



Penetrating Thoracoabdominal Trauma in a Patient with Situs Inversus Totalis: A Case Report and Review of the Literature

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ABSTRACT

Introduction: Situs inversus totalis is a rare congenital anomaly in which the thoracic and abdominal organs are located in mirror positions compared to their usual anatomical locations. Trauma in a patient with situs inversus totalis is unexpected in daily emergency and surgical settings.

Case Report: We present the case of a 36-year-old male patient who had multiple stab wounds to the thoracoabdominal region, and situs inversus totalis was coincidentally diagnosed. We detected diaphragmatic laceration with gastric perforation and repaired it primarily.

Conclusion: This anatomic anomaly could be challenging for acute care surgeons during surgical management if it is not preoperatively recognized. We also reviewed and presented identifying characteristics of trauma patients with situs inversus totalis in the literature.

Keywords: Situs inversus, trauma, wounds, penetrating

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Introduction

The standard and unique asymmetrical arrangement of thoracic and abdominal organs and major vessels is defined as situs solitus, and failure to establish situs solitus causes internal lateralization abnormalities including situs ambiguus (also known as heterotaxy) and situs inversus totalis (1). Situs inversus totalis (SIT) is a congenital anomaly in which the thoracic and abdominal organs are located in mirror positions compared to their standard locations. SIT is a very rare entity and is known since the 17th century, and its prevalence is approximately 1 in 10,000–20,000 individuals (1, 2). We present the diagnosis and management of a penetrating thoracoabdominal trauma in a patient with SIT.

Case report

A 36-year-old man was stabbed with a knife and was brought to the emergency department by his car 30 min later. He had no remarkable medical history. On examination, the patient was dyspneic, but he was hemodynamically stable. There were two stab wounds; one was 3×2 cm in size in the upper right quadrant and the other was 2×2 cm in size between the right ninth and tenth intercostal space. His abdomen was rigid, and upper right quadrant was tender; his laboratory findings were unremarkable. In the first chest X-ray evaluation, hemothorax was detected (Figure 1a), and tube thoracostomy was immediately performed. Thoracoabdominal computed tomography (CT) scan performed after negative focused abdominal sonography for

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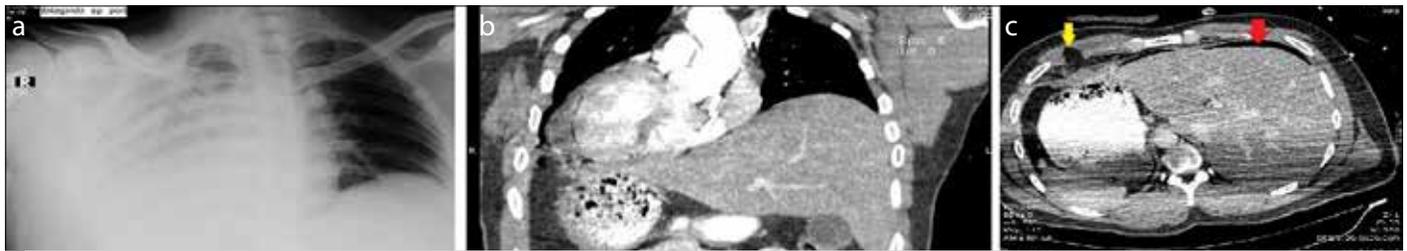


FIGURE 1. a-c. Chest X-ray (a) indicates right side hydrothorax. A section of coronal plane thoracoabdominal CT (b) shows situs inversus totalis. A section of transverse plane thoracoabdominal CT (c). The trajectory of the stab wound is shown with a yellow arrow. Free air is present at the anterior of the liver. That is shown by a red arrow

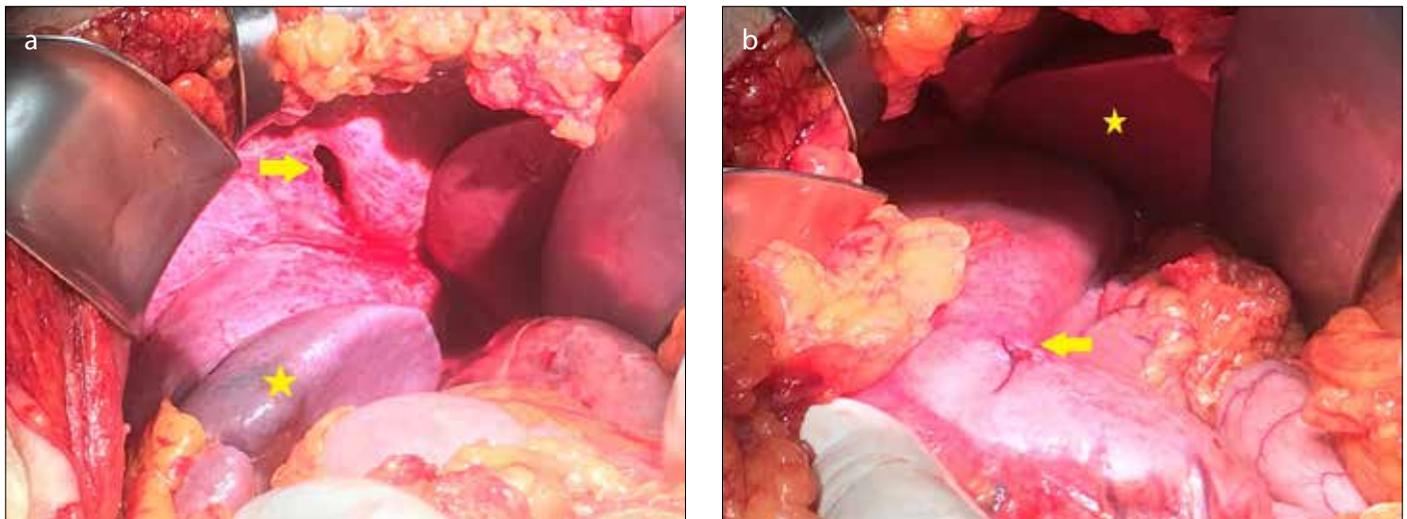


FIGURE 2. a, b. Intraoperative view of the diaphragm. A diaphragmatic laceration is shown with an arrow, and right-sided spleen is shown with a five-point star (a), intraoperative view of repaired gastric perforation is shown with an arrow, and left-sided liver is shown with a five-point star (b)

trauma patient (FAST) revealed SIT, right hemothorax with suspected diaphragm laceration, and viscus perforation (Figure 1b, c). After additional echocardiography assessment for minor cardiac injury besides FAST because of dextrocardia, explorative laparotomy was performed. Diaphragm laceration and gastric anterior wall perforation were revealed by explorative laparotomy and primarily repaired (Figure 2). His postoperative period was uneventful, and he was discharged on the sixth postoperative day. The 3-month follow-up period was also uneventful.

Informed written consent was obtained from the patient for his clinical records to be used in this report.

Discussion

Penetrating thoracoabdominal trauma can lead to complex and life-threatening clinical conditions due to injury mechanism. It can be caused by high kinetic energy with large caliber firearms in combat zones and low kinetic energy with gunshot or stab wounds in the civilian population (3, 4). Management of a patient with penetrating torso trauma is directly associated with the patient's hemodynamic condition; a hemodynamically stable patient with penetrating trauma and absence of evisceration and peritonitis signs could be observed and evaluated by serial physical examinations and imaging techniques, such as ultrasound and CT (5).

Assessment of diaphragm and recognition of diaphragm laceration is another essential point in penetrating thoracoabdominal trauma. Repairing of any diaphragm laceration, irrespective of the size and location of the injury, is pivotal to diaphragm lacerations. A missed small tear will become wider and larger in the course of time, which can lead to a diaphragmatic hernia due to intraabdominal pressure being higher than intrathoracic pressure (6, 7). We did not delay laparotomy because of peritonitis signs, such as rigidity and tenderness of the abdomen, and because CT indicated free air in the abdomen and suspicious diaphragm injury.

Many genes are responsible for the left-right development pathway in the human embryo, and any mutation of these genes causes left-right asymmetrical disorders such as heterotaxy and SIT. The inheritance pattern of SIT could be autosomal recessive or X-linked (1, 8).

There is considerable knowledge about elective surgery in patients with SIT in the literature, but to the best of our knowledge, this is the first case report of penetrating thoracoabdominal trauma in a patient with SIT from Turkey. We searched for terms such as "situs inversus totalis" and "trauma" in the MEDLINE, Scopus®, EMBASE, and DOAJ databases for case reports of humans published up to September 2016 in the English language (9-22). However, we did not find any retrospective or prospective study. We have reviewed and summarized

Table 1. Demographic variables and injury types in patients

Age	Gender	Trauma Type	Specific Injury	Reference
36	M	Penetrating	Diaphragm laceration, gastric perforation	Recent Case
27	M	Penetrating	Hemothorax	(9)
24	F	Blunt	Splenic injury	(10)
40	M	Penetrating	Diaphragmatic, gastric, splenic, and pancreatic laceration	(11)
18	M	Blunt	Splenic rupture	(12)
29	M	Blunt	Ileal perforation	(13)
24	M	Blunt	Aortic injury and multiple fractures	(14)
29	M	Blunt	Hemothorax, diaphragm rupture, and clavicular fracture	(15)
53	M	Blunt	Jejunal perforation and hemothorax	(16)
60	M	Blunt	Diaphragmatic rupture	(17)
20	F	Blunt	Splenic rupture	(18)
57	M	Blunt and Penetrating	Aortic dissection	(19)
25	M	Blunt	Aortic, splenic, and diaphragmatic rupture	(20)
25	M	Blunt	Diaphragm and liver laceration	(21)
27	M	Blunt	Femur fracture and mesenteric tear	(22)
22	M	Blunt	Subarachnoid hematoma and clavicular fracture	(22)

M: male; F: female

the results in Table 1. After excluding pediatric patients, we found a total of 16 trauma patients with SIT in the literature. The average age was 32.25 ± 13.32 years (range, 18–60 years). The male to female ratio was 14/2 (87.5% vs 12.5%). The majority of cases were blunt trauma (75%), three (18.8%) were penetrating trauma, and one (6.2%) was mixed-type trauma. Mortality was not reported among these cases. Furthermore, the number of patients with one and more than one organ injury was 7 (43.8%) and 9 (56.2%), respectively.

A patient with SIT could have some anatomical and physiological abnormalities, even more, organ locations in the mirror position such as right-sided cardium, left-sided spleen etc.. Anatomical abnormalities in patients with SIT may primarily include cardiovascular abnormalities, such as atrial or ventral septal defects, and great vessel transpositions in addition to physiological abnormalities, including ciliary dysfunction in the respiratory system (1, 23). These abnormalities can lead to more complex problems in patients with multiple traumas who already have multiple injuries.

In addition, SIT may result in challenges for surgeons due to adaptation to different locations of an anatomical structure during the dissection, especially in laparoscopic procedures. Bajwa et al. (24) reported that surgery performed in a patient with SIT had prolonged the postoperative apnea period. This and such similar instances indicate that anesthesiologists also need to prepare themselves for variations or abnormalities.

Conclusion

We presented an extremely rare case of a penetrating thoracoabdominal injury in a patient with SIT. Acute care surgeons and emer-

gency physicians should take into account and recognize this clinical condition.

Informed Consent: Written informed consent was obtained from patient who participated in this study.

Peer-review: Externally peer-reviewed.

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