Case Report

Traumatic abdominal wall hernia after impact from handlebar: A case report

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ARTICLE INFO

Keywords:
Abdominal wall hernia
Accidental injuries
Herniorrhaphy
Trauma

ABSTRACT

Traumatic abdominal wall hernia (TAWH) is a rare type of hernia resulting from blunt abdominal trauma. It develops following the inertia of sudden, high-energy blunt trauma or focused low-energy impact. A 22-year-old motorcyclist presented to the emergency department following a collision with an automobile. Clinical examination demonstrated a bulging mass at the lower abdomen, resulting from impact with the motorcycle handlebar. A contrast-enhanced CT scan of the abdomen revealed a disruption of both rectus abdominis muscle and linea alba at the lower abdomen with loops of small bowels and mesentery herniating through the defect, associated with multiple air pockets and pneumoperitoneum. Exploratory laparotomy showed TAWH containing loops of small bowel and mesentery in addition to mesenteric tears. Small bowel resection with primary anastomosis and repair of the anterior abdominal wall defect using interrupted polypropylene sutures was performed. The patient recovered well postoperatively and was discharged home three days later. A follow-up at 1 year showed no evidence of recurrence.

Introduction

Traumatic abdominal wall hernia (TAWH) is a rare type of hernia resulting from blunt abdominal trauma. It occurs after herniation through disrupted musculature and fascia associated with significant trauma, without skin penetration or evidence of a prior hernia at the site of the injury. TAWH develops following the inertia of sudden, high-energy blunt trauma during road traffic accidents; or focused low-energy impact, such as handlebar injury. It can also be caused by deceleration injuries such as seat belt syndrome [1]. Increased intraabdominal pressure combined with a tangential force can result in muscle and fascial disruption. Therefore, concomitant intra-abdominal injuries often present with TAWH. Although solid organ injuries are more common in blunt abdominal trauma, commonly reported injuries associated with TAWH are lumbar spine or pelvic fractures as well as mesenteric or bowel injury [2]. This is largely due to the mechanism of injury as mentioned above or complications following the herniation itself.

Although TAWH is uncommon, the detection rate has increased over the past few decades due to increased availability and widespread use of computed tomography (CT) in trauma care. Since there is a lack of comprehensive literature on the management of TAWH, it poses a dilemma for the attending physicians. Treatment is largely based on a combination of knowledge and experiences from managing trauma with principles of hernia repair. Herein, we report an unusual case of TAWH following a handlebar injury and discuss our management plan.

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https://doi.org/10.1016/j.tcr.2021.100557
Accepted 18 November 2021
Available online 23 November 2021
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Case report

A 22-year-old motorcyclist presented to the emergency department following a collision with an automobile while travelling at 90 km/h. On arrival, his Glasgow Coma Scale was 13 and he was haemodynamically stable. Clinical examination demonstrated a bulging mass at the lower abdomen, resulting from impact with the motorcycle handlebar (Fig. 1). The irreducible mass measures about 6 × 6 cm. There were no Grey-Turner, Cullen, signs of peritonism or chest injury noted. Focused sonography for trauma (FAST scan) showed no intraperitoneal free fluid. Chest and pelvic radiographs were unremarkable. Plain CT scan of the brain and cervical spine showed no intracranial bleed or evidence of cervical spine injury.

Contrast-enhanced CT scan of the abdomen revealed a disruption of both rectus abdominis muscle and linea alba at the lower abdomen with loops of small bowels and mesentery herniating through the defect, associated with multiple air pockets within the subcutaneous layer and pneumoperitoneum indicating a high possibility of small bowel perforation (Fig. 2). There were no obvious solid organ injuries noted. The patient was subjected to an emergency exploratory laparotomy.

Intraoperatively, loops of small bowel and mesentery were noted herniating through the anterior abdominal wall defect (approximately 6 × 6 cm) with a 1 × 1 cm small bowel perforation seen with significant contamination in the peritoneal cavity (Fig. 3A, B). Associated injuries include two mesenteric tears with no hematoma, active bleeding or small bowel compromise (Fig. 3C). The rest of the small bowel was inspected to be normal and solid organs were unremarkable. Small bowel resection and primary anastomosis was done and the anterior abdominal wall defect was primarily repaired with interrupted polypropylene sutures without the use of a mesh (Fig. 3D). The patient recovered well postoperatively and was discharged home three days later. A follow-up at 1 year showed no evidence of recurrence.

Discussion

Clinicians should always be vigilant to TAWH particularly in patients who present with visible soft tissue injury of the abdominal wall following blunt trauma. The common site of herniation is the flank (47.5%), abdominal wall (17.5%) based on an incidence study involving 80 patients by Coleman et al. [3]. Early radiological detection can lead to a more favourable outcome. Multi-imaging modalities should be used to the clinician's advantage to evaluate for an abdominal wall defect if there is a clinical suspicion based on the mechanism or clinical findings after blunt abdominal trauma. Other than the mandatory FAST scan in abdominal trauma, point of care ultrasonography is a great imaging tool in diagnosing TAWH. The dynamic nature of ultrasonography aids clinicians in identifying a breach in the abdominal wall defect and accentuating a hernia particularly by a change in the posture or performing a Valsalva manoeuvre [4]. In the acute setting, at times it may not be feasible to ask the patient to perform the Valsalva manoeuvre or elicit a cough impulse. Contrast-enhanced CT has become the gold standard of imaging for diagnosing intra-abdominal injuries in hemodynamically stable patients. In our case, the TAWH was diagnosed clinically and confirmed via a CT scan.

Surgery is the mainstay of treatment for TAWH. The timing of surgical intervention depends largely on the concomitant injuries and the patient's clinical condition. Haemodynamically unstable patients should be managed based on trauma protocols. In our case, emergent surgery was warranted as signs of bowel perforation were evident on imaging. Due to the significant contamination of the peritoneal cavity, a primary repair was done instead of mesh repair to avoid mesh infection. Tension-free approximation of the rectus sheath was achieved via interrupted polypropylene suture.

Hemodynamically stable patients with minimal visceral injuries are candidates for simultaneous TAWH repair during exploration. Other factors to consider include simultaneous repair includes injury severity score, size of abdominal wall defect and the risk of incarceration [5]. The use of mesh in an emergency TAWH repair is debatable, weighing the benefits of lower recurrence rate against the risk of surgical site or mesh infection. In small hernia defects, attempts for primary closure with non-absorbable monofilament sutures are recommended, but the risk of recurrence rate can be as high as 33 to 40% [6]. Techniques such as component separation and relaxing incisions can be used for successful closure of larger hernia defects. Mesh repair is a relative contraindication in contaminated fields. However, using a biologic mesh is a good alternative in cases with large wall defects in a contaminated surgical field [7]. In these hostile environments, biological mesh possesses inherent properties of being able to incorporate into the surrounding

Fig. 1. Lower abdominal wall swelling associated with overlying skin contusion, visualized from the anterior (A) and lateral view (B).
tissues with decreased risk of infection, adhesion, erosion, extrusion and rejection compared with a synthetic mesh [7]. Unfortunately, these biological meshes are yet to be made available in our country.

In stable patients with asymptomatic TAWH and no indication for immediate surgical intervention, elective repair may be performed once the patient is in optimal condition. Elective repair may be classified into acute; within 2 weeks post-trauma, or delayed; after 2 weeks post-trauma as described by Karhof et al. [8]. The recurrence rate following repair is similar for acute and delayed repair [8]. Delayed repair may be advantageous, as the hernia sac may develop later, making it easier to find the muscular margins, facilitating the design and incorporating the mesh. The decision needs to be made after thorough examination and investigation as delayed repairs are associated with a high risk of bowel incarceration and strangulation [9]. The timing of repair should be determined based

Fig. 2. Axial view of the abdominal CT scan demonstrating a defect in the linea alba resulting in herniation of small bowel and its mesentery, with the presence of air pockets (arrow).

Fig. 3. (A) Small bowel herniation with perforation (arrow) upon exploration. (B) Linea alba and rectus sheath defect after reduction of small bowel. (C) Small bowel mesentery tears. (D) Upper two thirds of the laparotomy wound closed en-masse with continuous polypropylene sutures and the ventral hernia defect at the lower one third was closed with interrupted vertical mattress polypropylene sutures.
on the extent of the local injury as well as concomitant injuries. Therefore, treatment strategies must be tailored to the patient based on individual circumstances.

Some authors advocate non-operative management in selected patients with asymptomatic defects. Netto et al. reported that 24 of 34 patients diagnosed with TAWH were managed nonoperatively [10]. Two of these patients developed symptoms and were repaired 8 months later. The remaining 22 patients (64.7%) did not develop any symptoms or complications relating to the hernia up to 16 months of follow-up [10]. In another study by Coleman et al., 71.3% of patients with TAWH were treated non-operatively with a similar follow-up period with no evidence of symptoms or complications as well [3]. However, the site and size of the defect were not taken into consideration in these studies. Furthermore, complications could occur even after the short follow-up period of 16 months.

Minimally invasive techniques such as laparoscopic repair can be advocated even in the acute setting if the technical expertise is available. Diagnostic laparoscopy can be performed to exclude other intraabdominal injuries, avoiding the need for midline exploratory laparotomy in stable patients. The advantage of performing laparoscopy in clinically non-evident TAWH besides better visualization of the abdominal wall is the accentuation of the hernia by the pneumoperitoneum. Insufflated gas seeps through the hernia defect and creates surgical emphysema or a prominent swelling over the affected region thus reducing the chances of missing this diagnosis intraoperatively. Laparoscopic tension-free mesh repair of TAWH can be safely accomplished using an approach similar to that of laparoscopic ventral hernia repair [11]. A composite mesh is used in both instances and secured posterior to the abdominal wall as an underlay mesh [11]. This method has been shown to be associated with a lower recurrence rate than onlay and inlay techniques [11]. In comparison to laparotomy, laparoscopy offers less wound complications, shorter hospital stay, lesser post-operative pain and an earlier return to normal activity [11]. A systematic review by Parker et al. reported that there are no statistically significant results between laparoscopic component separation and open component separation in terms of recurrence [12]. However, laparoscopic repair reduced the odds of recurrence significantly compared with open repair [12].

Most recurrences occur in patients following primary repair rather than mesh repair. Timing does not seem to be an important predictor for recurrence, making the patient's condition and concomitant injuries the most important factor in determining the timing of repair [8]. In our patient, evidence of bowel perforation prompted us for an open approach, even though it could have been performed laparoscopically in trained hands. As the surgical field was contaminated, tension-free primary repair of the abdominal wall defect was performed. Long term follow-up is essential to detect recurrences.

Conclusion

We present a rare case of traumatic anterior abdominal wall hernia successfully treated by emergent primary repair. Clinicians should have a high index of suspicion for TAWH in all patients with blunt abdominal trauma with evidence of soft tissue injury or swelling over the abdominal wall. Surgical repair is the mainstay of treatment for TAWH, however, the treatment strategies and modality of defect closure has to be tailored to the patient based on individual circumstances.

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