CASE REPORT – OPEN ACCESS

International Journal of Surgery Case Reports 4 (2013) 958–960

Contents lists available at ScienceDirect

International Journal of Surgery Case Reports

journal homepage: www.casereports.com

Blunt transection of rectus abdominis following seatbelt related trauma with associated small and large bowel injury☆

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ARTICLE INFO

Article history:
Received 8 May 2013
Received in revised form 2 August 2013
Accepted 6 August 2013
Available online 20 August 2013

Keywords:
Rectus abdominus
Rupture
Seat-belt

ABSTRACT

INTRODUCTION: Closed rupture of rectus abdominis following seatbelt related trauma is rare.
PRESENTATION OF CASE: We present the case of a 45 year old female who presented with closed rupture of the rectus abdominis in conjunction with damage to small bowel mesentery and infarction of small and large bowel following a high velocity road traffic accident. Multiple intestinal resections were required resulting in short bowel syndrome and abdominal wall reconstruction with a porcine collagen mesh. Post-operative complications included intra-abdominal sepsis and an enterocutaneous fistula.
DISCUSSION: The presence of rupture of rectus abdominis muscle secondary to seatbelt injury should raise the suspicion of intra-abdominal injury.
CONCLUSION: Our case highlights the need for suspicion, investigation and subsequent surgical management of intra-abdominal injury following identification of this rare consequence of seatbelt trauma.

1. Introduction

Tearing of the small bowel mesentery and rupture of small bowel or colon are common gastrointestinal injury patterns associated with seat belt related trauma resulting from rapid deceleration forces. Such injuries occasionally result in delayed presentation with manifestations including small bowel obstruction through a mesenteric tear[1] and an enterocutaneous fistula involving the sigmoid colon.[2] Rare cases including appendiceal transection in a child secondary to a lap belt have also been documented.[3]

The 'seatbelt sign,' the presence of bruising on the abdominal wall along the site of the belt increases the likelihood of intra-abdominal injury.[4] Closed rupture of the rectus abdominis muscle secondary to seatbelt trauma has been described in the past associated with intestinal rupture at 90 cm from the ligament of Treitz.[5] Rupture of rectus abdominis with associated rupture of the ipsilateral renal artery has also been described in the literature.[6] Seatbelt injury can also result in complete rupture of abdominal wall musculature with resultant subcutaneous herniation of small bowel.[7]

Obese patients present their own challenges, often presenting with differing injury patterns.[8] However, stipulated 'cushion effect' may result in a lower severity of abdominal injuries in obese individuals.[9]

We present a case of closed rupture of the rectus abdominis muscle in association with small bowel and mesenteric injury in an obese middle-aged female secondary to seatbelt trauma.

2. Presentation of case

A 45 year old female, BMI 38, was a front-seat passenger restrained with a seat belt in a car involved in a high velocity (>60 mph) front end collision road traffic accident. The air bag deployed during the accident but did not result in any injuries, facial or otherwise. However, there was significant intrusion into the passenger compartment and our patient was initially trapped inside. The driver sustained an isolated long bone fracture but was otherwise well. Following prolonged extrication she presented to our accident and emergency department tachycardic (HR 110/min) with borderline hypotension (95–110 mmHg systolic) which both responded to fluid resuscitation. Abdominal examination revealed a soft abdomen, diffusely tender, with bruising to flanks and in the distribution of the seatbelt, from left hypochondrium to right inguinal region. There was a suspicion of palpable small bowel loops in the left hypochondrium.

The CT scan of thorax, abdomen and pelvis findings were that of discontinuity of the rectus abdominis muscle with protrusion of large and small bowel through the defect (Fig. 1). Fluid was noted within the fat adjacent to the loops of ascending and descending colon in both flanks. There was no evidence of perforation. Further free fluid was also noted tracking down the right flank, adjacent to the spleen and in the pelvis. The CT scan also suggested traumatic aortic dissection; however, this was not symptomatic and

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http://dx.doi.org/10.1016/j.ijscr.2013.08.003

Fig. 1. Protrusion of large and small bowel through discontinuity of the rectus sheath.

was managed conservatively and monitored with subsequent CT scanning.

Several skeletal injuries were sustained including several undisplaced rib fractures without underlying lung contusion, closed fracture dislocation of the left ankle in addition to closed fractures of the left distal radius and left distal fibula.

An initial damage-limitation laparotomy was performed which confirmed rupture of the rectus abdominis muscles and devascularisation of the skin under the areas of seat-belt related bruising. The abdomen was contaminated with blood and small bowel contents. Multiple segments of ischaemic bowel were found with avulsed mesentery. A single section of small bowel beyond the mesenteric avulsion was resected en-bloc with the right colon up to the proximal transverse colon. The splenic flexure and descending colon up to sigmoid colon was also resected. The ends were stapled off leaving 90 cm small bowel from duodeno-jejunal flexure, 20 cm of isolated transverse colon and distal colon from sigmoid downwards to rectum. A temporary abdominal closure was applied using a bag of saline as a "Bogota bag" stitched to fascia of the anterior abdominal wall covered by abdominal gauze sandwiched between 2 layers of transparent adhesive dressing with low pressure suction onto the gauze via 2 small bore vacuum drains maintained at low pressure using drainage bottles connected to wall suction.

A second re-look laparotomy 48 h later revealed there had been no further peritoneal contamination. The remaining healthy 90 cm of small bowel was anastomosed to 20 cm of transverse colon. This anastomosis was required to allow the bowel to reach the abdominal wall as a stoma as the small bowel alone would not reach through the thick adipose tissue. The remaining colon, measuring 40–50 cm in length, was defunctioned from the recto-sigmoid junction. The rectus abdominis was opposed and the abdominal musculature re-enforced with Permacol™ [10], a porcine dermal collagen implant. The biological mesh provided tensile strength required for re-enforcement of the closure.

Post-operative complications included intra-abdominal collections requiring re-laparotomy, and further collections requiring radiological drainage. Total parenteral nutrition (TPN), was given, both in hospital and at home, to manage her short bowel syndrome and an enterocutaneous fistula from the site of her ileo-colic anastomosis. Following spontaneous closure of the fistula, the TPN was withdrawn and she is now maintaining her nutrition with a normal diet and has returned to work. She is requiring enteral and parenteral magnesium supplements but is otherwise well. She has declined reversal of her colostomy as concerns over resulting stool frequency might not be compatible with her occupation as a teacher.

3. Discussion

Our case describes how closed rupture of the rectus abdominis muscle can be associated with multiple intra-abdominal injuries to small and large bowel. Transection of the rectus muscles secondary to trauma has been previously documented in association with rupture of small bowel.[5] In our case abdominal examination findings were hard to interpret due to the patient's body habitus but bruising in the distribution of the seatbelt was apparent. However, even in a slim abdomen closed rupture of the rectus muscles would not have been readily suspected due to rarity of the condition.

Imaging should be reviewed in conjunction with a patient's clinical condition, proceeding to laparotomy where necessary. Rare injuries such as closed rupture of rectus abdominis should be considered. In our case initial radiology reports attributed imaging findings to congenital herniation of small bowel. On subsequent radiology review, limited traumatic dissection of her aorta was also noticed although was asymptomatic.

Transection of the rectus resulting from seatbelt injury highlights considerable amount of force transferred to the extra-abdominal compartment. This should raise suspicion of injury to intra-abdominal structures. Whilst CT scan did not indicate any overt visceral injury, multiple skeletal fractures were an indication of the force of impact.

4. Conclusion

Whilst seatbelts have been responsible for a decreasing mortality and decreased severity of injuries from road traffic accidents, seatbelt related injury patterns arise from the transfer of kinetic energy to the abdominal wall and internal visceral organs, both intra and retro-peritoneal. As per manufacturer's safety guidelines, seatbelts should be tight with no slack. In the UK it is illegal for drivers and passengers to not wear a seatbelt. The presence of rupture of rectus abdominis muscle secondary to seatbelt injury should raise the suspicion of intra-abdominal injury. In these cases there should be a low threshold for laparotomy to explore the possibility of occult injury.

Conflict of interest statement

None.

Funding

None.

Ethical approval

Written informed consent was obtained from the patient for publication of this case report and case series and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Author contributions

K. Patel contributed to the write up of case, literature review and discussion. R. Doolin and N. Suggett contributed to the write up of case and discussion.

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