Case study

Hemothorax due to transdiaphragmatic liver penetrating injury caused by broken knife.

ABSTRACT

Thoracic trauma is one of the most fatal cases of patients admitted to emergency departments. Thoracic trauma occurs in 20–25% of all trauma patients worldwide and is the third cause of trauma-related deaths. Approximately 5% of trauma admissions are liver injuries. In some blunt or penetrating injuries, both intrathoracic and intra-abdominal organs may be injured. It is aimed to present the case of a broken knife entering from the right paravertebral location, causing hemothorax as a result of diaphragm and liver injury without injuring the lungs, due to the importance of the multidisciplinary approach among surgical departments in the study.

A 44-year-old male patient was admitted to the emergency department due to penetrating injury. An oblique injury of approximately 5 cm was seen in the posterior part of the right hemithorax. Radiologically, It was detected that the knife, which entered through the 10th intercostal space, was stuck inside and the knife handle was broken. It was observed that the broken blade entered from the paravertebral region, passed into the intrathoracic area, causing hemothorax, and passed from the edge of the inferior vena cava and embedded itself in the liver. Multidisciplinary operation planning was made among the departments. All department surgeons were present in the operating room at the same time. The paravertebral space was assessed and the embedded blade was slowly withdrawn by the neurosurgeon. Explorative laparotomy was done by the general surgeon and gastroenterology surgeon. Transdiaphragmatic injury was evaluated by the thoracic surgeon and major vascular structures were evaluated by the cardiovascular surgeon. In the postoperative period, the patient was discharged on the 5th postoperative day with full recovery without any complications.

Penetrating trauma is one of the most fatal cases of patients admitted to emergency departments. In some cases, intrathoracic and intra-abdominal penetrating injury may occur together, rarely from a single entrance location. The timing of critical intervention varies depending on whether the patient's vitals are stable or unstable. If the hemodynamics are stable in penetrating injuries, all affected anatomical structures should be evaluated with radiological examinations. For successful, uncomplicated surgical treatments, controlled techniques, interdepartmental consensus and, when necessary, simultaneous presence of surgeons in the surgery are essential.

Keywords:*broken knife, hemothorax, liver, multidisciplinary, surgery*

INTRODUCTION

Thoracic trauma is one of the most fatal cases of patients admitted to emergency departments. Although the majority of these traumas are blunt, there is an increase in penetrating injuries.Thoracic trauma occurs in 20–25% of all trauma patients worldwide and is the third cause of trauma-related deaths [1]. The most common consequences of thoracic trauma are rib fractures, pulmonary contusion, diaphragmatic injuries, pneumothorax and hemothorax [2]. Approximately 5% of trauma admissions are liver injuries. The liver is the most frequently injured intra-abdominal organ in both blunt and penetrating injuries [3]. In some blunt or penetrating injuries, both intrathoracic and intra-abdominal organs may be injured. It is aimed

to present the case of a broken knife entering from the right paravertebral location, causing hemothorax as a result of diaphragm and liver injury without injuring the lungs, due to the importance of the multidisciplinary approach among surgical departments in the study.

CASE REPORT

A 44-year-old male patient was admitted to the emergency department due to penetrating injury. An oblique injury of approximately 5 cm was seen in the posterior part of the right hemithorax. It was detected that the knife, which entered through the 10th intercostal space, was stuck inside and the knife handle was broken. A Computed Tomography (CT) scan was performed immediately after fluid replacement. It was observed that the broken blade entered from the paravertebral region, passed into the intrathoracic area, causing hemothorax, and passed from the edge of the inferior vena cava and embedded itself in the liver in CT (Fig 1). A right thorax tube was placed and 700 cc was drained. The patient was admitted to intensive care. Multidisciplinary operation planning was made among the departments of neurosurgery, thoracic surgery, general surgery, gastroenterology surgery, and cardiovascular surgery. All medical and technical requirements for possible complications were completed. The decision for together elective surgery was made. All department surgeons were present in the operating room at the same time. Explorative laparotomy was done by the general surgeon and gastroenterology surgeon. Transdiaphragmatic injury was evaluated by the thoracic surgeon and major vascular structures were evaluated by the cardiovascular surgeon. It was planned to detect possible intrathoracic bleeding by placing the right thorax tube at the base. No active bleeding was seen. The paravertebral space was assessed and the embedded blade was slowly withdrawn by the neurosurgeon. Simultaneously, liver bleeding area compression was provided within the abdomen (Fig 2).The bleeding of the liver was stopped and then repaired. The patient was extubated and taken to intensive care. Hemodynamic stabilization was observed and the patient was admitted to the thoracic surgery ward on the 3rd postoperative day. After mobilization and pulmonary rehabilitation, the thorax tube was removed. The patient was discharged on the 5th postoperative day with full recovery without any complications Fig 3).

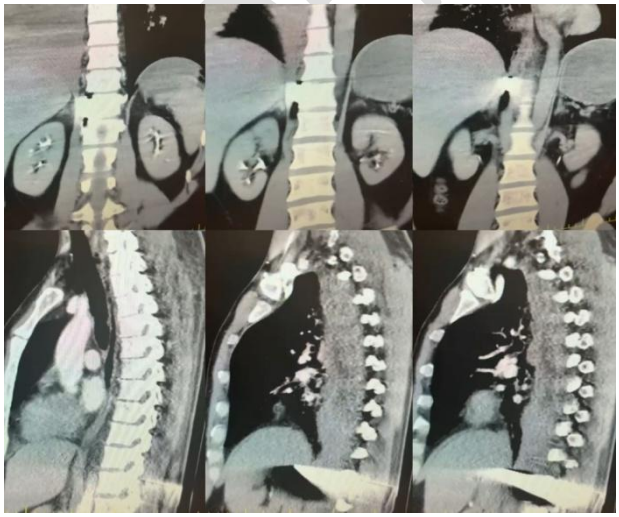

Fig 1: Images of Computed Tomography

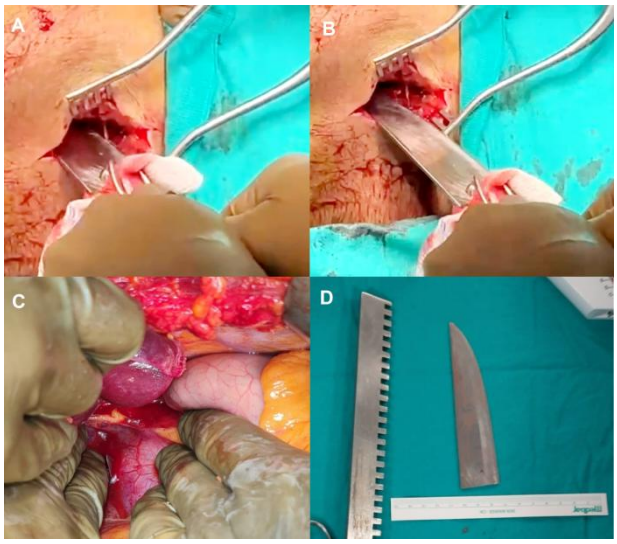

Fig 2: A,B; Image of foreign body removal C; Image of simultaneous laparotomy
D; Image of broken knife

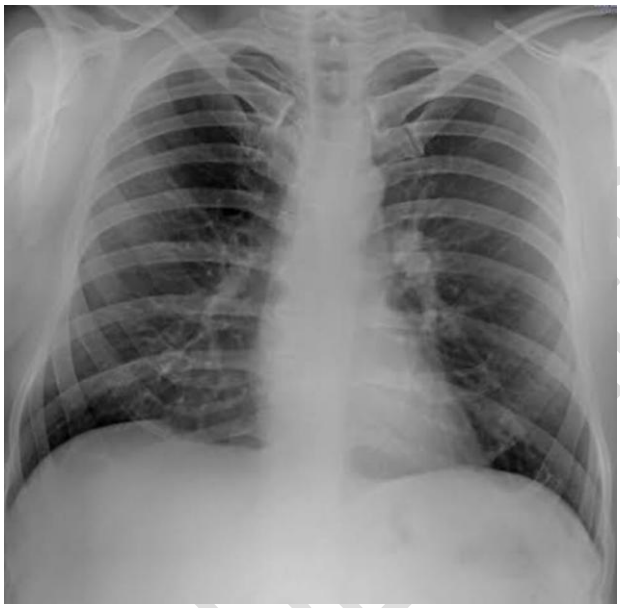
Fig 3: Chest radiography of the patient at discharge

DISCUSSION

Injuries to the liver are one of the fatal injuries in trauma patients. While exploratory laparotomy was previously performed, it can now be followed. When determining treatment planning, anatomical structures, hemodynamic status and other accompanying injuries are taken as basis [4]. Non-surgical treatment is only possible with hemodynamic stability. It was reported 94% of the patients had blunt liver injuries and 4% had penetrating liver injuries in a study [5]. It was determined that the broken blade had advanced from the paravertebral area and was embedded in the liver in our case. Radiologically, it was seen that it injured the intercostal space, pierced the diaphragm and proceeded to the liver from there. Foreign objects in thoracic injuries may include firearms, broken glass or metal products [6]. Thoracic penetrating injuries are an extremely challenging situation for emergency physicians and thoracic surgeons. Because it has a high mortality rate due to the critical anatomical structures located in this area [7]. Therefore, it requires very rapid evaluation and multidisciplinary intervention. If the patient's vital signs are stable and critical surgical intervention will not be

delayed, radiological examination should be performed first [8]. In our case, right hemothorax was detected and vital signs were stable. Computed Tomography (CT) was performed for major vascular evaluation and to determine which anatomical structures were injured by the broken blade. On examination, it was seen that the broken blade touched the inferior vena cava. Upon examination, it was observed that the broken knife contacted the inferior vena cava, passed through the intercostal space close to the medulla spinalis, injured the diaphragm, contacted the lung, and embedded itself in the liver. Since no contrast extravasation from major vascular structures was observed, a right tube thoracostomy was performed. There was 800 cc hemorrhagic drainage and it was observed that it continued as leakage. Simultaneously, the patient was examined by general surgery, neurosurgery and cardiovascular surgery physicians. An interdepartmental consensus was quickly planned, and it was decided that all physicians would operate at the same time. All possible complications during the removal of the broken blade were determined. It was proven that the neural anatomical structures were intact during the removal of the broken blade. During the removal of the broken blade, it was proven that the neural anatomical structures were intact, there was no bleeding from the inferior vena cava, and the bleeding originated from the intercostal structures, diaphragm and liver. Compression was applied to active bleeding originating from the liver and diaphragm. The patient's liver and diaphragm were repaired without any major blood loss. The patient was extubated and the surgery was completed successfully. Approximately 75% of trauma-related deaths are accompanied by thoracic injuries [9]. Therefore, in these injuries, a good physical examination and optimum radiological examinations should be performed if the vital signs are stable. In unstable penetrating thoracic injuries, critical intervention should be performed without wasting time with imaging. In these cases, tube thoracostomy and/or emergency exploratory thoracotomy is performed [10]. Emergency laparotomy is a similarly high-risk procedure. Its perioperative management is challenging and is associated with high mortality worldwide [11]. Therefore, if the patient is hemodynamically stable, surgery is adopted if necessary after conservative treatment. In penetrating injuries, it is essential to evaluate all anatomical structures related to localization.

CONCLUSION

Penetrating trauma is one of the most fatal cases of patients admitted to emergency departments. In some cases, intrathoracic and intra-abdominal penetrating injury may occur together, rarely from a single entrance location. The timing of critical intervention varies depending on whether the patient's vitals are stable or unstable. If the hemodynamics are stable in penetrating injuries, all affected anatomical structures should be evaluated with radiological examinations. For successful, uncomplicated surgical treatments, controlled techniques, interdepartmental consensus and, when necessary, simultaneous presence of surgeons in the surgery are essential.

Ethical Approval

As per international standard or hospital standard written ethical approval has been collected and preserved by the author(s).

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