Traumatic Abdominal Wall Hernia: Early or Delayed Repair?

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Abstract Traumatic abdominal wall hernia after blunt trauma is a rare entity. They can easily be overlooked in patients who have multiple trauma, as its signs and symptoms may be variable due to the presence of multiple injuries. Imaging with computed tomography or ultrasound confirms the diagnosis as well as identifying any associated injuries. Although surgery is the standard treatment for traumatic abdominal wall hernias, there is no consensus on the early or late repair of the defect. Some authors recommend early surgical intervention in order to avoid the risk of intra-abdominal organ injury, incarceration, and strangulation. In this study, we report our experience in three cases, which did not involve emergency surgery. Long-term outcome is successful. Elective hernia repair may be safe and feasible in stable patients.

Keywords Abdominal wall · Hernia · Herniation · Traumatic hernia · Treatment

Introduction

Traumatic abdominal wall hernia (TAWH) is a rare type of hernia that occurs after low- or high-velocity impact of the abdominal wall against a blunt object. It is defined as bowel or abdominal organ herniation through a disruption of

musculature and fascia following severe blunt trauma [1]. Skin penetration is absent, and there should be no evidence of hernia defect before the injury. Since the first report by Selby [2] in 1906, multiple case reports and series have been reported in the literature. Although the incidence of blunt abdominal trauma is high in civilian medical practice, TAWHs after blunt trauma are uncommon. The prevalence of TAWHs in blunt trauma patients seen at a designated trauma center in published series is approximately 1 % [3–7]. Owing to the rare incidence and complex nature of this condition, it is not possible to plan randomized control trials for optimal surgical management. Therefore, repair or timing of these hernias is not standardized. Most surgeons combine the knowledge of the acute management of the trauma patient with elective hernia repair. In this study, three cases that did not undergo emergency surgery are presented, and the rationale behind delayed surgery is discussed on the basis of the characteristics of the patient and the hernia.

Case 1

A 41-year-old female patient met a traffic accident; she had fractures of the facial bones, grade 2 injury to the liver, fracture of the first thoracic vertebra, and a muscular defect in the anterior wall of the lower left quadrant of the abdomen with a hernia sac containing bowel loops. Ultrasound and contrast-enhanced computed tomography (CT) showed no other abnormalities in the abdomen or thorax. We decided on conservative treatment and observe the patient; she was discharged 8 days after admission. Four months later, the patient was operated, and a 10×6-cm fascia defect between the medial left iliac wing and the pubic ramus was repaired with polypropylene mesh. She did not show any recurrences or complications in the 72-month period after the hernia repair.

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Case 2

A 56-year-old female was hospitalized after road traffic accident. She sustained subarachnoid hemorrhage and tibia and rib fractures and received emergency nonoperative treatment and was presumably discharged after reasonable recovery. An emergent operation for the 1.5-cm fascia defect in the right iliac fossa, which is determined in CT, has not been planned. She attended our clinic a year later with complaints of pain and swelling in the right groin. A 2.5-cm fascia defect and hernia in the right iliac fossa was repaired with polypropylene mesh. The patient was discharged without complications and showed no recurrence or complications in the follow-up period of 45 months.

Case 3

A 41-year-old male fell down the stairs. Examination showed abrasion, ecchymosis, and tender swelling in the left subcostal area. According to emergency abdominal tomography, there was grade 1 injury to the left kidney, a tissue defect on the anterior wall of the upper left quadrant of the abdomen, and omental herniation without any involvement of bowel loops, extending up to the subcutaneous area (Fig. 1). He was treated conservatively, recovered fully, and was discharged. In the 43 months of postdischarge follow-up, he is asymptomatic and has an abdominal defect of 14×8 cm. He has decided to postpone his surgical repair for personal reasons.

Discussion

In 1939, McWhorter [8] reported a case of TAWH and proposed a list of criteria for diagnosis. These criteria were revised and simplified by Clain [9] in 1964 and became the basis for TAWH criteria used today (Table 1). After that, Malagoni and Condon [10] and Damschen et al. [1] suggested additional criteria for the diagnosis of TAWH.

In 1988, Wood et al. categorized TAWHs into three types according to their causes [11]. The first category is composed of ruptures in the abdominal musculature due to a sudden increase in the intra-abdominal pressure caused by energy transfer in situations such as motor vehicle accidents or falls from height. In these cases, the risk of intra-abdominal organ injury is quite high, and defects are usually seen in the flank and upper abdominal areas. The second category consists of ruptures in the abdominal wall caused by a lower energy exerted by a blunt object with small surface such as the handlebar of a bicycle (handlebar hernia). Although this type of injury is more common, there is a low possibility of intra-abdominal injury, and the third category is intra-abdominal hernias caused by deceleration type of injuries.

In the literature, there is a predominance of TAWH localization in the lower abdomen, rather than the upper abdomen. This is caused by an increase in intra-abdominal pressure during injury, combined with the fact that the abdominal wall is weaker in the presence of natural orifices, such as the inguinal canal in the lower abdomen, rather than the direct impact of injury itself.

Car accidents are the most common (49 %) cause of TAWH, followed by bicycle handlebar injuries in 25 % of cases. Motorcycle accidents represent 14 % of all cases. In the

Fig. 1 Axial CT image of case 3 shows the fascia defect on the anterior wall of the upper left quadrant of the abdomen

Table 1 Criteria for the diagnosis of TAWH [9]

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- Immediate appearance following the injury without signs of skin penetration
 - Persisting signs of trauma at the time of consulting with a doctor
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remaining 12 %, common mechanisms of injury such as falling from height and strike by an animal are described.

The diagnosis may be made at the time of a detailed abdominal examination. At the present, a widespread use of CT in the identification of possible intra-abdominal injuries in patients who were subject to blunt traumas paved the way for more frequent and earlier diagnosis of TAWHs. Now, almost 72 % of the cases are diagnosed at first admission [6, 7, 12, 13]. If and when needed, contrast radiography such as barium studies, ultrasonography, and magnetic resonance imaging can also be performed. However, since the sensitivity and specificity of the CT are quite high, it is now the gold standard in the diagnosis of intra-abdominal injuries including hernias. CT images show the anatomy of the detached muscles, contents of the sac, and associated injuries, besides differentiating them from hematomas or abscess. In complicated traumatic hernia cases, however, imaging techniques are less effective in indicating mesenteric rupture or evaluating bowel viability [12].

Dennis et al. [7] described a new grading system by using CT. All scans were specifically reviewed for the presence of abdominal wall injury and graded according to the following system: grade I = subcutaneous tissue contusion, grade II = abdominal wall muscle hematoma, grade III = single AW muscle disruption, grade IV = complete abdominal wall muscle disruption, grade V = complete AW muscle disruption with herniation of abdominal contents, and grade VI = open herniation.

The incidence of abdominal organs being involved varies between 25 and 79 % in the literature [1, 6, 7, 14, 15]. Although supraumbilical and lumbar hernias have a higher risk of coexisting visceral injuries, infraumbilical lesions are less likely to be so. There are occasions when an isolated TAWH is the one and only sequel. Each and every trauma patient has his/her own characteristics because trauma patterns are so variable. The importance and the knowledge of the pattern of concomitant injuries lie in the fact that it determines the TAWH treatment method. Patients with TAWH must be assessed and handled primarily as trauma patients. The type of injury may direct the treatment pattern of TAWH.

Surgical treatment of TAWH is categorized as urgent or elective and early or delayed. There are controversies regarding the timing of exploration: immediate or delayed. Timing of surgery depends mostly on the concomitant injuries that require treatment priority. In unstable patients, all trauma protocols for stabilization must be followed. When emergency surgical intervention is not required, repair of the hernia defect

may be delayed. Delayed exploration, as well as delays in diagnosis, can lead to some problems such as bowel strangulation or obstruction. The risk of incarceration and strangulation in some reports varies from a low rate of >10 % and a high rate of 25 % [6, 13, 16, 17]. The common scenario of a patient undergoing surgery for abdominal injuries remains elusive. Simultaneous hernia repair should be considered in relation to the patient's abdominal wall defect, trauma score, strangulation risk, the patient's overall condition, and available surgical expertise [10, 18–20]. Patients with minimal abdominal injuries who tend to be stable during the operation are candidates for TAWH repair at the same time, although this increases the surgical site infection and recurrence rate [1]. Despite the high rate of wound problems associated with single-staged reconstruction of contaminated fields, it can safely be performed with mesh reinforcement [21]. Should surgical intervention be needed in the hernia, such as pelvic fixation, early elective repair may be performed. Otherwise, it may be delayed for several weeks to allow the resolution of the surrounding soft tissue damage and hematoma [7].

Some recommend that the repair of the abdominal wall defect may be delayed and performed electively. In one reported series [6], the majority of TAWHs were managed nonoperatively. Their data suggests that the nonoperative management of a TAWH may be safe in patients in whom there is no other indication for laparotomy, and the hernia is asymptomatic (Table 2) [6, 22]. A recent study [23] suggests that in patients in whom hernia is diagnosed by CT and that there is no obvious abdominal injury requiring immediate laparotomy, repair can safely be delayed, and treatment can take place when the patient is in optimal clinical condition.

Another important reason for delayed repair is the fact that the hernia sack may develop at a later period, which makes it easier to find the muscular margins, facilitating the design and use of the mesh system. However, sometimes, the defect may enlarge with time, and muscles undergo disuse atrophy; thus, primary approximation may be difficult [24]. Rarely, repair is complicated by the need to have fixation of mesh to bony landmarks. In spite of this challenge, the laparoscopic approach with tension-free mesh repair of a traumatic abdominal wall hernia can be accomplished successfully using an approach similar to that taken for laparoscopic inguinal hernia repair [25].

Table 2 Some suggestions for the management of TAWH [20]

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- The mechanism of injury should be a deciding factor, whether a patient with TAWH requires an immediate laparotomy or not
 - If clinically apparent, anterior abdominal hernias appear to have a high rate of associated injuries and need urgent laparotomy
 - Occult TAWH is diagnosed only by a CT scan and may help in delaying immediate laparotomy or hernia repair
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In this study, we report three adult cases of TAWH, two of which underwent elective hernia repair. One of the two patients, whose hernias are repaired with polypropylene mesh, is in the 45th month, and the other is in the 72nd month of follow-up, and there have been no complications or recurrences so far. Our third patient, who is not operated yet, is in the posttraumatic 43rd month without any complaints.

The review of the literature and our data suggest that delayed repair of a TAWH may be safe and feasible in selected patients in whom there is no other indication for laparotomy, and the hernia is asymptomatic. This repair can be done with primary closure if the tissue allows or with prosthetic material if the defect is too large.

In conclusion, the timing of surgery in any TAWH case should be considered depending on the severity of the trauma, the size of the wall defect, clinical and radiological findings, associated injuries, and the clinical status of the patient. Elective hernia repair may be more suitable in stable patients.

Conflict of Interest The authors declare that there are no conflicts of interest.

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