CASE REPORT

Paediatric abdominal wall hernia following handlebar injury: should we diagnose more and operate less?

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SUMMARY

Traumatic abdominal wall hernia following handlebar injury can be easily missed and is thus underreported. A 12-year-old boy presented with handlebar injury to the left upper quadrant of his abdomen. Except for a localised swelling, thought to be related to a haematoma, he was haemodynamically stable. CT revealed an abdominal wall defect with herniating fat that was not evident clinically and was also missed on immediate ultrasound examination. As there were no associated injuries and the abdominal wall defect was small without any herniating bowel loops, masterly inactivity was observed. After 6 weeks, the swelling has disappeared completely and there is progressive reduction in the size of the defect.

BACKGROUND

The estimated incidence of bicycle handlebar injuries is reported to be 1.15/1 000 000 children under the age of 19 years. This does not include motor vehicular accidents.¹ Traumatic hernia is one of the most common handlebar injuries (29%) but only 40 paediatric cases are reported.² The number of reported cases has remained more or less static, although the number of children riding cycles and scooters is increasing. This is explained by the missed and delayed diagnoses of traumatic abdominal wall hernias leading to significant under-reporting.^{1 3-5} Clinical signs may not correlate with the severity of injury and ultrasound at times can be inconclusive. We therefore recommend a high index of clinical suspicion and a low threshold to use CT for diagnosis. In contrast, to the increasing tendency for early surgical repair for every case, we also suggest a more individualised approach to treat traumatic abdominal wall hernias.

CASE PRESENTATION

A 12-year-old boy with a previously unscathed abdomen presented with a left abdominal wall swelling 20 h after flipping over the handlebar of his BMX bike. The swelling was tender and situated in the left upper quadrant of the abdomen measuring 10 × 10 cm (figure 1). There were no other associated injuries. He was haemodynamically stable. Bloods tests, including the serum amylase levels, were normal.

INVESTIGATIONS

Ultrasound examination on admission demonstrated abdominal wall haematoma without any

Figure 1 Clinical photograph at presentation and 6 weeks later.

abdominal wall defect or associated intra-abdominal solid visceral injury. We performed a CT of the abdomen despite the normal initial ultrasound and amylase level because of the high energy impact, the degree of pain and swelling over the injured site. The CT scan (figure 2) revealed an abdominal wall haematoma with an underlying 2 cm defect in the muscles at the site of injury. Intra-abdominal fat was seen herniating through this defect, but no bowel loops were involved.

DIFFERENTIAL DIAGNOSIS

Abdominal wall haematoma can mask an underlying traumatic hernia initially and CT can play an important role in differentiating between the two.

Figure 2 CT scan of the abdomen at the time of presentation showing the site of hernia and the overlying haematoma.

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TREATMENT

As the boy was clinically stable and the defect was small without involvement of the bowel loops, we decided to manage it conservatively.

OUTCOME AND FOLLOW-UP

The child is completely pain free with a complete resolution of the local swelling (figure 1). There is no palpable defect at the end of 5 months. Ultrasound shows a progressive decrease in the size of the defect down to 1 cm after 5 weeks (figure 3) and less than 5 mm at 6 months. The plan is to continue observant management and monitor with further imaging as required.

DISCUSSION

Traumatic abdominal wall hernia (TAWH) results from an intense impact from a non-penetrating trauma which is capable of disrupting the underlying muscle and fascia. Owing to skin being more elastic as compared to the contracted muscles and fascia, it remains intact.^{6–12} Handlebar injuries have been cited in the literature as the most common cause (35%) followed by crush (25%) and seatbelt injury (19%).^{3 13} The term ‘handlebar hernia’ was first introduced for TAWH by Dimyan *et al* in 1980, but the first case was described earlier in 1906 by Selby.^{2 4 6 8 10 12 14–16}

TAWH is found mostly in boys, the incidence ranging from 79% to 100%.^{2 9 17} TAWH has been reported to occur in different parts of the abdominal wall, but it is most common in the lower abdomen. This is probably due to the absence of a posterior rectus sheath in this region.^{3 11 15 18–21} However, Yan *et al* have reported 4/5 cases of TAWH (80%) to be in the upper abdomen. In our case, the TAWH was located in the left upper quadrant, where the natural impact of the handlebar usually lies.

Criteria for the diagnosis of TAWH have been modified over the years.^{8 16} A comprehensive definition includes herniation through disrupted musculature and fascia following trauma without skin penetration in the absence of herniation at the site prior to injury.^{3 21 22} Malangoni added that there should be no evidence of a peritoneal sac at the time of surgery,^{21 22} but TAWH with an intact peritoneal sac is frequently described.^{6 16}

Attempts have been made to classify TAWH based on the mechanism of injury, energy of the impact, size and site of defect, contents of the hernia and associated injuries. In 1988, Wood *et al* categorised TAWH into three types based on the size of defect and mechanism of injury.^{4 6 15 20 23}

Type I—small defects owing to blunt trauma with small instruments, for example, bicycle handlebar. These occur mainly

in the lower quadrant and tend to be tangential as more direct blows would penetrate the abdomen.

Type II—large defects with high energy impact, for example, motor vehicle crash or a fall from a height.

Type III—large defect, tangential shearing force with breach of the peritoneum and bowel herniation, for example, deceleration (seat belt) injuries.

The overall incidence of associated internal injuries in TAWH is 16–30%.^{9 23} They are more common at the upper quadrant TAWH and in cases involving high energy impact.^{9 11 23} The presence of a handlebar imprint on the abdominal wall confers increased risk of associated significant abdominal injury.^{9 17} We recommend a low threshold to perform a CT abdomen in these patients.

Clinical diagnosis is challenging as patients can be relatively asymptomatic. We believe that a significant number of cases remain undiagnosed until a later date. TAWH is known to present as late as 5 years after the trauma.^{4 15} Classical signs of hernia are seen in only 50% of cases.³ Muscle disruption may not be evident on initial physical examination. Repeat evaluation is required in the presence of persistent symptoms.^{9 14} Local tenderness and the presence of an overlying haematoma often preclude a proper assessment.²⁴ Yan *et al*⁹ have reported a delayed diagnosis in 13% of their cases.

A plain lateral or oblique radiograph of the abdomen can show bowel loops outside the abdominal cavity. Ultrasound has been used as a bedside modality to confirm the diagnosis of TAWH and also to assess injury to solid intra-abdominal organs. It is a fast, portable, cost-effective first-line option, but may fail to be diagnostic as in the present case.^{3 18 24} CT of the abdomen has been found to be very sensitive to detect small abdominal wall defects unlikely to be picked clinically. Except for abdominal pain, there were no other clinical signs in our patient. The serum amylase was normal and the ultrasound examination on presentation missed the hernial defect which was detected by a CT scan. At the same time, CT is able to delineate the anatomy of the defect, differentiate an abdominal wall haematoma and also evaluate associated intra-abdominal injuries, especially in the case of supraumbilical injuries. A search of the literature also finds mention of a fast straining, low-dose CT to augment a non-diagnostic ultrasound in difficult herniae. Limitations of CT include a hollow viscous injury and mesenteric tears.^{4 6 8 9 11 12 15 22 24–26} Cases are documented where all investigations failed to make a preoperative diagnosis of TAWH which was confirmed at laparoscopy or laparotomy.^{18 27}

Management recommendation by most of the reports in the literature for isolated TAWH is immediate to early repair of the hernia to prevent complications like incarceration. Primary layered repair with or without the use of a prosthetic mesh has been reported. The use of laparoscopy as a diagnostic tool, as well as in the management of TAWH, has been described recently.^{2–4 6 8 10 15 16 19 20 22–25}

As reported by Kumar *et al*,³ of the 90% of surgeons who operated TAWH, 66% operated immediately and 24% after a period of conservative management.²⁴ The reasons for delayed surgery were surgeon preference, delayed diagnosis, lack of medical fitness and patient’s reluctance. However, 10% of surgeons were successful in managing TAWH conservatively.²⁴ Matsuo *et al*⁷ have described a 9-year-old child of TAWH with a 3 cm fascial defect. Ultrasound showed an intestinal loop within the abdominal wall musculature. There were no associated injuries on the CT abdomen. The hernia resolved within 3 weeks of expectant management with an abdominal bandage.¹⁴ Litton

Figure 3 Ultrasound of the abdominal wall after 5 weeks showing a small muscle defect but no herniation.

Table 1 Literature review of conservative management for paediatric handlebar hernia

Serial number	Authors	Number of cases	Duration of follow-up (months)
1	Matsuo <i>et al</i>	1	3
2	Litton <i>et al</i>	1	4
3	Karaman <i>et al</i>	1	3
4	Present case	1	6

et al have reported a spontaneous resolution of a handlebar hernia in a 13-year-old boy who was awaiting elective repair.⁷ Karaman *et al*¹⁷ have described an isolated TAWH with a 4 × 2 cm fascial defect that resolved spontaneously over 6 weeks (table 1).

In conclusion, we should have a low threshold for doing a CT scan in patients with severe blunt abdominal injury even if there is no suspicion of injury to the intra-abdominal organs. In the absence of other indications for immediate surgical intervention, a conservative approach towards the management of TAWH is recommended. The small size of the defect with an absence of herniating bowel loops is an important factor in favour of conservative management. We recommend a more individualised approach towards the management of traumatic hernia rather than an automatic early surgical repair in all cases.

Learning points

- ▶ Myth—a paediatric traumatic abdominal wall hernia is rare.
- ▶ Truth—there is a significant under-reporting owing to a missed diagnosis and the actual number can be much higher.
- ▶ Myth—early surgical intervention is required in all cases of traumatic abdominal wall hernia.
- ▶ Truth—surgical intervention can be individualised taking into consideration associated injuries and size/contents of the hernia.
- ▶ In the setting of acute trauma and in the presence of an abdominal wall haematoma, initial ultrasound may not detect an underlying abdominal wall defect. Even CT is reported to have missed an abdominal wall hernia. But it is essential to have a high index of clinical suspicion. Clinical observations and investigation, if clinically indicated, should guide further management in each case.
- ▶ Emphasis on the basic clinical teaching—treat the patient, not the reports/investigations, that is, just because investigations show an abdominal wall hernia, one need not rush in with early surgery; rather, one needs to consider the overall clinical picture before embarking on any surgical intervention.

Competing interests None.

Patient consent Obtained.

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