

# Shock requiring thoracotomy after penetrating thoracic trauma: A case report

## Penetran toraks travması sonrası torakotomi gerektiren şok kliniği: Olgu sunumu

Elif Koçkara<sup>1</sup>, Hatice Şeyma Akça<sup>1</sup>, Abdullah Algın<sup>1</sup>, Serdar Özdemir<sup>1</sup>, Serkan Emre Eroğlu<sup>1</sup>

<sup>1</sup> University of Health Sciences, Ümraniye Education and Research Hospital, Department of Emergency Medicine, Istanbul, Turkey

ORCID ID of the author(s)

EK: 0000-0001-8912-172X

HŞA: 0000-0003-2823-9577

AA: 0000-0002-9016-9701

SÖ: 0000-0002-6186-6110

SEE: 0000-0002-3183-3713

### Abstract

Thoracic trauma is one of the leading causes of 25-50% of all traumatic injuries and death in the entire population. The main problem in thoracic traumas is the disruption of respiratory and hemodynamic functions. We aimed to investigate emergency thoracotomy performed in thoracic injury and its effect on patient mortality. In this case, we examined the time from the arrival of a 41-year-old woman with penetrating multiple injuries to the thorax to the decision to perform an emergency thoracotomy. Although the shock approach and resuscitation protocols were properly applied, an emergency thoracotomy was decided on, since there was no improvement in the patient's clinical condition and active bleeding was observed in FAST ultrasonography. The patient, whose vital values improved after thoracotomy, was discharged from the hospital after 1 week of intensive care and service follow-up. It should not be forgotten that performing an emergency thoracotomy in intrathoracic penetrating injuries is a key point in the patient's survival.

**Keywords:** Thorax, Trauma, Penetrating injuries

### Öz

Toraks travması tüm travmatik yaralanmaların %25-50'sinin ve tüm yaş grubunda ölümün önde gelen sebeplerinden biridir. Toraks travmalarında ana sorun, solunumun ve hemodinamik fonksiyonların bozulmasıdır. Biz bu çalışmada acil servise ulaştığında yaşamsal değerleri bozulmuş ve resüsitasyona cevap vermeyen bir toraks yaralanmasında yapılan acil torakotomiye sunmayı amaçladık. Bu vakada toraksa penetre multipl yaralanmaları olan 41 yaşında bir kadın olgunun hastaneye gelişinden acil torakotomi kararı alınmasına kadar olan süreyi inceledik. Şok yaklaşımının ve resüsitasyon protokollerinin uygun biçimde uygulanmasına rağmen hastanın klinik durumunda iyileşme olmaması ve yapılan FAST ultrasonografisinde aktif kanama görülmesi üzerine hastaya acil torakotomi kararı alındı. Torakotomi sonrası yaşamsal değerlerinde düzelme görülen hasta 1 haftalık yoğun bakım ve servis takibinin ardından ayakta taburcu edildi. Şok yaklaşımı doğru bir şekilde uygulanmış olmasına rağmen, toraks içi penetran yaralanmalara acil torakotomi endikasyonu kararının alınmasının ve uygulanmasının hastanın mortalitesinde kilit bir nokta olduğu unutulmamalıdır.

**Anahtar kelimeler:** Toraks, Travma, Penetran yaralanma

## Introduction

One of the significant causes of mortality among young adults is multiple traumas, reason mostly being accompanying solid organ injuries [1]. Eighty-five percent of the thoracic traumas are blunt traumas [2]. In their study on 34120 trauma cases between 1993 and 2002, Demetriades et al. [3] reported 65% blunt and 35% penetrating thoracic traumas [3]. Among all thoracic traumas (including blunt or penetrating), approximately 10% require surgical intervention [4].

The main problem in thoracic traumas is the disruption of respiratory and hemodynamic functions. The first group of patients die at the scene of accident; in most cases the cause is cardiovascular injuries. The second group of patients are lost within the first hour, because of uncontrolled bleeding and respiratory failure. The third group of patients die due to late complications such as infection, myocardial damage, and pulmonary embolism. In this case, we aimed to examine the importance of emergency thoracotomy in the management of uncontrolled bleeding in patients included in the first and second groups.

Corresponding author / Sorumlu yazar:  
Hatice Şeyma Akça

Address / Adres: Sağlık Bilimleri Üniversitesi,  
Ümraniye Eğitim ve Araştırma Hastanesi, Acil  
Tıp Kliniği, İstanbul, Türkiye  
E-mail: drhaticeseyma\_@hotmail.com

Informed Consent: The authors stated that the written consent was obtained from the patients presented with images in the study.

Hasta Onamı: Yazarlar çalışmada görüntüleri ile sunulan hastalardan yazılı onam alındığını ifade etmişlerdir.

Conflict of Interest: No conflict of interest was declared by the authors.

Çıkar Çatışması: Yazarlar çıkar çatışması bildirmemişlerdir.

Financial Disclosure: The authors declared that this study has received no financial support.  
Finansal Destek: Yazarlar bu çalışma için finansal destek almadıklarını beyan etmişlerdir.

Published: 8/30/2020  
Yayın Tarihi: 30.08.2020

Copyright © 2020 The Author(s)  
Published by JOSAM

This is an open access article distributed under the terms of the Creative Commons Attribution-Non Commercial-NoDerivatives License 4.0 (CC BY-NC-ND 4.0) where it is permissible to download, share, remix, transform, and build upon the work provided it is properly cited. The work cannot be used commercially without permission from the journal.



## Case presentation

A 41-year-old female patient with no known diseases was stabbed in many places in front of her apartment and brought to the hospital by the ambulance. When the patient was found, she had many penetrating injuries, the majority of which were on the thorax. Her Glasgow coma scale score was 8. The patient was fixed with a trauma board and a neck collar by the first-response team, and fluid resuscitation was started during transport. When the patient arrived at our hospital, her Glasgow coma scale score had dropped to 7. Her blood pressure was 69/25 mmHg, oxygen saturation at room air, 100%, and pulse was 105 beats/min. On physical examination, there was a stab wound about 10 cm-long, involving the skin, subcutaneous tissue, and the platysma muscle in the lower 1/3 half of the neck, from which there was no active bleeding. There was a 2-cm-long stab incision at the level of the 3<sup>rd</sup> costa on the sternum, which was actively bleeding. Additionally, there were two 7-cm-long incisions on the left scapula, one 8 cm-long incision on the right forearm, one 4-cm incision on the first and second fingers in the right hand, one 10-cm-long incision lateral to the left humerus, and numerous about 3-cm-long incisions in the distal interphalangeal joints on palmar aspect of all fingers of the left hand. The patient, who was unconscious and had difficulty breathing, was considered to have stage 4 shock, and intubated. She was administered 1000 cc 0.9% NaCl intravenously within 20 minutes, 2 units of non-specific 0 Rh-erythrocyte suspension in 20 minutes, and 1 gram of tranexamic acid in 100 cc of 0.9% NaCl in 10 minutes.

FAST ultrasonography performed at the bedside revealed fluid in the right upper quadrant in the Morrison space and B line in the left lung. Her hemoglobin value was 8 g/dL, platelet count was 224 000/mm<sup>3</sup> and leukocyte count was 13,300/μl at presentation. Biochemistry results were as follows: ALT (Alanine Aminotransferase): 11 U/l, AST (Aspartate Aminotransferase): 21 U/l, creatinine 1.12. mg/dl, BUN (blood urea nitrogen): 32.1 mg/dl, K: 3.5 mEq/l, Na: 131 mEq/l. After administration of erythrocyte suspension, her hemoglobin value was 6.7 g/dl in blood gas. Massive hemothorax was detected in the left lung (Figure 1), and there was pulsatile hemorrhage from the left scapular and left mammarian incisions. The thoracic surgery team was notified.

The patient, whose vascular injuries, lung parenchymal incisions and diaphragmatic incisions were repaired during the operation, was taken to the intensive care unit postoperatively (Figure 2). After the operation, the patient's hemoglobin value was 8.2 g/dl, platelet and leucocyte counts were 98.000/mm<sup>3</sup> and 16,400/μl, respectively. Biochemistry analysis of the blood sample revealed the following results: ALT: 13U/l, AST: 39 U/l, BUN: 27.82 mg/dl, creatinine: 0.63mg/dl, K: 4.1 mEq/l, Na: 144 mEq/l. The patient's troponin value after cardiopulmonary resuscitation was 1.527 ng/ml. The patient, whose clinical and laboratory values improved after 1 week of intensive care follow-up, was transported to the ward, and 10 days later, she was discharged. During discharge, her hemoglobin value was 9.7 g/dl ALT: 44 U/l, AST: 56 U/l, BUN: 12.4 mg/dl, creatinine 0.56 mg/dl, Na: 137mEq/l, and K: 3.7 mEq/l. She was followed-up uneventfully.

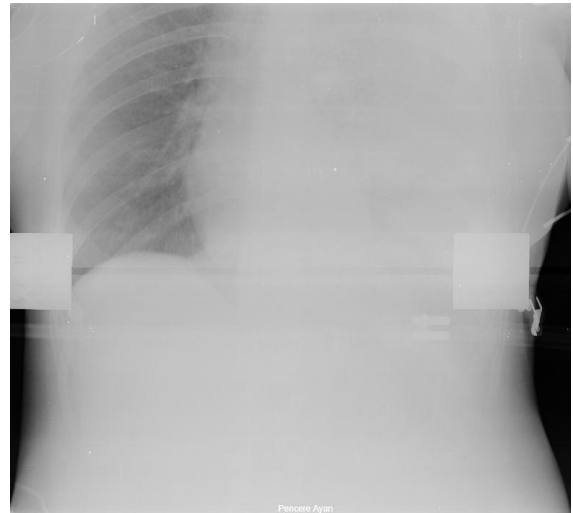


Figure 1: Chest x-ray at the presentation of the patient



Figure 2: Chest x-ray after thoracotomy

## Discussion

The form and time of trauma is highly significant in a patient with thorax trauma. If the patient is conscious, anamnesis should be obtained from the patient and eyewitnesses of the event in detail and quickly. Meanwhile breathing and circulation should be checked. It should be remembered that cervical spine injury may occur during evaluation of the head and neck region for airway obstruction. In case of unconsciousness, airway obstruction can easily occur due to tongue obstructing posteriorly, blood, vomit, secretion, foreign body aspiration, and crushing of the larynx and trachea. During inspiration, chest movements or paradoxical movements that do not participate in breathing should be evaluated by monitoring chest movements. Pulse and skin color should be checked to monitor circulation. With palpation, pain, irregularities and crepitations in the chest wall can be detected. Percussion may reveal hyper or hyporesonance in case of pneumothorax or hemothorax. The presence and characteristics of respiratory sounds should be evaluated with auscultation. Depending on the severity of the trauma, the patient may present with shock. Our patient was in stage-4 shock at presentation [1-4].

Emergency thoracotomy is performed on patients who are faced with death due to trauma in emergency conditions. 10-15% of all thorax traumas require emergency thoracotomy.

These cases usually progress with massive hemothorax, cardiac tamponade, extensive thoracic injury, or major thoracic vascular injury. Rarely, tracheobronchial or esophageal injuries occur. In the remaining 85-90% cases, chest tube insertion, pain control and observation are sufficient. Thoracotomy performed from the 4<sup>th</sup> or 5<sup>th</sup> intercostal space is best for penetrating cardiac injuries. Clamshell incision on the left should be preferred in the event of a right hemithorax injury. The survival chances of patients who are emergency thoracotomy candidates increase with appropriate pre-hospital intervention and rapid transport. ET is still a life-saving attempt in a small patient population. Limited injuries to the chest wall rarely require surgical intervention. In this case, there were multiple isolated injuries to the chest wall, as well as penetration to the thoracic cavity. If not within the thorax, wounds can be sutured after bleeding control. Intercostal vascular injuries and hemothorax-causing injuries such as those to the internal mammary artery can be detected. These injuries can be controlled by cauterization or ligation [5].

Hemothorax is the presence of blood in the thoracic cavity. Depending on the location, duration, and amount of bleeding, it can be followed up only by tube thoracostomy, or emergency thoracotomy may be required. FAST ultrasonography performed in our patient detected massive hemothorax in the left lung and a decision for a thoracotomy was made. Traumatic diaphragmatic rupture is seen in 4.5-6% of trauma cases. Although it usually occurs with penetrating traumas, blunt traumas may also be the cause. Possible diaphragmatic, thoracic, and abdominal joint injuries should be considered in penetrating injuries of the thoracic region below the nipple line. In our case, a penetrating injury was present in the midclavicular line at the left 2<sup>nd</sup>-3<sup>rd</sup> ribs, and FAST USG showed pulsatile hemorrhage in the internal mammary artery. The defect in penetrating diaphragmatic injuries was smaller than those which occur with blunt trauma. Rupture is usually observed in the left diaphragmatic leaf (80-90%) [6].

Our patient was classified as stage 4 shock at the time of arrival at the hospital, a blood transfusion protocol was initiated, the patient was intubated, and surgical teams were informed. Blood transfusion in stage 3-4 shock patients is not the first option and indicated if the patient is unresponsive to intubation and fluid resuscitation. It should be taken into consideration that active bleeding may continue in the patient and physical examination and imaging should be further expanded. Emergency thoracotomy in patients with penetrating thoracic trauma is a key point in the patient's survival.

### Conclusion

Even if shock is managed appropriately, it should not be forgotten that performing an emergency thoracotomy in intrathoracic penetrating injuries is a key point in the patient's survival.

### References

1. Haberal MA, Dikiş ÖŞ, Lewis Jakar E. Thoracic Trauma: Analysis of 440 Cases. *Kafkas J Med Sci*. 2019;9(2):97-102. doi: 10.5505/kjms.2019.02223
2. Emircan Ş, Özgüç H, Aydın ŞA, Özdemir F, Köksal Ö. Factors affecting mortality in patients with thorax trauma. *Ülusal Travma Acil Cerrahi Derg*. 2011;17(4):329-33. doi: 10.5505/tjes.2011.76158.
3. Demetriades D, Murray J, Charalambides K, Alo K, Velmahos G, Rhee P, et al. Trauma fatalities: time and location of hospital deaths. *J Am Coll Surg*. 2004;198(1):20-6. doi:10.1016/j.jamcollsurg.2003.09.003.
4. Baumgartner FJ, Thoracic Trauma. In: Baumgartner FJ, editors. *Cardiothoracic Surgery*, 3rd ed. Texas: Landes Bioscience, 2004:245-262.
5. Brock MV, Mason DP, Yang SC. Thoracic trauma. In: del Nido PJ, Swanson SJ, editors. *Sabiston, Spencer Surgery of the Chest*, 7th ed. Philadelphia: Elsevier Saunders, 2005:79-102.

6. Çobanoğlu U, Kara V, Yalçınkaya İ, Er M, Işık AF, Sayır F, et al. traumatic diaphragmatic ruptures: diagnostic and therapeutic approaches. *Türk Göğüs Kalp Dama*. 2012;20(1):85-93. doi: 10.5606/tgkdc.dergisi.2012.014.

This paper has been checked for language accuracy by JOSAM editors.

The National Library of Medicine (NLM) citation style guide has been used in this paper.