

Research Article

Thorax Gunshot and Sharp Cutting Tool Injuries: for 5 Months Nyala Experiences

Hüseyin Fatih SEZER¹ and Hakan DAYANIR²

¹Kocaeli University, Kocaeli/Turkey

²University Of Health Sciences Gülhane Health Vocational School, Ankara/Turkey

Abstract

Background: The two most common causes of penetrating thoracic trauma are firearm injuries and injuries by sharpened cutting tool. Penetrating thoracic injuries are risk factors for high mortality and morbidity, so they need to be diagnosed correctly and timely in order to perform an effective intervention. In this study, patients with penetrating thoracic trauma were treated through surgical intervention accompanying minimal morbidity–mortality compared to literature, even though they were admitted relatively late.

Methods: In this retrospective study, 29 gunshot and stab wounds penetrating thoracic trauma patients were admitted to the emergency department of Nyala Sudan Turkey Education and Research Hospital between April and September 2018.

Results: Of the 29 patients, 7 (24.13%) were gunshot injuries and 22 (75.86%) were injured with a sharp cutting tool. While 13 of the cases (44.82%) were admitted on the day the incident took place, 5 of them (17.24%) were post-traumatic first day of the admission, 9 of them (31.03%) were post-traumatic day 2, whereas 1 of them (3.44%) was post-traumatic the third day of admission. Finally, 14 patients (48.28%) were followed-up conservatively without tube thoracostomy, while 15 patients (51.72%) underwent tube thoracostomy in follow-up. No patient was operated for penetrant trauma. Mortality was not seen.

Conclusion: Patients with penetrating thoracic trauma were treated by surgical interventions accompanying minimal morbidity–mortality even though they were admitted relatively late to healthcare facilities.

Keywords: penetrating thoracic injuries, sharp cutting tool, gunshot

Corresponding Author:
Hüseyin Fatih SEZER;
Kocaeli University Medical
Faculty Hospital,
Kocaeli/Turkey,
email: hfs.hfs@gmail.com

Received 12 November 2020
Accepted 26 December 2020
Published 31 December 2020

Production and Hosting by
Knowledge E

© Hüseyin Fatih SEZER and
Hakan DAYANIR. This article
is distributed under the terms
of the [Creative Commons
Attribution License](#), which
permits unrestricted use and
redistribution provided that
the original author and
source are credited.

Editor-in-Chief:
Prof. Mohammad A. M. Ibnouf

 OPEN ACCESS

1. Introduction

Thorax traumas are the third most common type of trauma after cranial and extremity traumas considering the frequencies and are responsible for about 25% of traumatic deaths [1, 2]. The vast majority of thorax traumas are blunt traumas, with approximately 30% of them being penetrant in origin (3, 4). The two most common causes of penetrating thoracic trauma are as a consequence of firearm or by a the sharp cutting tool (2). Penetrating thoracic injuries are risk factors for high mortality and morbidity, so they need to be diagnosed correctly and timely in order to perform an effective intervention.

If the thoracic injury is accompanied by multi-organ lacerations, the risk of mortality and morbidity tends to be higher (1). In this study, patients with penetrating thoracic trauma were treated with surgical interventions accompanying minimal morbidity–mortality compared to literature, even though they were admitted relatively late to a healthcare facility.

2. Materials and Methods

In this retrospective study, 29 gunshot and stab wounds penetrating isolated thoracic trauma patients were admitted to the emergency department of Nyala Sudan Turkey Education and Research Hospital between April and September 2018. Patients were evaluated in terms of age, gender, trauma cause, duration of application, thoracic pathologies resulting from trauma, accompanying non-thoracic pathologies, treatment and their application period, intensive care unit stay, complications, hospital stay, mortality and follow-ups after discharge.

2.1. Statistical analysis

Statistical evaluation was performed using IBM SPSS 20.0 (SPSS Inc., Chicago, IL, USA). The normal distribution fitness test was assessed using the Kolmogorov–Smirnov test, categorical variables were expressed as a percentage (%). Relationships between categorical variables were evaluated by Chi-square analysis.

3. Results

Of note, 27 (93.10%) of the 29 patients were male and 2 (6.89%) were female, aged 14–68 years. The mean age of the patients was 26.59 years, with the mean age of the men being 26.56 years and that of the women being 27 years (Table 1).

Of the included patients, 7 (24.13%) were gunshot injuries and 22 (75.86%) were injured with a sharp cutting tool. Besides, 13 of the cases (44.82%) were admitted on the day the incident took place while 5 of them (17.24%) were post-traumatic first day of admission, 9 of them (31.03%) were post-traumatic day 2, and 1 of them (3.44%) was post-traumatic third-day admission (Figure 1). The average duration of application was 1.92 days.

Interestingly, in 17 (58.62%) patients, the injury was in the right hemithorax, in 10 (34.48%) patients, it was in the left hemithorax, and 2 (6.89%) patients had bilateral injuries.

All patients underwent a PA or AP chest X-ray, in addition to which 10 (34.48%) patients underwent lateral chest X-ray, 13 (44.82%) had thoracic CT, and 1 (3.44%) underwent abdomen CT.

While 21 (72.41%) patients experienced thoracic pathologies secondary to trauma, no such condition was seen in the remaining 8 (27.58%) of them. Pneumothorax was present in all patients with this pathology. Hemothorax was found in 11 (37.93%) patients, rib

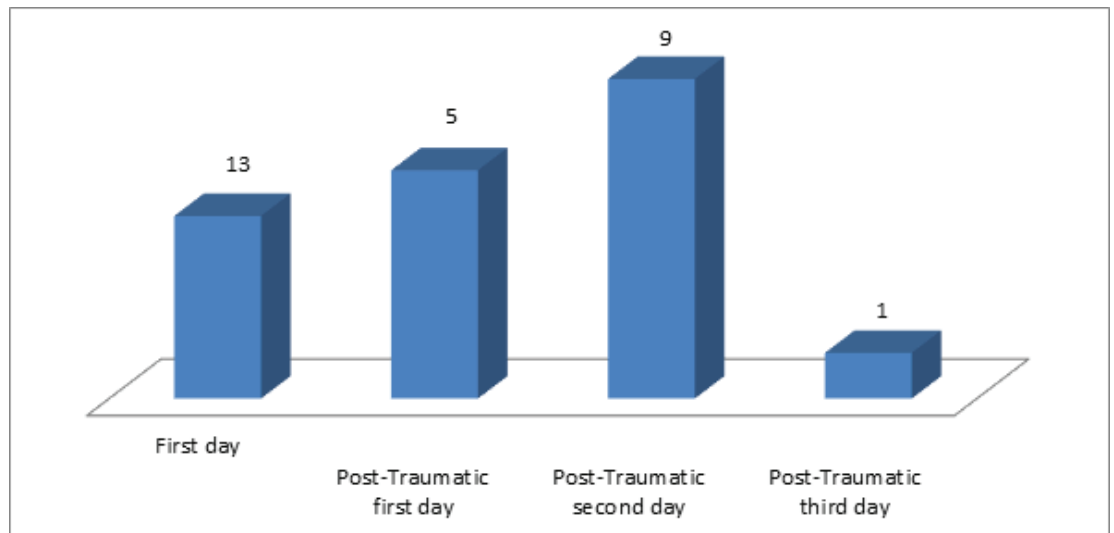


Figure 1: Patient application times.

fracture was evident in 3 (10.34%), lung contusion in 3 (10.34%), mediastinal emphysema in 5 (35.71%), and subcutaneous emphysema in 8 (27.58%) patients with this pathology (Figure 2). In addition, one (3.44%) patient had an injury with sharp cutting tool related to the retroperitoneus except for this injury, such a condition associated with thorax trauma were not encountered.

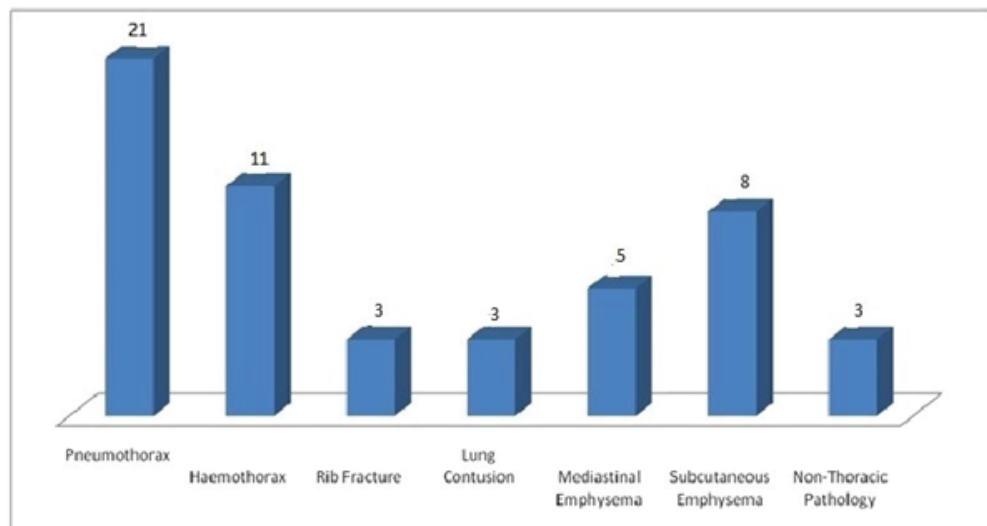


Figure-II : Thoracic pathologies due to penetrant injury seen in patients.

Figure 2: Thoracic pathologies due to penetrant injury seen in patients.

In total, 14 (48.28%) patients were followed-up conservatively without tube thoracostomy, while 15 (51.72%) patients underwent tube thoracostomy in follow-up. One (3.44%) patient had to undergo a second tube thoracostomy with expansion defect. Continuous oxygen therapy was given to 10 (34.48%) patients and 5 (50%) of them received this

treatment for mediastinal emphysema when oxygen therapy was given to these five patients (50%) with partial pneumothorax.

No patient was operated for penetrant trauma. During the follow-up and treatment, intensive care was needed for 11 (37.93%) patients and the mean intensive care unit admission period was 2.36 days (Table 1). The mean follow-up chest drain was 6.67 days in patients followed-up with tube thoracostomy (Table 1).

In addition, six patients (20.68%) had complications during follow-up and three (50%) of these complications were expansion defect, three (50%) were atelectasis and one (16.66%) was a wound infection. No other complications were observed. One (1.66%) patient underwent perioperative blood transfusion. Mortality was not seen. The mean duration of hospitalization was 4.5 days (Table 1).

TABLE 1: Mean periods.

Age	26.59 (Year)
Male	26.56 (Year)
Female	27 (Year)
Application time to hospital	1.92 (Day)
Tube thoracostomy time	6.67 (Day)
Intensive care time	2.36 (Day)
Total hospital stay	4.5 (Day)

Following the discharge, no complication was reported by any of the patients; all of them were followed-up in a healthy manner. In three cases, after the trauma, there were bullet cores in various parts of thorax but it was not clinically important and no attempt for removal was performed.

4. Discussion

Considering the trauma frequencies, thoracic trauma ranks third after the cranial and extremity traumas [1]. Trauma is the most common cause of deaths before the age of 40 in the community and one in four of the traumatic deaths are related to thoracic trauma [3]. Approximately 30% of thoracic traumas are penetrant traumas [3, 4]. The two most common causes of penetrating thoracic trauma are firearm injuries and injuries by sharp cutting tool [2]. The other major causes of penetrant thoracic trauma are traffic accidents, falls, and assaults. In a large study conducted by Demetriades *et al.* with a long duration of nine years and 34,120 trauma patients, 35% of the thoracic traumas were observed to be penetrating, mortality was observed in 7.8% of the patients, and 4% of them were due to penetrating thoracic trauma [5]. They also reported that the most common critical injuries were cranial and the second most frequent were thoracic injuries [3, 5]. Moreover, in the same study, penetrant trauma had a mortality rate of 11.5% in itself [5]. According to our concept of study, all of our patients were a penetrating thoracic trauma. Seven (24.13%) patients were gunshot injuries while 22 (75.86%) were injured with a sharp cutting tool [3, 5]. Unlike the literature, there was no mortality in our cases.

Penetrating thorax traumas are often seen in patients between 20 and 40 years of age [6]. Men are more frequently exposed to penetrating traumas [1, 2, 4]. In our study, the mean age of the patients was 26.59 years and the male ratio was 93.10%, which was in line with the literature.

Penetrating thoracic injuries are most often caused by cutter drill and less frequent firearm injuries, even if different ratios are given in the wider series [2, 4, 7, 8]. In our study, 24.139% of the penetrating thoracic trauma was caused by firearms and 75.86% by cutting piercing tools which is also in line with the literature.

In our study, the referral period of patients was often after the first day because of the location of our hospital, transportation difficulties, material concerns, sociocultural beliefs and indifference. We did not find any satisfactory result with regards to finding a relevant English and native literature over the last 25 years on the post-penetrating thoracic trauma admission time to the health center.

Perhaps the most useful diagnostic technique for penetrating thorax trauma is radiological imaging after the physical examination. Generally, PA, lateral, and AP lung chest X-ray are used, however, chest CT is frequently applied. Chest X-ray was used for all of our patients and thoracic CT was used in 13 (44.82%) patients.

The most common thoracic pathologies in penetrating thoracic trauma are: hemothorax and pneumothorax [1–3, 7, 8]. Less frequent occasions are subcutaneous and mediastinal emphysema, contusion, laceration, tracheoesophageal injury, chylothorax, and cardiac injury. In our study, pneumothorax (72.41%) and hemothorax (37.93%) were the most common complications. One of our patients had extrathoracic penetrating injury and all of the other patients had penetrant trauma specific to thorax. We think that this situation depends on the sociocultural structure and habits.

In general, tube thoracostomy-closed drainage system can be applied, and conservative approach is also possible [3]. If tubal thoracostomy is followed by 1500 cc hemorrhagic drainage or a drainage <1500 cc with an hourly 200 cc drainage lasting for 4 hr or if 100 cc hemorrhagic drainage continues for 6–8 hr and in case of hypovolemic shock, cardiac injury, major vascular injury, trachea-bronch-large lung parenchymal laceration or prolonged air leak, thoracotomy-sternotomy-VATS (Video Assisted Thoracic Surgery) can be performed. Usually follow-up with tube thoracostomy is sufficient, thoracotomy-stereotomy rates due to penetrating thoracic trauma in national wide-ranging studies ranged from 2.9 to 14.3% [1, 9, 10]. Moreover, many international publications have reported high thoracotomy rates [1]. Continuous oxygen therapy, respiratory exercises, postural drainage, pain control can be used in conservative treatment. In our study, 14 (48.28%) patients without tube thoracostomy were followed-up conservatively, while 15 (51.72%) who underwent tube thoracostomy and were also followed-up. Continuous oxygen therapy was given to 10 patients (34.48%); 5 (50%) of them received it for mediastinal emphysema treatment, while the other 5 (50%) received it for partial pneumothorax treatment. Contrary to the literature, no patient required thoracotomy.

In national publications, the most common cause of morbidity in penetrating thoracic traumas was found to be atelectasis [8, 9]. In our study, six (20.68%) patients had complications during follow-up when three (50%) of them were atelectasis, three (50%) of expansion defect, and one (16.66%) of wound infection; no other complications were

encountered. Additionally, one (1.66%) patient underwent blood transfusion. Although our patients had relatively late admission, mortality was not seen; the lack of other systemic injuries associated with appropriate surgical management and follow-up, the absence of pulmonary–thoracic wall vascular injuries that required major thoracic vascular injury or thoracotomy may be the reason for this condition.

5. Conclusion

Thoracic penetrant trauma is a risk factor for mortality and morbidity. Diagnosis and necessary intervention should be done, as soon as possible for this reason. Tube thoracostomy is often adequate for follow-up and treatment, but conservative treatment may be available in some cases. Successful results can be obtained by appropriate surgical intervention even in penetrating thoracic trauma that does not apply in time. Although of late presentation, our patients had good outcome in our facility.

Acknowledgements

We would like to thank at first, Dr. İsmayil Yılmaz and Nyala, Sudan, Turkey Education and Research Hospital employees.

And we would like to thank all the patients who kindly participated in the study

Ethical considerations

The study protocol was approved by the Kocaeli University Ethics Committee (19.6.2019/2019-179).

Competing interests

No potential conflict of interest relevant to this article was reported.

Availability of data and material

The raw data used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Funding

None

References

- [1] Leblebici, H. i., Kaya, Y., and Koçak, A. H. (2005). Göğüs travmalı 302 olgunun analizi. *Turkish Journal of Thoracic and Cardiovascular Surgery*, vol. 13, no. 4, pp. 392–396.
- [2] Yılmaz, M. S., Çavuş, U. Y., Büyükcem, F., et al. (2013). Acil serviste penetran göğüs travması:76 hastanın analizi. *S.D.Ü. Tıp Fakültesi Dekanlığı*, vol. 20, no. 4, pp. 139–143.
- [3] Guitron, J., Huffman, L. C., Howington, J. A., et al. (2009). Blunt and penetrating injuries of the chest wall, pleura, and lungs. In: T. W. Shields, J. Locicero, C. E. Reed, R. H. Feins (Eds.) *General Thoracic Surgery* (7th ed.), pp. 891–902. Philadelphia: Lippincott Williams & Wilkins.
- [4] Karamustafaoğlu, Y. A., Yavaşman, i., Kuzucuoğlu, M., et al. (2009). Penetran travmalı olgularda 13 yıllık deneyimimiz. *Medical Journal of Trakya University*, vol. 26, no. 3, pp. 232–236.
- [5] Demetriades, D., Murray, J., Charalambides, K., et al. (2004). Trauma fatalities: time and location of hospital deaths. *Journal of the American College of Surgeons*, vol. 198, no. 1, pp. 20–26.
- [6] Sirmali, M., Türüt, H., Topçu, S., et al. (2003). A comprehensive analysis of traumatic rib fractures: morbidity, mortality and management. *European Journal of Cardio-Thoracic Surgery*, vol. 24, pp.133–138.
- [7] Robison, P. D., Harman, P. K., Trinkle, J. K., et al. (1988). Management of penetrating lung injuries in civilian practice. *Journal of Thoracic and Cardiovascular Surgery*, vol. 95, no. 2, pp. 184–190.
- [8] Tekinbas, C., Eroglu, A., Kurkcuoğlu, I. C., et al. (2003). Chest trauma: analysis of 592 cases. *Ulusal Travma ve Acil Cerrahi Dergisi*, vol. 9, no. 4, pp. 275–280.
- [9] Başoğlu, A., Akdağ, A. O., Celik, B., et al. (2004). Thoracic trauma: an analysis of 521 patients. *Ulusal Travma ve Acil Cerrahi Dergisi*, vol. 10, pp. 42–46.
- [10] Çağırıcı, U., Uç, H., Çalkavur, T., et al. (1998). Toraks travmaları: 6 yıllık deneyimlerimiz. *Ulusal Travma ve Acil Cerrahi Dergisi*, vol. 4, pp. 248–252.