.



Available online at www.nofor.org

Abstract

This case series has been prepared to create a perspective to evaluate blunt heart trauma, in which physical and psychological effects of trauma are seen together, in clinical forensic medicine practices. Case 1: A 50-year-old female patient with a history of hypertension had a heart attack in the first 24 hours after blunt trauma, she had an angiography and a coronary stent inserted. Case 2: A 60-year-old woman with no known disease fell after one of the children who entered her garden without permission kicked her; she had angiography within 24 hours due to chest pain and stenocardia and found that she had coronary heart disease. Case 3: A 60-year-old man with a history of atherosclerotic heart disease had argued with neighbours and had a blow to his chest; in the emergency service, hospitalization was recommended to the patient due to left bundle branch block and troponin results; However, he refused hospitalization and left the hospital. Forensic medical evaluation of heart attack and rhythm disorders after blunt chest trauma or arguments is an important issue. Medical evaluation in terms of heart damage following blunt chest traumas is one of the factors that contribute to forensic reports prepared after the incident.

Keywords: Blunt chest trauma, heart damage, rhythm disorders, forensic report

INTRODUCTION

It is a well-known fact that in addition to the physical damage that trauma can cause to the body of the individual, it also causes psychological problems and the body has physiological responses to these problems. It is stated in the literature that complications due to psychological stress and physical exertion that develop during and after trauma in individuals with and without previous cardiac problems are a spectrum that can go up to cardiac arrest [1-3]. In the process of evaluating the stressor effects of trauma and reflecting these in reports, forensic medicine specialists may need to establish a causal link. First of all, it should be reminded that whether the perpetrator is at fault or not is a matter that should

be evaluated by the court.

It has been reported that various rhythm disorders can be seen within 24-48 hours after trauma [4]. Clinical sensitivity of using CK-2 isoforms in the diagnosis of myocardial infarction is 90-95% [5]. The presence of contusion is most accurately detected with troponins [6]. In blunt chest traumas, cases of direct cardiac damage are reported as 5-15 % [7]. This damage may belong to the pericardium, myocardium, endocardium and coronary arteries.

This study aims to attract attention to the importance of determining whether myocardial damage detected after trauma in clinical forensic medicine is due to trauma.

CITATION

Yasar Teke H, Balci Y. Preparing reports in cases with blunt trauma to the heart area: Three cases. NOFOR. 2022;1(1):6-9. DOI: 10.5455/NOFOR.2022.10.07



Corresponding Author: Hacer Yasar Teke, Ordu University Faculty of Medicine, Department of Forensic Medicine, Ordu, Türkiye
Email: hacer.hgulderen2004@gmail.com

CASE 1

In the examination of the 50-year-old patient who was brought to the emergency service after a family argument and fight and who had previous hypertension disease, shapeless ecchymoses with pale edges in sizes of 1x1 cm., 1x0.5 cm. and 0.5x0.5 cm. in the middle 1/3 part of the right arm on the inner side, and 2.5x1 cm. on the right arm 1/3 part outer side, shapeless ecchymoses in sizes of 2x0.5 cm, 0.5x0.5 cm., 0.5x0.5 cm. and 1x0.5 cm. on the left arm 1/3 part outer side, a shapeless ecchymosis in a size of 5x3 cm. on the right elbow posterior side and a shapeless ecchymosis in a size of 4x2 cm. on the right thigh inner side in the middle 1/3 part were seen. In addition, high troponin was found in tests performed for the patient's chest pain complaint. In the cardiology consultation, his electrocardiography showed T wave negativity at V3- V6 and dynamic T wave changes; ejection fraction was 55% in the echocardiography, left ventricular diameters were normal and pericardial effusion was not found. Thoracic CT was found to be within normal limits. The patient was referred to the intensive care unit indicating that intensive follow-up was appropriate with a suspicion of acute coronary syndrome.

In the coronary angiography performed a day later in the hospital B he was transferred to, a stent was applied to the patient who had total stenosis in the right coronary artery (RCA), retrograde filling of RCA, 40-50 % stenosis and 30 % stenosis in the distal of left descending coronary artery (LMCA).

In the examination at Forensic Medicine Clinic seven days after the incident, the patient stated that he had been injured after an argument in the family, he had taken a blow to the chest, he still had complaints of shortness of breath and chest pain, he had a heart attack after the incident, a coronary stent was inserted and his treatment was still continuing, and ecchymoses with pale lemon-yellow-pistachio green edges in places compatible with the first examination were found in the patient's body. It was found that he had ecchymotic needle marks around both elbows and inguinal region which were due to the medical interventions.

CASE 2

When a 60-year-old female patient warned the children sitting around and on the tree in her garden, one of the children kicked her chest. The patient, who realized that she could not breathe and she had low blood pressure, called an ambulance and went to the District State Hospital. In her examination, it was found that the patient described trauma-related sensitivity in her chest, while her thoracic CT did not show any findings. During her follow-up, she was transferred to the Cardiology Centre because her cardiac troponin was 1.02 and these values increased, her general condition worsened and there were significant ECG changes.

In the cardiology clinic of Hospital A, it was found that the patient had chest ache, her electrocardiography (ECG) showed ST elevation at AVL part; the patient was admitted to coronary intensive care unit; found LAD (left anterior descending coronary artery) plaque, CX (circumflex coronary artery) plaque and while

RCA (right coronary artery) was normal.

In the cardiology clinic, it was found that the patient had chest ache, and her ECG showed ST elevation at the AVL part; she was admitted to coronary intensive care unit and found LAD (left anterior descending coronary artery) plaque, CX (circumflex coronary artery) plaque, and RCA (right coronary artery) was normal.

In the examination at Forensic Medicine Clinic three days after the incident, the patient stated that she came to the cardiology service of the hospital in the district centre after her first intervention was made in the District State Hospital, she had angiography, she was hospitalized in the intensive care for one night and in the normal service for another night, she still had shortness of breath and chest pain; her examination showed a 2x1 cm. shapeless ecchymosis with pale edges and purple coloured in the middle on upper 1/3 part of the right thigh.

CASE 3

In the external examination of 63-year-old male patient who was admitted to emergency service after an argument with the neighbours and who had previous heart disease, no ecchymoses, scratches or bleeding was seen. Cardiology consultation was asked because he had complaints of pain on the back and chest. In the cardiology consultation, hospitalization to coronary intensive care unit was recommended since troponin was within normal limits and the patient had left bundle branch block. The patient did not agree to hospitalization.

In the examination at Forensic Medicine Clinic eight months after the incident, the patient stated that during the incident, he was hit hard on his back and he had pain in the chest and back after he fell on his knees, after the first intervention in the emergency service, the cardiologist told him that he needed to stay in the hospital, but he left the hospital of his free will, the doctor prescribed him Nextep and Ecopirin, he was still using these drugs, and he had used medication before due to heart disease. He still had pain on his left shoulder and neck from time to time; his examination did not show any external traumatic lesions.

DISCUSSION

Blunt trauma can be affected the heart in several different ways; 1) through direct energy transfer of the force on the rib cage, 2) through slower heart rate, 3) through compression of the heart between the spine and the sternum. Theoretically, it describes a histologically detectable situation that cannot be detected by myocardial commode imaging methods. It can frequently be seen in cases that peak at T-wave occurring after a low energy force during sports events (football, baseball, golf, etc.), causing ventricular fibrillation afterward or cardiac arrest by leading to complete heart block in which QRS complex is affected [8]. Myocardial contusion is a state which occurs in traumas with higher energy and it is characterized by myocardial lesions (haemorrhage, increased edema formation, necrosis, polymorphonuclear infiltrates) and increased extravascular resistance and decreased coronary blood

flow and cardiac functions due to these myocardial lesions [9,10]. Even if severe myocardial contusion reduces heart functions, a significant cardiac shock may rarely develop [11].

When the clinical appearance of blunt heart trauma is examined, it is stated in the literature that it may show findings such as minor ECG or enzyme anomaly, arrhythmia, free wall rupture, septal rupture and heart failure [12,13]. In addition, following blunt heart injuries, lesions can be seen such as hemopericardium, myocardial contusion, free wall rupture, rhythm or conduction disorders, valve injuries and myocardial infarctions (MI) [14]. Since clinical findings may be mild-transient and difficult to understand in blunt heart traumas, especially in cases of pericardial and myocardial contusion, diagnostic problems may often arise. It is also a medical necessity to avoid possible and significant late complications. In a study conducted by Parmly et al. on cases with blunt trauma, which make up 1% of autopsies, it was reported that isolated myocardial contusion and laceration was the second most common injury pattern after ruptures with a rate of 23.6% [15].

Although ECG changes can occur frequently in myocardial contusion, a normal ECG should not exclude trauma. It should be kept in mind that ECG mostly shows left ventricular functions and may show normal findings in trauma cases associated with the right ventricle [16]. In order of frequency, cardiac anomalies after blunt trauma include sinus tachycardia, extra systoles, right bundle branch block, and repolarization anomalies (ST segment and T waves). Q waves and life-threatening severe arrhythmia are very rare [16]. T wave negativity at V3- V6 and dynamic T wave changes in the ECG of our first case and ST elevation in the second case were evaluated as ECG findings in parallel with the literature supporting myocardial infarctions and it was decided that the injuries endangered individuals' lives.

In the determination of traumatic myocardial damage, Troponin I is preferred since it is more specific when compared with Troponin T. Troponin levels should be followed swiftly and they should be evaluated with the clinical state of the patient. In our second case, a swift follow-up of post-traumatic troponin levels and a continuous increase in this value led to the patient's being transferred to a more advanced centre. It was understood that the case did not develop a serious clinical complication, such as cardiac rupture, etc. Since the test results supported myocardial infarction in this patient, it was decided that the injury endangered individual's life.

The echocardiographic finding was present only in our first case and this eco result was reported as within the normal boundaries. Echocardiography is a significant diagnostic tool in terms of the definitive diagnosis of other cardiac lesions and in preventing complications, especially in severe traumas. In a case report by Tsokuas et al., the echocardiography of a 46-year-old male case who developed acute myocardial infarction and congestive heart failure showed anterior myocardial infarction findings. Although echocardiography showed akinesia in the interventricular septum, dyskinesia on the apical anterior wall and severe deterioration in the left ventricle general systolic function,

coronary angiography showed to be within normal limits [17].

Our first two cases had ecchymosis as a traumatic finding outside the chest area. This can be evaluated as the fact that the individual was exposed to a trauma. On the other hand, although our third case did not have the other findings of trauma, it is a medically known fact that the psychological effect of the argument that took place, adrenalin discharge, and other physiological incidents may cause arrhythmia in the heart. In a case report by Allemeersch et al., a 41-year-old patient who was exposed to a high-energy traffic accident was found to have fracture in the skull base, fractures in the bilateral ribs in the chest wall, pericardial haemorrhage in addition to subdural and subarachnoid haemorrhage and complete dissection in the right coronary artery [18].

The incidence rate of common clinical myocardial infarction findings in cases younger than 45 years of age was between 6 and 10% in the literature. In a study by Christensen et al., a total of 77 cases, 64% of which were associated with traffic accidents and 4% of which were associated with fights, were evaluated as myocardial infarctions that developed after blunt chest trauma [19]. In a study by Park et al., it was found that in a 16-year-old male patient who had chest trauma by hitting the handrails while riding a motorcycle, ST elevation was found in ECG, an increase was found in cardiac enzymes and the left ventricular function was suppressed. In the diagnostic coronary angiography performed three weeks later, a complete occlusion including collaterals in the proximal left anterior descending artery (LAD) right coronary artery and left circumflex artery, and percutaneous coronary intervention was applied to the LAD lesion [20]. In another case report, a 37-year-old male with severe mental retardation was evaluated in the emergency service he presented with a complaint of substernal chest pain after physical assault to his head, face and chest area. Electrocardiography showed ST segment elevation in V2, V3 and aVL and normal sinus rhythm with Q waves in aVL. Coronary artery also showed total occlusion in the left descending coronary artery. The patient was discharged four days later without any complications [21].

The common characteristics of our three cases was the presence of atherosclerotic heart disease, which was detected after trauma in the first two and which was previously present in the third case. There is a case of exacerbation in the disease here. According to the Article 23 of the Turkish Penal Code (TPC); if an act causes a more severe or another result than intended, the individual must act with negligence at least in terms of this result.

Article 86 of TCK includes the penalties for deliberate injuries, while Article 87 includes the penalty for "aggravated crime by result". "Causing life-threatening danger" is one of the "aggravated crime by the result" cases in subparagraph (d) of paragraph 1 of Article 87.

In the Guide to the Evaluation of Injury Crimes Defined in the Turkish Penalty" code which was prepared by the Forensic Medicine Institute and Forensic Medicine Specialists and Forensic Medicine Association defined by the Turkish penalty code, Table

1 gives a list of injuries that cause a life-threatening situation. “Myocardial infarction triggered by the stressors that come out within 24 hours after trauma” is also on the list and it is one of the “aggravated crime by result” cases [22].

In legal evaluations, for people who injure others to be punished for “aggravated crime by the result”, issues such as whether they knew the injured person had heart disease previously, whether they predicted those people may have a heart attack after the argument-fight and trauma are important.

Although the risk of developing acute MI is low in cases with blunt chest trauma, cardiac evaluation of patients with chest ache in emergency services is judicially, medically and legally important in terms of detecting late complications of trauma.

The important thing in forensic medical evaluation is the establishment of a cause-effect relationship between the trauma experienced and the myocardial infarction that occurs after the trauma experienced. In terms of establishing this cause-effect relationship, the hour the individual experienced the trauma, the first admission hour to the hospital, admission complaints, tests conducted, diagnosis and medical and interventional procedures should be examined in detail and consultation should be demanded from the specialists in the related branch.

Conflict of interests

The authors declare that there is no conflict of interest in the study.

Financial Disclosure

The authors declare that they have received no financial support for the study.

References

1. Akay A. Travma ve kalp Ölümleri İlişkisi. Tez danışmanı: Üzün İ. Cerrahpaşa Tıp Fakültesi Adli Tıp Anabilim Dalı, 2020; İstanbul.
2. Krexi L, Georgiou R, Krexi D, Sheppard MN. Sudden cardiac death with stress and restraint: The association with sudden adult death syndrome, cardiomyopathy and coronary artery disease. *Medicine, Science and the Law*. 2016;56:85-90.
3. Lecomte D, Fornes P, Nicolas G. Stressful events as a trigger of sudden death: a study of 43 medico-legal autopsy cases. *Forensic Science International*. 1996;79:1- 10.
4. Culliford AT. Nonpenetrating cardiac trauma. In: Hood RM, et al. *Thoracic trauma*. Philadelphia: W B Saunders Company. 1989:211-23.
5. Karakuş A, Kuvadik G, Fransa I. Trauma and heart. *Mustafa Kemal Üniversitesi Tıp Dergisi*. 2014;5:38-44.
6. Ranasinghe AM, Lewis ME, Graham TR. Myocardial contusion. *Trauma*. 2004;6:169-75.
7. Atalar E, Acil T, Aytemir K, et al. Acute anterior myocardial infarction following a mild nonpenetrating chest trauma—a case report. *Angiology*. 2001;52:279–82.
8. Link MS, Wang PJ, Pandian NG, et al. An experimental model of sudden death due to low-energy chest-wall impact (commotio cordis). *N Engl J Med*. 1998;338:1805–11.
9. Sutherland GR, Calvin JE, Driedger AA, et al. Anatomic and cardiopulmonary responses to trauma with associated blunt chest injury. *J Trauma*. 1981;21:1–13.
10. Okubo N, Hombrouck C, Fornes P, et al. Cardiotroponin I and myocardial contusion in the rabbit. *Anesthesiology*. 2000;93:811–7.
11. Orliaguet G, Jacquens Y, Riou B, et al. Combined severe myocardial and pulmonary contusion: Early diagnosis with transesophageal echocardiography and management with high-frequency jet ventilation. *J Trauma*. 1993;34:455–7.
12. Karakuş A, Kuvandık G, Fansa İ. Travma ve kalp. *Mustafa Kemal Üniversitesi Tıp Dergisi*. 2014;5:38-44.
13. Mattox KL, Flint LM, Carrico CJ. Blunt cardiac injury. *J Trauma*. 1992;33:649–50.
14. Buchman TG, Hall BL, Bowling WM, Kelen GD. *Thoracic Trauma*. Cline DM, Ma OJ, Tintinalli JE. *Emergency Medicine*. 5th Ed. America: McGrawHillView CO,2002:100.
15. Parmley LF, Manion WC, Mattingly TW. Nonpenetrating traumatic injury of the heart. *Circulation*. 1958;18:371-96.
16. Orliaguet G, Ferjani M, Riou B. The heart in blunt trauma. *Anesthesiology*. 2001; 95:544–8.
17. Tsoukas A, Andreades A, Zacharogiannis C, et al. Myocardial contusion presented as acute myocardial infarction after chest trauma. *Echocardiography*. 2001;18:167–70.
18. Allemeersch G, Muylaert C, Nieboer K. Traumatic coronary artery dissection with secondary acute myocardial infarction after blunt thoracic trauma. *Journal of the Belgian Society of Radiology*. 2018;102:1–3.
19. Christensen MD, Nielsen PE, Sleight P. Priorbluntchesttraumamay be a cause of single vessel coronary disease; hypothesis and review. *Int J Cardiol*. 2006;108:1-5.
20. Park WS, Jeong MH, Hong YJ, et al. A case of acute myocardial infarction after blunt chest trauma in a young man. *J Korean Med Sci*. 2003;18:889–93.
21. Perez O, Nair RM, Kewan T, Al-jaghbeer MJ. A rare case of ST-elevation myocardial infarction after blunt chest trauma. *Cureus*. 2020;12:e 7710
22. <https://www.atk.gov.tr/tckyaralama24-06-19.pdf> accessed date 16.10.2022