

The analysis of 89 patients that performed tube thoracostomy by general surgeons

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ABSTRACT

Amaç: Death due to thoracic trauma accounts for 20% of all trauma deaths. The aim of this study was to discuss our approach applied by general surgeons for thoracic traumas in our center.

Material and Method: A total of 89 patients (82 males, 7 females; mean age: 26.8 years; range: 7 to 77 years) with thoracic trauma who were admitted to the emergency department and underwent thoracostomy by general surgeons between January 2008 and December 2013 were retrospectively analyzed.

Results: Penetrating trauma was found in 61 patients (68%), which was the most common cause of thoracic trauma. Pneumothorax was the most common clinical sign in 57 patients (64%). Abdominal pathologies were the most common concomitant extra-thoracic pathologies in 17 patients (19%). Fifteen patients (17%) underwent laparotomy due to an intra-abdominal organ injuries. Splenic trauma and diaphragmatic injury were detected in five patients. Complications were seen in two patients (2.2%): one had an air leak and one had persistent pneumothorax. Three patients with multi-trauma died in the early period due to additional pathologies. No mortality was seen in any patient due to thoracic trauma.

Conclusion: Approaches to thoracic trauma should be well-known by all general surgeons and necessary emergency interventions should be performed as a matter of urgency. It is also essential to correctly select patients who are in need of a timely and appropriate referral to a tertiary center to reduce the rate of mortality and morbidity.

Anahtar Kelimeler: Hemothorax, pneumothorax, thoracic injury, tube thoracostomy

INTRODUCTION

Tube thoracostomy due to a trauma through the point view of a general surgeon can be different than a thoracic surgeon. The majority of cases were reported by thoracic surgeons in the literature. Mortality and morbidity rates are high in blunt or penetrating thoracic traumas. The mortality rate due to a thoracic trauma is approximately 4 to 20% (1). Early diagnosis and treatment are, therefore, essential to provide respiratory continuity. Applying an appropriate approach to patients with thoracic trauma may substantially reduce the rate of mortality and morbidity. Although thoracic surgeons usually handle thoracic trauma, treatment and follow-up of many patients are performed by general surgeons in places where no thoracic surgeon is available or in cases with multi-trauma.

Tube thoracostomy is one of the unique tools thanks to its diagnostic and therapeutic specialties. Whether a general surgeon needs a thoracic surgeon in all cases has been widely answered by the real-world practices of a general surgeon. Life-saving capacity of tube thoracostomy through its easy application should not be overlooked by general surgeons due to the concerns of malpractice.

In this present study, we aimed to discuss our approach to patients with thoracic trauma in our center where no thoracic surgeon is available.

MATERIAL AND METHOD

A written informed consent was obtained from each patient. The study protocol was approved by the local Ethics Committee. The study was conducted in accordance with the principles of Declaration of Helsinki.

A total of 89 patients with a thoracic trauma who were admitted to the emergency department of our hospital and underwent tube thoracostomy and were followed at the general surgery outpatient clinic between January 2008 and December 2013 were retrospectively analyzed. Patients with tube thoracostomy due to iatrogenic reasons and due to other operations or interventions were excluded from the study. The patients included in the study were evaluated in terms of age, sex, etiology of the trauma, clinical signs, accompanying trauma, applied surgical interventions, referral to an advanced center and mortality. All patients were evaluated with physical examination, laboratory tests and radiologically,

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Table 1. Demographic characteristics of patients

| | |
|-------------------------|------------|
| Age | 26.8 years |
| Sex | |
| Male | 82 (92%) |
| Female | 7 (8%) |
| Etiology | |
| Blunt | 25 (28.1%) |
| Penetrating | 64 (71.9%) |
| Length of hospital stay | 5.1 days |
| Removal of tube | 3.4 days |

Table 2. Etiological causes

| Etiology | n | % |
|------------------|----|-----|
| Stab wounds | 61 | 69 |
| Traffic accident | 11 | 12 |
| Falling down | 9 | 10 |
| Beaten | 5 | 6 |
| Gunshot | 3 | 3 |
| Total | 89 | 100 |

Table 3. Clinical signs

| Findings | n | % |
|------------------|----|-----|
| Pneumothorax | 58 | 65 |
| Hemopneumothorax | 22 | 25 |
| Hemothorax | 9 | 10 |
| Total | 89 | 100 |

Table 4. Other thoracic pathologies

| Other thoracic pathologies | n | % |
|----------------------------|---|---|
| Multiple rib fracture | 8 | 8 |
| Single rib fracture | 4 | 4 |
| Subcutaneous emphysema | 6 | 7 |
| Diaphragmatic injuries | 5 | 6 |
| Pulmonary contusion | 3 | 3 |
| Heart injury | 2 | 2 |
| Scapula fracture | 1 | 1 |
| Clavicle fracture | 1 | 1 |

Table 5. Extra-thoracic pathologies

| Extra-thoracic pathologies | n | % |
|----------------------------|----|----|
| Abdominal | 17 | 19 |
| Lower extremity | 8 | 9 |
| Upper extremity | 7 | 8 |
| Cranial | 3 | 3 |
| Peripheral vascular | 1 | 1 |
| Total | 35 | 39 |

and followed with serial posteroanterior chest X-rays. Additional imaging, such as thoracic computed tomography (CT), was performed, if required. The patients with an extra-thoracic injury were treated and followed concomitantly by relevant specialties.

RESULTS

Of all patients, 82 (92%) were males and seven (8%) were females with a mean age of 26.8 (range: 7 to 77) years (Table 1). Tube thoracostomy was performed in the left hemithorax, right hemithorax, and bilaterally in 53, 33, and three patients, respectively. Posteroanterior chest X-rays were obtained in all, but three patients whose general condition was poor. Computed tomography was obtained in 33 patients (37%) in whom further imaging was necessary. Penetrating trauma was found in 61 patients (68%), as the most common cause of thoracic trauma. Other etiological causes are shown in Table 2. Pneumothorax was the most common clinical sign in 57 patients (64%), followed by hemopneumothorax in 21 patients (23%). Other findings are shown in Tables 3 and 4. Abdominal pathologies were the most common concomitant extra-thoracic pathologies in 17 patients (19%), followed by extremity pathologies in 15 patients (17%). Other extra-thoracic pathologies are shown in Table 5. Fifteen patients (17%) underwent laparotomy due to an intra-abdominal organ injury. Splenic trauma and diaphragmatic injury were detected in five patients, while two of them underwent splenorrhaphy, while three underwent splenectomy. Diaphragm injuries were repaired in all of these patients. Other causes for laparotomy included injuries to liver, small bowel, urinary bladder, stomach, and colon (Table 6). One patient who was admitted to the hospital due to a motor vehicle accident had first- and second-degree burns in an area less than 10% of the body surface. One patient had a fracture of the mandible. Three patients died during the first hour following presentation to the hospital due to additional cranial pathologies. Pneumothorax was present in three patients with cranial pathologies; however, no hemothorax was detected. Emergency thoracotomy was performed following the development of severe hypotension in two patients who had isolated thoracic penetrating injuries with a knife that was penetrating the thoracic cavity. Left ventricular and left atrial injuries were found in one in each patient. Both patients were stable postoperatively and were discharged uneventfully in the fifth and eighth postoperative days, respectively.

Complications were seen in two patients (2.2%): one had an air leak and one had persistent pneumothorax. Nine patients (10%) were referred to an advanced medical center after the first intervention was performed due to severe hemorrhagic drainage from the thoracic tube in six, persistent pneumothorax in one, and prolonged air leak in one patient. One patient was referred to a center with a cardiovascular surgery clinic due to popliteal artery injury. Feedback reports revealed that three patients with a high level of drainage were treated by thoracotomy, while others were treated non-surgically, and all of them were discharged in a good condition. The mean hospital stay and mean time to the removal of extubation, excluding the previously referred nine patients and three death events, in the early period, were 5.1 (range: 2 to 14) and 3.4 (range: 1 to 7) days, respectively.

Table 6. Causes for laparotomy

| Laparotomy | Operations | n | % |
|----------------------------------|--|----|----|
| Splenic and diaphragmatic injury | Splenorrhaphy (n=2), Splenectomy (n=3), diaphragm repair (n=5) | 5 | 6 |
| Liver injury | Primary repair | 4 | 5 |
| Small bowel injury | Primary repair | 3 | 3 |
| Bladder injury | Primary repair | 1 | 1 |
| Stomach injury | Primary repair | 1 | 1 |
| Colon injury | Primary repair | 1 | 1 |
| Total | | 15 | 17 |

DISCUSSION

Mortality and morbidity are high in blunt or penetrating thoracic trauma with a mortality rate of approximately 4 to 20% of all thoracic trauma cases (1). Thoracic trauma is the third most common type of trauma, following head and extremity trauma (2,3). Blunt and penetrating traumas cause other organ injuries in 75% of the cases, which substantially increase the rates of mortality and morbidity (2). In the literature, the rates of penetrating and blunt trauma have been reported to be variable. Leblebici et al. (4) reported an incidence of penetrating trauma of 63.3%. However, blunt trauma was reported to be more common in several studies, while penetrating trauma accounted for 30% of the cases (5,6). The incidence of blunt and penetrating trauma was also reported to be 58.7 to 75.8% and 24.1 to 41.3%, respectively (4, 7-10). In this present study, 25 patients (28.1%) had blunt and 64 patients (71.9%) had penetrating trauma. The different rates of penetrating and blunt trauma in our study are mostly due to socioeconomic status and the proximity of the research area to a region with busy roads.

In addition, thoracic traumas have been reported to occur more frequently in men (4, 8, 9). Consistent with this finding, 82 patients (92%) were males in our study.

Furthermore, the most frequent bone pathologies accompanying thoracic traumas are single or multiple rib fractures. Other than rib fractures, clavicle, scapula, and sternal fractures have been also reported (8, 9). Although sternal fractures are rare, the risk of cardiac injury is increased in those cases, particularly in the presence of rib fractures (11). Similarly, in the present study, rib fractures were the most common bone pathology. We also found cardiac injury in two patients. In both patients, the etiological cause was penetrating injury, but not blunt trauma.

The rupture of the diaphragm is seen principally on the left side due to the sudden increase in the intra-abdominal pressure (12, 13, 14). Five patients (6%) had diaphragmatic injury in this present study, and all were repaired using an abdominal approach.

Hessani et al. (15) and Martin et al. (16) reported the duration of hospital stay in patients who underwent thoracic tube placement to be 4.1 days and 10.4 days, respectively. Removal of the tube was reported to be after 5.9 and three days by Martin et al. (16), and Younes et al. (17), respectively. In this present study, the mean hospital stay and mean duration until extu-

bation was 5.1 days and 3.4 days, respectively. Complications of tube thoracostomy include persistent air leak, persistent pneumothorax, recurrent pneumothorax, and non-functioning tube. In several studies, the rate of complications was reported to vary between 4.8 and 30% (16-20), consistent with our study findings (2.2%). Duration of the removal of the tube, length of hospital stay, and development of complications related with the thoracic tube have been associated with the severity of the injury. The specialty of the health professional, such as a surgeon or an emergency medicine physician, inserting the thoracic tube, and the team transporting the patients have been also implicated in the development of complications (16).

In a study reported by general surgeons, 110 patients with thoracic trauma were evaluated and 14 complications (12.7%) were seen where procedures beyond tube thoracostomy were also undertaken by general surgeons alone, which resulted in higher complication rates, compared to our study (21).

According to Ball et al. (22), complications might vary depending on the training disciplines. The rates of complications in general surgery, internal and family medicine, other surgical disciplines and emergency medicine were 7%, 13%, 25%, and 40%, respectively.

Bevis et al. (23) also suggested reported that complication rates decreased from 12% to 8%, when surgeons with advanced practice skills followed the patients, rather than trauma surgeons.

In another study supporting the previous one, Etoch et al. (19) showed that the rate of complication was 6% in patients treated by thoracic surgeons, while it was 13% in patients followed by emergency physicians. Moreover, they suggested that referring all patients to a thoracic surgeon resulted in a complication rate of 38%.

The results of our study were beyond what we expected, compared to previous studies. We consider that reduced durations of hospitalization, time to extubation, and complication rates might all be due to the fact that patients with severe injuries were referred to more advanced centers.

In addition, extremity fractures have been reported to be the most common among the extra-thoracic pathologies (50 to 54%). Head trauma (27.4 to 44%) and abdominal injuries (13.7 to 21%) are among the other commonly seen extra-thoracic

pathologies (24, 25). However, these rates were found to be lower in this present study. The most common extra-thoracic pathology was abdominal injury (19%). Extremity fractures were seen in 17%, while head trauma was seen in 3% of the patients. The most common injury was splenic damage among the patients requiring laparotomy. Appropriate interventions were performed in patients with intra-abdominal injuries.

On the other hand, no mortality was seen in any patients with thoracic trauma who underwent tube thoracostomy in the present study. We consider that the most important cause for this result is the timely diagnosis of patients with severe injury and timely initial interventions and appropriate referrals to advanced centers. The motto of a general surgeon should be, therefore, not to refer every patient to tertiary centers and not to delay in referral meanwhile in selected cases to achieve acceptable rates of mortality and morbidity.

CONCLUSION

In conclusion, approaches to thoracic trauma should be well-known by all general surgeons and necessary emergency interventions should be performed as a matter of urgency. It is also essential to correctly select patients who are in need of a timely and appropriate referral to a tertiary center to reduce the rate of mortality and morbidity.

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