



Missed diagnostic clues and intraoperative discovery of situs inversus totalis in an adult trauma patient: A case report

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Abstract

Situs inversus totalis is a rare congenital anomaly that may remain undetected until imaging or surgery. We report a previously healthy 50-year-old male twin who presented with polytrauma and haemodynamic instability after a road traffic collision. He had left pneumohaemothorax, blunt abdominal trauma with peritonitis, and a closed right femoral fracture. The patient's haemodynamic instability and the need for urgent resuscitation and surgical intervention limited the time available for a complete preoperative assessment, while incorrect left–right labelling of the chest radiograph obscured recognition of dextrocardia.

At laparotomy, mirror-image abdominal anatomy was discovered incidentally, with the spleen on the right and the liver, gallbladder, and appendix on the left. The spleen was shattered, and a jejunal perforation was also identified. Right-sided splenectomy, jejunal repair, and incidental appendicectomy were performed. Postoperative imaging confirmed dextrocardia, and recovery was uneventful. This case highlights the importance of correct radiographic labelling, focused examination, and intraoperative adaptability when unexpected anatomy is encountered.

Keywords: Situs inversus totalis; blunt abdominal trauma; dextrocardia; focused assessment with sonography for trauma; emergency laparotomy

Introduction

Situs inversus totalis is a rare congenital anomaly, reported in approximately 1 in 5,000–20,000 individuals^{1,2}. It is characterised by complete right-to-left reversal of the thoracic and abdominal organs and is commonly associated with dextrocardia¹. Many affected individuals remain asymptomatic and may be unaware of the condition throughout life; consequently, it is often discovered incidentally during imaging or surgery^{1,2}. Situs inversus totalis has also been reported in twins, but published cases show that it may be discordant even in monozygotic twin pairs³.

In trauma care, the anomaly may be particularly easy to miss. Resuscitation and control of life-threatening bleeding appropriately take priority, and haemodynamic instability may preclude preoperative imaging or a complete physical examination⁴. Subtle clinical clues, such as a displaced

cardiac apex, may therefore go unnoticed¹. Radiographic labelling errors can add a further layer of confusion when anatomy is atypical^{5,6}.

We present a case of situs inversus totalis discovered unexpectedly during emergency laparotomy for blunt abdominal trauma in a polytraumatised male twin. The case highlights how

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urgent trauma care, missed bedside clues, and imaging pitfalls can combine to delay recognition of an important congenital anatomical variant, and underscores the need for vigilance when findings do not fit expected anatomy.

Case presentation

A 50-year-old male twin and commercial motorcyclist presented to the accident and emergency department four hours after a collision with a fast-moving oncoming vehicle. He reported right-sided upper abdominal pain, progressive abdominal distension, left-sided chest pain, and pain in the right thigh.

On presentation to our facility, he was fully conscious, with a Glasgow Coma Scale score of 15/15, but was pale, diaphoretic, tachycardic, and hypotensive. Chest examination showed reduced expansion of the left hemithorax, decreased air entry, stony dullness to percussion over the left lower chest, and hyperresonance over the upper zone, in keeping with left pneumohaemothorax. Abdominal examination revealed distension, generalised tenderness, and guarding, consistent with blunt abdominal trauma complicated by peritonitis. Examination of the right lower limb showed thigh swelling, deformity, and tenderness, consistent with a closed right femoral fracture; the limb was splinted at presentation. His packed cell volume was 17%, supporting significant blood loss. Resuscitation was started immediately because of haemodynamic instability. Given the circumstances, a complete cardiovascular examination, including localisation of the cardiac apex, was not performed, and no imaging was obtained before chest tube insertion.

A left-sided chest tube was inserted for the pneumohaemothorax. A chest radiograph obtained after tube thoracostomy was incorrectly labelled left/right. Although it showed lung re-expansion, the mislabelling prevented recognition of dextrocardia (Figure 1).

Given persistent hypotension and signs of intra-abdominal bleeding, the patient was taken for emergency exploratory laparotomy. FAST was not performed because bedside ultrasonography was unavailable in the emergency department, and transfer to the radiology department would have delayed definitive surgical management of this



Figure 1. Chest radiograph after left-sided chest tube insertion, showing lung re-expansion. Incorrect left-right labelling obscured recognition of dextrocardia.

haemodynamically unstable patient.

Intraoperative Findings

At laparotomy, approximately 2.5 L of haemoperitoneum was encountered. The operative field then revealed unexpected mirror-image anatomy: the spleen was shattered and located on the right, the liver and gallbladder were on the left, the appendix was in the left iliac fossa, and a 1-cm jejunal perforation was present on the antimesenteric border about 80 cm from the duodenojejunal junction (Figures 2-4). The cardiac impulse was also palpable on the right, in keeping with dextrocardia.

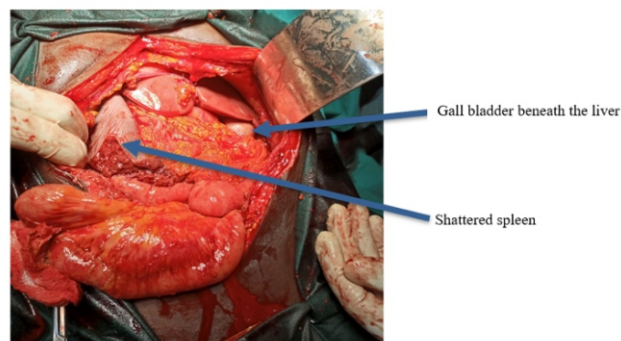
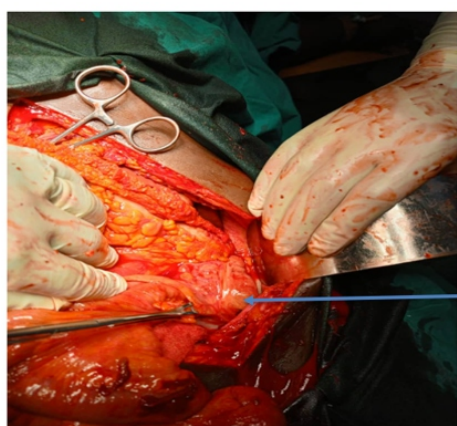


Figure 2. Intraoperative image showing the injured right-sided spleen, with the gallbladder on the left.



Caecum with
appendix held by
Babcock forceps

Figure 3. Intraoperative image showing the caecum and appendix on the left.



Jejunal perforation

Figure 4. Intraoperative image showing the jejunal perforation.

Operative Management

Operative treatment consisted of right-sided splenectomy, primary repair of the jejunal perforation, and incidental appendectomy, corresponding to the findings shown in Figures 2–4. The appendix was removed because it was left-sided; this was considered reasonable to avoid future diagnostic confusion should appendicitis occur. The abdomen was thoroughly irrigated and closed.

Postoperative Course

A correctly labelled postoperative chest radiograph – this time with the marker placed before exposure – confirmed dextrocardia and mirror image thoracic anatomy (Figure 5).

Open reduction and internal fixation (ORIF) was performed later after the patient had stabilized.

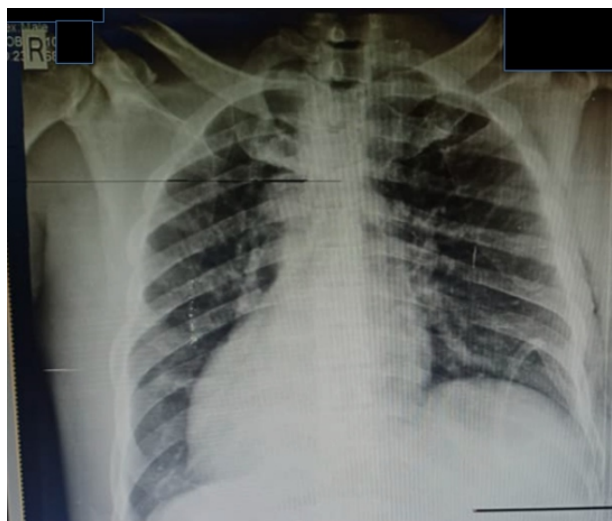


Figure 5. Correctly labelled postoperative chest radiograph confirming dextrocardia and mirror-image thoracic anatomy

The patient recovered uneventfully and was discharged in stable condition. He was counselled on postsplenectomy care and received the scheduled vaccines, including protection against encapsulated organisms and annual influenza vaccination in line with current asplenia management protocol^{7,8}.

Discussion

This case reflects a practical problem in trauma surgery: a clinically important congenital anomaly may remain completely unsuspected until the abdomen is opened. Situs inversus totalis is usually compatible with normal life and may cause no symptoms, but in an emergency, it becomes highly relevant because clinical signs, radiographic interpretation, and operative orientation are all based on expected anatomy^{1,2}. In this patient, the immediate priority was resuscitation and control of haemorrhage, and this contributed to the diagnosis being missed before laparotomy.

Several features explain the delayed recognition. The patient was unstable, so preoperative abdominal imaging was not feasible. The urgent need for tube thoracostomy and emergency laparotomy also limited the time available for a complete cardiovascular examination. As a result, the displaced cardiac apex, which could have suggested dextrocardia, was not identified. The chest radiograph obtained after the closed tube thoracostomy compounded the problem because it

was incorrectly labelled, despite showing lung re-expansion (Figure 1). This reinforces a simple but important safety point: anatomical side markers should be placed correctly before exposure, since laterality errors can mislead clinicians when the patient's anatomy is unusual^{5,6}.

The case also supports a disciplined approach to trauma assessment, even when decisions must be made quickly. Life-saving intervention should not be delayed in an unstable patient, but a focused examination can still yield useful information^{4,9}. Locating the cardiac apex, reviewing chest findings carefully, and remaining alert to anatomical variants may help avoid assumptions based solely on usual organ positions¹.

Although the patient was a twin, chest radiography and abdominal ultrasonography of his twin sister showed normal thoracoabdominal situs. Discordance for situs inversus has previously been reported among twin pairs.³ No conclusions regarding sporadic or familial inheritance can be drawn in this case because a broader family history, genetic evaluation, and assessment for an underlying ciliopathy were not undertaken.

Point-of-care ultrasonography is especially relevant in this type of scenario. Focused assessment with sonography for trauma (FAST) can be performed rapidly at the bedside to detect free intraperitoneal, pericardial, or pleural fluid in trauma patients^{4,9}. In addition to detecting haemoperitoneum, bedside ultrasound may alert clinicians to unexpected organ orientation. In patients with situs inversus and traumatic solid-organ injury, FAST has been reported to assist in recognising both intra-abdominal injury and reversed anatomy². Wider access to FAST and basic ultrasound training for emergency and surgical teams could therefore improve early trauma assessment, particularly in resource-limited settings.

Once the abdomen was opened, the team had to reorient rapidly to mirror-image anatomy. Figures 2 and 3 show the right-sided spleen, left-sided liver and gallbladder, and appendix in the left iliac fossa, while Figure 4 shows the jejunal perforation. This reversal can complicate operative orientation during emergency laparotomy, particularly when exposure is hurried and haemorrhage control is the immediate priority. A similar Nigerian report by Olasehinde and colleagues described complete situs inversus

discovered in a polytraumatised adult after a road traffic accident; that patient also had left haemothorax, dextrocardia on chest radiography, exploratory laparotomy, and jejunal perforation repair¹⁰. Other reports of splenic injury or rupture in patients with situs inversus further emphasise the need for flexibility and heightened situational awareness when standard anatomical expectations do not apply^{11,12}.

A key implication of this case is that clinically significant anatomical variants may remain unrecognised until emergency operative intervention reveals them. When clinical, radiographic, or operative findings do not fit the expected pattern, clinicians should pause and reconsider the possibility of an anatomical variant. Correct radiographic labelling, focused bedside examination, access to ultrasound, and operative adaptability may reduce avoidable diagnostic error. In this patient, despite delayed recognition of the anomaly, timely operative management and postoperative care resulted in a good outcome.

Conclusion

Situs inversus totalis may remain undetected until trauma or another emergency brings the patient to surgery^{1,2}. In unstable patients, the lack of preoperative imaging and the constraints of urgent care can obscure the diagnosis⁴. This case underscores the importance of correct pre-exposure radiographic labelling, focused bedside examination, and readiness to adapt when intraoperative anatomy is unexpected. Surgeons involved in trauma care should acquire basic focused assessment with sonography for trauma (FAST) skills as part of early bedside assessment. With prompt recognition and appropriate management, outcomes can be favourable.

Ethical approval and consent

This case report was prepared in accordance with the principles of the Declaration of Helsinki¹³. Formal ethical approval was not required for this single case report. Informed consent was obtained from the patient for publication of this case report and accompanying images.

Conflict of interest

The authors declare no conflict of interest.

Ai assistance disclosure

AI-assisted writing tools were used to support language editing, clarity, structure, formatting, and reference consistency during manuscript preparation. No AI tool was used to generate clinical data, create or alter patient images, make diagnoses, or replace author interpretation. All clinical content, patient information, images, conclusions, and references were reviewed, verified, and approved by the authors, who take full responsibility for the integrity and accuracy of the manuscript.

References

1. Eitler K, Bibok A, Telkes G. Situs inversus totalis: a clinical review. *Int J Gen Med*. 2022;15:2437-2449. doi:10.2147/IJGM.S295444
2. Muñiz AE. Focused assessment with sonography in trauma (FAST) examination in a patient with situs inversus and splenic contusion. *Trauma Cases Rev*. 2019;5:075. doi:10.23937/2469-5777/1510075
3. Segal NL. Situs inversus totalis in twins: a brief review and a life history. *Twin Res Hum Genet*. 2017;20(1):90-95. doi:10.1017/thg.2016.101. PMID:28105968
4. Ashley JR, Burczak KW, Cotton BA, Clements TW. Management of blunt abdominal trauma. *Br J Surg*. 2024;111(7):znae168. doi:10.1093/bjs/znae168.
5. Titley AG, Cosson P. Radiographer use of anatomical side markers and the latent conditions affecting their use in practice. *Radiography*. 2014;20(1):42-47. doi:10.1016/j.radi.2013.10.004
6. Aakre KT, Johnson CD. Plain-radiographic image labeling: a process to improve clinical outcomes. *J Am Coll Radiol*. 2006;3(12):949-953. doi:10.1016/j.jacr.2006.07.005
7. Centers for Disease Control and Prevention. Adult immunization schedule by medical condition and other indication, United States, 2025 [Internet]. Atlanta: CDC; 2025 [cited 2026 Jul 23]. Available from: <https://www.cdc.gov/vaccines/hcp/imz-schedules/adult-medical-condition.html>
8. Ladhani SN, Fernandes S, Garg M, Borrow R, de Lusignan S, Bolton-Maggs PHB. Prevention and treatment of infection in patients with an absent or hypofunctional spleen: a British Society for Haematology guideline. *Br J Haematol*. 2024;204(5):1672-1686. doi:10.1111/bjh.19361
9. Bloom BA, Gibbons RC. Focused Assessment With Sonography for Trauma. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 [cited 2026 Jul 23]. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK470479/>
10. Olasehinde O, Owojuyigbe AM, Adisa AO, Awowole IO. Incidental finding of complete situs inversus in a polytraumatized adult. *Afr J Med Med Sci*. 2014;43(2):183-186. PMID:25474996
11. Kamath B, Chatterjee AS, Chandorkar I. Splenic injury in situs inversus totalis: a surgical challenge. *J Clin Diagn Res*. 2015;9(5):PD01-PD02. doi:10.7860/JCDR/2015/13376.5871
12. Khandelwal R, Chaudhary R, Kumar L, Singh M, Usurumarthi P, Singh S, et al. Splenic rupture in a patient with situs inversus. *JRSM Short Rep*. 2012;3(9):61. doi:10.1258/shorts.2012.011151
13. World Medical Association. World Medical Association Declaration of Helsinki: ethical principles for medical research involving human subjects. *JAMA*. 2013;310(20):2191-2194. doi:10.1001/jama.2013.281053