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Unique laparoscopic emergency management of traumatic obstructed abdominal wall hernia: A case report and review of literature

Arwa M. Aljuhani¹, Ghaith A. Al Saied², Arjmand Reyaz³, Mohammed A. Alkahlan⁴, Ibrahim M. Aljohani⁵, Muhammed M. Abukhater⁶

Abstract

Traumatic abdominal wall hernia (TAWH) is a rare clinical occurrence, with only limited cases published since 1906. This type of hernia is primarily caused by low- or high-energy blunt force trauma, resulting in damage to abdominal wall musculature while the skin is intact. The diagnosis and management of TAWH poses a lot of challenges and complexities. Herein, we present a case of a 32-year-old male Saudi patient who sustained significant abdominal trauma as a driver involved in a front collision while wearing a seat belt. Upon arrival at the trauma center, the patient was hemodynamically stable and exhibited clinical signs of left flank bulge, seat belt sign, and abdominal bruising. First, a focused assessment with sonography for trauma (FAST) was performed, which revealed minimal free fluid in the abdomen. Subsequent contrast-enhanced IV computed tomography (CT) scan confirmed a 3.6-cm left lateral abdominal wall defect with herniation of short segments of the large and small bowel loops and adjacent subcutaneous fluid. Following initial observation, the patient developed signs of bowel obstruction. A repeat CT scan showed interval progression of the hernia, partial small bowel obstruction, and other concerning findings. An emergency laparoscopic exploration revealed a large defect at the left lumbar region containing omentum and long segments of the small bowel with mild distension. The bowel and omentum were reduced. The surgical repair included herniorrhaphy and mesh placement. The patient recovered well and was discharged on the third postoperative day. This case underscores the importance of thorough evaluation and timely intervention in TAWHs. Rapid surgical management, aided by advanced imaging techniques, can lead to favorable outcomes even in complex cases involving bowel herniation and associated complications.

Keywords:

Computed tomography, herniorrhaphy, interval hernia repair, laparoscopy, traumatic bowel injury

Introduction

Traumatic abdominal wall hernias (TAWHs) are a rare but clinically significant presentation. The main cause of TAWH is blunt or penetrating abdominal trauma, which can cause disruption of the abdominal wall musculature and fascia.^[1] As a result of traumatic injury, the intra-abdominal contents protrude through the resulting defect. The first case

of TAWH was documented by Selby^[2] in 1906. The incidence of TAWH is around 1% of all abdominal traumas.^[3] Despite its low prevalence, its management poses unique challenges that require prompt recognition and intervention. The etiology of TAWH varies and can stem from a wide range of traumatic mechanisms including motor vehicle accidents, falls from heights, sports-related injuries, and direct blows to the abdomen.^[4] The forceful impact

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¹Department of General Surgery, King Abdulaziz Specialist Hospital, Taif, Saudi Arabia,

²Department of General Surgery and Critical Care Medicine, Riyadh,

³Department of General Surgery, Minimal Invasive Surgery, King Fahad Medical City, Riyadh,

⁴Surgical Oncology Department, King Fahad Medical City, Riyadh, Saudi Arabia,

⁵Department of General Surgery, College of Medicine, Taif University, Taif, Saudi Arabia,

⁶Surgical Oncology Department, MIS and Bariatric Surgery, King Fahad Medical City, Riyadh, Saudi Arabia

Address for correspondence:

Dr. Arwa M. Aljuhani,
Department of General Surgery, King Abdulaziz Specialist Hospital, Taif 26526, Saudi Arabia.

E-mail: arwa.4aljuhani@outlook.com

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experienced during such events can lead to the sudden elevation of intra-abdominal pressure. This pressure can lead to a breach in the weakened abdominal wall. Furthermore, the traumatic force can result in a tear in musculature, which allows herniation of organs. Often, TAWH is accompanied by intra-abdominal injuries.^[5] Gastric injury is the usual suspect after a blunt abdominal injury.^[6] The clinical presentation of TAWH is highly variable and may range from asymptomatic cases to life-threatening emergencies. Patients often present with localized pain, swelling, and a palpable mass at the site of injury. In some cases, signs of bowel obstruction or visceral compromise may also be present.^[7] The diagnosis of TAWH requires a high index of suspicion, as these hernias may not be immediately evident on initial evaluation. Advanced imaging modalities such as computed tomography (CT) scans play a crucial role in confirming the diagnosis.^[8] Management of TAWH is complex and necessitates a multidisciplinary approach. The primary treatment goal is to reduce herniated contents, closure of the abdominal wall defect, and restoration of normal abdominal anatomy.^[9] In this case report, we present a unique instance of TAWH in a male patient who sustained a high-speed road accident.

This case report presents a unique laparoscopic emergency management of a traumatic obstructed abdominal wall hernia. The management approach in this case was guided by the patient's worsening clinical condition and the need for prompt intervention. The successful outcome of this laparoscopic approach highlights its potential in the treatment of TAWHs and associated complications. The case also emphasizes the importance of utilizing imaging modalities such as CT scans in the diagnosis and operative planning of these hernias.

Case Report

A 32-year-old male Saudi patient was brought to our trauma center by Emergency Medical Services following a high-speed road traffic accident involving a frontal collision. The patient was wearing a seat belt while driving. His medical history revealed no chronic illnesses. Upon arrival, he was hemodynamically stable, with a heart rate of 111 beats/min, blood pressure of 177/99, and a temperature of 36°C. In addition to other injuries, he had a left flank bulge, seat belt sign, and skin bruising over the lower abdomen and left flank, with no signs of peritonitis. Focused assessment with sonography for trauma (FAST) in the emergency department revealed mild free fluid in Morrison's pouch.

Laboratory investigations revealed the following results: a white blood cell (WBC) count of 18.70, hemoglobin (HGB) level of 15.5, hematocrit (HCT) of 46, and platelet

count of 394. A contrast-enhanced IV CT scan of the abdomen and pelvis showed a 3.6-cm defect in the left lateral abdominal wall. This defect contained small segments of the large and small bowel loops, along with adjacent subcutaneous fluid. The herniated bowel loops exhibited slightly increased wall enhancement. There was no dilatation observed in the proximal bowel loops, and there was no presence of pneumatosis intestinalis.

The patient was admitted for observation and underwent a CT scan with oral contrast, which showed no signs of bowel obstruction. The initial plan was to proceed with interval hernia repair. However, after 5 days, the patient displayed symptoms of bowel obstruction. Therefore, a repeat contrast-enhanced CT scan with IV and oral contrast was performed. The repeat scan revealed an increase in the size of the left lumbar hernia, measuring 6 cm, with a large defect in the left abdominal wall. Within this defect, dilated small bowel loops measuring up to 3.3 cm were observed at the hernial neck, indicating partial small bowel obstruction. The fat stranding was also present. Additionally, there was an increase in the size of the left subcutaneous abdominal wall hematoma and left psoas hematoma, but no active bleeding was detected. Furthermore, there was a worsening of the pelvic hemoperitoneum and the development of perihepatic free fluid [Figure 1].

The plan for emergency laparoscopic exploration and hernia repair was implemented. After obtaining informed consent, the patient underwent exploratory laparoscopy at 1:00 PM for a duration of two hours. Intraoperative findings revealed a large defect of approximately 6–7 cm in the left lumbar area, containing omentum and long segments of small bowel with mild distention. The bowel and omentum were carefully reduced back into the peritoneal cavity [Figure 2]. The defect was repaired with interrupted sutures using Proline 1 by endo-closure. Subsequently, an intraperitoneal dual mesh measuring 25 cm × 20 cm was fixed using Securestrap tacker (Proceed TM Surgical Mesh of J&J MedTech). The patient recovered without complications and was discharged in good condition on the third postoperative day after successfully tolerating an oral diet.

Two weeks after the operation, the patient presented to the emergency department with complaints of abdominal pain. On examination, their vital signs were stable, and the abdomen was soft and not distended, although there was mild tenderness on the left side. Laboratory investigations revealed a WBC count of 16.20, an HGB level of 15.6, an HCT level of 47, and a platelet count of 672. A contrast-enhanced CT scan of the abdomen and pelvis showed a fluid collection measuring 4 cm × 6 cm × 10 cm along the lateral abdominal wall, with adjacent subcutaneous fat stranding. There was

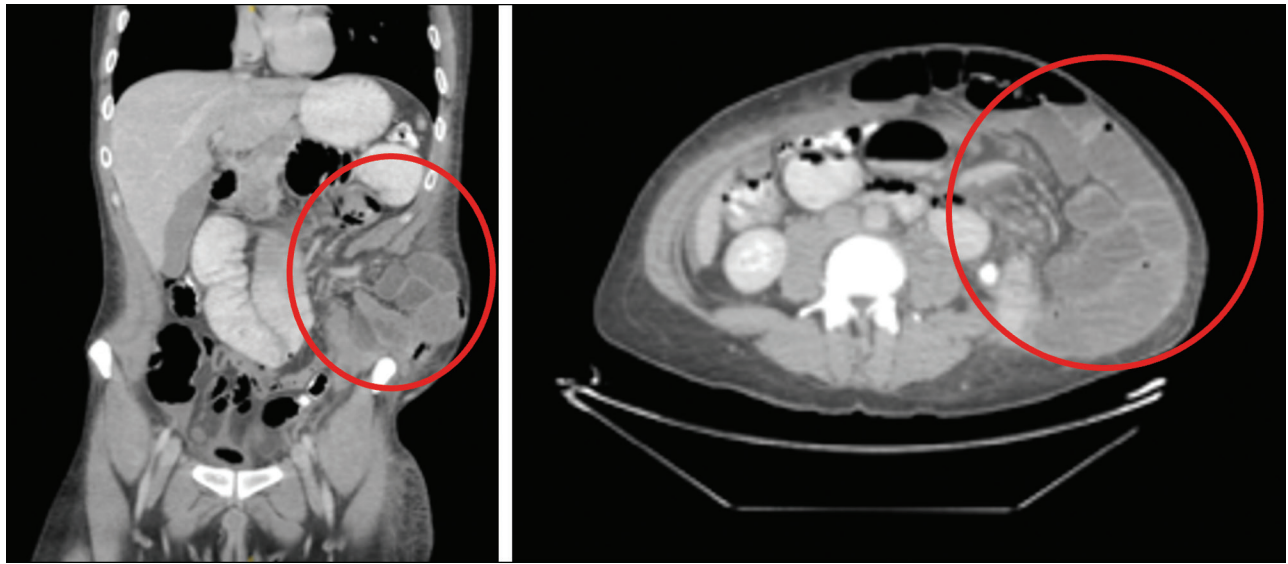


Figure 1: Pre-operative CT with oral contrast (partial SBO): Large left-sided abdominal wall defect 6 cm long containing small bowel loops dilated up to 3.3 cm in the transitional zone at the hernial neck and causing partial small bowel obstruction

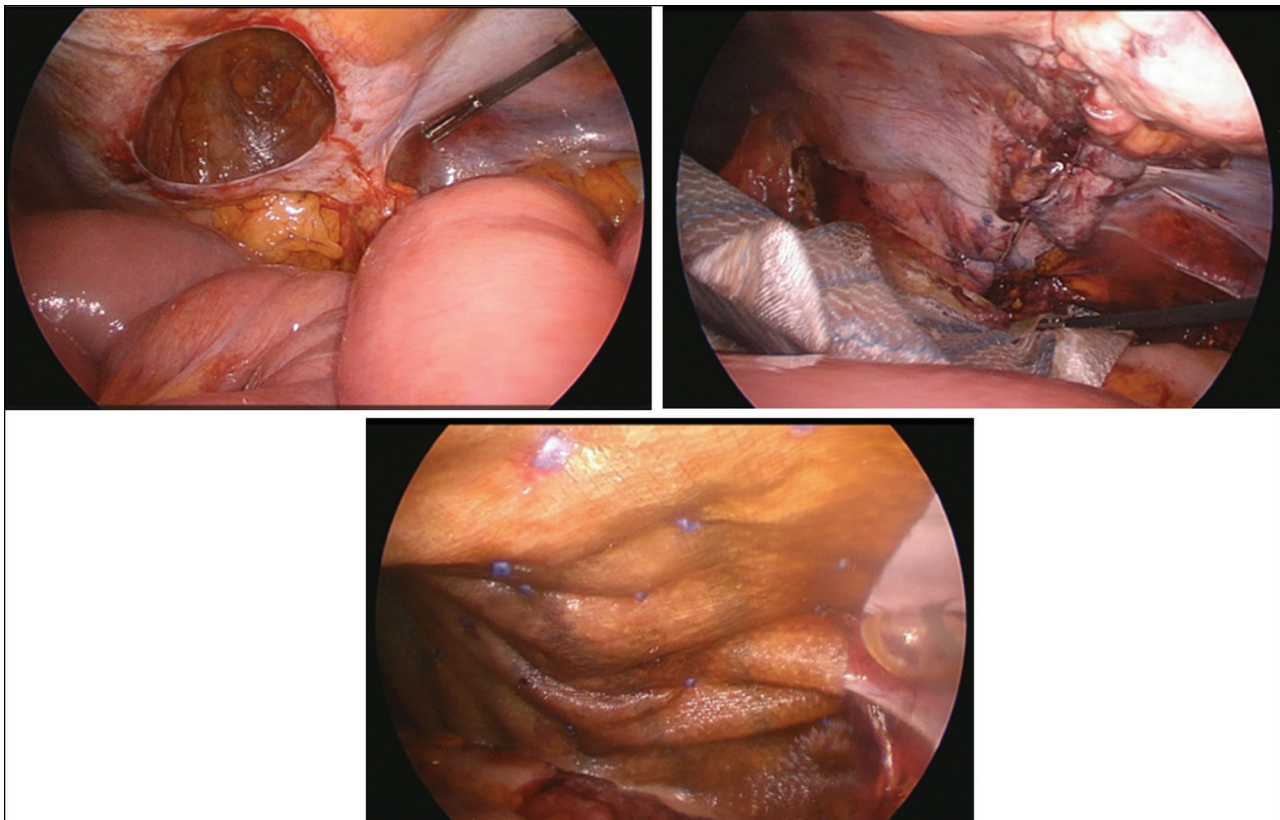


Figure 2: Intraoperative: Large defect about 6–7 cm at left lumbar, muscle approximation using endo-closure Proline 1 (7 stitch) on a healthy, strong muscle around the defect, dual mesh applied 20 cm × 25 cm, fixed with absorbable tucker

no collection within the abdominal or pelvic cavity [Figure 3]. The patient underwent ultrasound-guided percutaneous aspiration, during which approximately 120 cc of bloody-tinged fluid was drained. Fluid analysis revealed a WBC count of 5 and an RBC count

of 1024. Consequently, the patient was discharged with a diagnosis of subcutaneous hematoma.

The patient was reevaluated at the clinic 3 weeks after being discharged from the hospital. They were doing

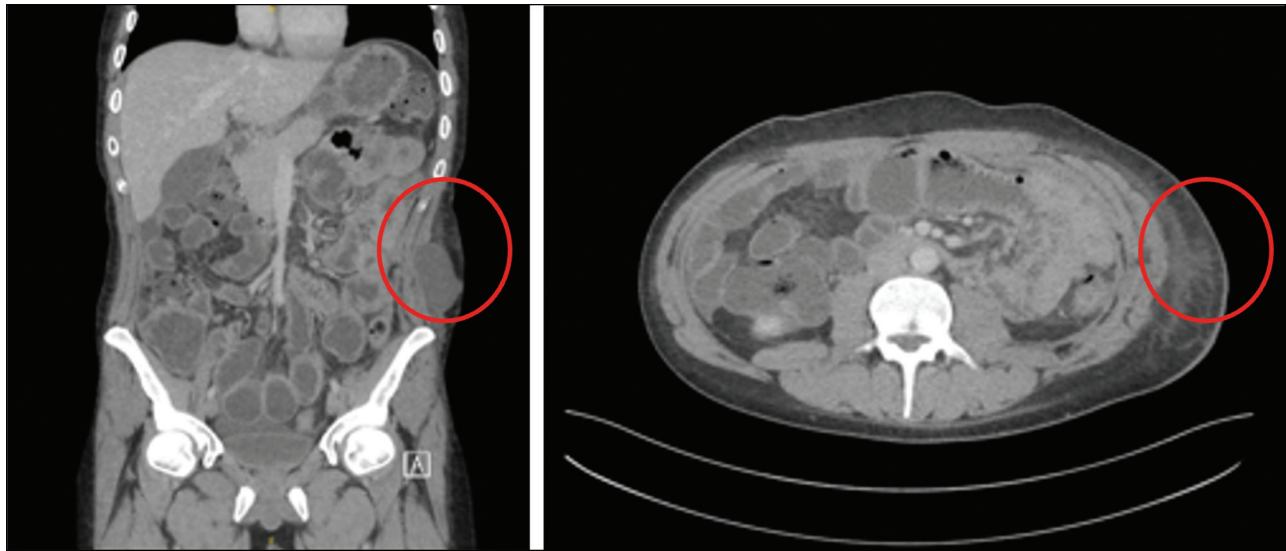


Figure 3: Postoperative CT with IV contrast (with hematoma): post-left lumbar hernia/lateral abdominal wall hernia repair with subcutaneous fluid collection along the lateral abdominal wall; otherwise, no recurrence of hernia

well, with no signs of infection or recurrence. A follow-up ultrasound of the abdomen revealed a reduction in the size of the lateral abdominal wall collection. The patient was seen 6 months after the operation and showed no signs of hernia recurrence.

Discussion

TAWH is a result of blunt force trauma and does not involve skin penetration or any preexisting hernia.^[10] Generally, the blunt force is distributed over a large area to prevent penetration, however, it is small enough to remain focal. According to Wood *et al.*, there are three major classifications of TAWH. Type 1 that includes high-energy injuries associated with motor vehicle accidents whereas type 2 is caused by low-energy injuries such as bicycle accidents. Type 3, on the other hand, are injuries caused by deceleration such as seat belt injuries.^[11] The diagnosis of TAWH is not a straightforward task. Although most hernias can be identified upon physical examination, TAWH is often missed during initial assessments due to their rare occurrence with low-energy trauma associated hernias being the most likely to be missed. A search was undertaken in PubMed and Google Scholar to find published reports of TAWH studies. We included studies published in the last 5 years. No language restriction was applied. References were also cross-checked for other relevant studies. We identified 21 studies including three case series [Table 1].

The use of FAST and CT scans for evaluation is consistent with standard practice in trauma centers.^[32] The application of FAST is relatively less common

practice compared to CT scans. In the literature review, we identified only two studies that utilized the FAST modality for the diagnosis of TAWH.^[15,19] FAST is a rapid bedside ultrasound examination used to identify free fluid in the peritoneal, plural, and pericardial spaces. Various studies have demonstrated that the sensitivity of FAST ranges between 85% and 96% and a specificity higher than 98%.^[33] The sensitivity can even reach up to 100% in hypotensive trauma patients. Furthermore, the FAST examination is quite rapid as experienced personnel can provide it within five minutes.^[34] Due to this, it can reduce time to surgical intervention which is crucial for improving patient outcomes. Even with the higher sensitivity and specificity of FAST, CT scan remains the go-to imaging modality for TAWH, as seen in most of the cases in our literature review. In the present case, a CT scan offered detailed anatomical information and aided in assessing the extent of injuries. Alhadeedi *et al.* showed in a case series of 12 cases the utility of CT scans in diagnosing hernias. Laparotomy was used for repair with no patient mortality.^[31] In our case, the decision to proceed with laparoscopic exploration and hernia repair was guided by the patient's worsening clinical condition. Laparoscopy offers a minimally invasive approach, allowing for accurate assessment of intra-abdominal structures.^[35] The herniorrhaphy and mesh placement were essential for preventing recurrence and complications in this case.^[36] Similar to the present case, various studies included in the literature review also applied mesh repair for hernia, demonstrating no recurrence at follow-up.^[21,28] The development of bowel obstruction highlights the potential complications of traumatic abdominal injuries. Similar to our

Table 1: Published reports of TAWH and their significant findings

Author	Participants	Type of injury	Presentation	Imaging modality	Treatment	Outcomes
Cervantes <i>et al.</i> ^[12]	20-year-old male	Stump of a felled tree	Abdominal distention, swelling around umbilicus, bruises on skin.	NA	Laparotomy	Day 7 = wound infection 3 Months = strong abdominal wall
Lyu and Ma ^[13]	71-year-old female	Car collision	Pain in lower quadrant	CT scan revealed disruption of the right abdomen wall	Open surgery	6 months = no recurrence
Ahmed ^[14]	2-year-old boy	Fall	Reducible swelling in right loin	US	Laparotomy	Good condition at discharge
Chan <i>et al.</i> ^[15]	22-year-old male	Automobile collision	Bulging mass in lower abdomen	FAST and CT scan	Exploratory laparotomy, small bowel resection, and primary anastomosis	At 1-year, no recurrence
Bejiga ^[16]	55-year-old male	Bicycle handlebar injury	Abdominal pain	NA	TAWH repair, bowel resection, and end-to-end anastomosis	At 4 months, no complaint
Dorpman and Dams ^[17]	68-year-old female	Head on motor collision	Sternum and rib fractures, painful mass in left flank found after 6 months	CT scan	Elective hybrid repair with mesh placement	At 3-months, CT scan revealed no recurrence
Abdelali <i>et al.</i> ^[18]	36-year-old female	Collision with automobile	Ecchymosis on left flank	CT scan	Symptomatic treatment	Laparoscopy planned after weight reduction
Cussen <i>et al.</i> ^[19]	34-year-old male	Road vehicle accident	Lower abdominal bruising	FAST and CT scan	Symptomatic treatment	NA
Delaune <i>et al.</i> ^[20]	Case series (2 cases)	Car accident	Abdominal pain	X-ray, CT scan, MRI	Conservative treatment, surgery	On follow-up, normal clinical exam
Kumar <i>et al.</i> ^[21]	70-year-old female	Bull horn	Abdominal pain	NA	Open mesh hernioplasty	No recurrent at 1-year follow-up
Azimi-Ghomi <i>et al.</i> ^[22]	67-year-old male	Low fall	Tender lateral flank mass	CT scan	Mesh hernia repair	No postoperative complications
Pothiawala <i>et al.</i> ^[23]	46-year-old male	Motor vehicle accident	Pain over chest and abdomen	CT scan, MRI, X-ray	Laparotomy	No postoperative complications
Sharma <i>et al.</i> ^[24]	32-year-old male	Fall from 12–14-m height	Abdominal pain and left flank fullness	CT scan	Open mesh repair	Uneventful postoperative period.
Jeong <i>et al.</i> ^[25]	64-year-old male	Struck with rebar	Lower quadrant abdominal pain	CT scan	Laparotomy	Improvement seen in hemoperitoneum
Chowdhury <i>et al.</i> ^[26]	3-year-old girl	Hit with motor vehicle	Abrasions in abdominal wall	X-ray	Laparotomy	Uneventful postoperative period.
Vu and Klinkner ^[27]	10-year-old male	Bicycle handlebar	Bowel protruding from wound	CT scan	Laparotomy	No recurrent hernia
Kevin <i>et al.</i> ^[28]	Case series (15 cases)	Motor accidents (60%)	Colonic injuries (53%)	CT scan	Primary suture repair (32%) and mesh repair (68%)	4 patients had recurrence
Sorber <i>et al.</i> ^[29]	Case series (9 case)	Motor vehicle collisions	Seat belt sign	CT scan	Laparoscopy	Positive outcomes postoperatively
Nguyen <i>et al.</i> ^[30]	27-year-old female	Car accident	Abdominal pain and nausea	X-ray, CT scan	Laparoscopy	No sign of recurrence
Andrabi <i>et al.</i> ^[7]	29-years-old male	Road accident	Abdominal pain	CT scan	On-lay polypropylene mesh	Uneventful postoperative period
Alhadeedi <i>et al.</i> ^[31]	Case series (12 cases)	Trauma cases	Intra-abdominal injuries	CT scan	Laparotomy	No patient died on follow-up

CT = computed tomography, MRI = magnetic resonance imaging, FAST = focused assessment with sonography for trauma

case, Andrabi *et al.*^[7] also reported a case of TAWH, accompanied by small bowel obstruction. They successfully managed the patient with exploratory

laparotomy with hernioplasty.^[7] Compared to other studies, this case highlights the role of laparoscopic treatment of TAWH and its associated complications.

Conclusion

TAWHs, although rare, pose significant consequences for patients undergoing blunt or penetrating trauma to the abdomen. This case report highlights the diagnostic challenges, management considerations, and successful surgical intervention in a patient with a TAWH following a high-speed road traffic accident. The present case was diagnosed using FAST and CT scan imaging modalities. The present study supports the role of CT scans in the diagnosis and operative planning of TAWH. The management and the surgical intervention either elective or emergency depend on the patient condition and the clinical findings. In our case, the patient had symptomatic bowel obstruction secondary to the TAWH, which necessitated emergency laparoscopic exploration with primary repair of the hernia defect and mesh application. Further research and collaborative efforts are needed to expand our understanding of these rare hernias and refine their management strategies.

Author contributions

Dr. Arwa Aljuhani contributed to concept and design, literature review, data extraction, case writing and manuscript writing; Dr. Ghaith Saied contributed to concept and design and manuscript review; Dr. Arjmand Reyaz contributed to the case presentation, manuscript drafting, and revision; Dr. Mohammed Alkahlan contributed to concept and design and data extraction; Dr. Ibrahim Aljohani contributed to literature review and manuscript writing; Dr. Muhammed Abukhater contributed to concept and design and manuscript review.

Ethical policy and institutional review board statement

As per the standard practice for case reports, our study did not require approval from an Institutional Review Board (IRB). However, we ensured compliance with ethical standards by informing the department head and the treating physician.

We declare that our study adhered to the ethical principles of the Declaration of Helsinki, and treated all the patients' data with confidentiality and were used for scientific purposes only.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Data availability statement

There are no datasets generated or analyzed in the current study; hence, data sharing is not applicable.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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