

A Case of Iliac Crest Avulsion with Peritoneal Disruption and Bowel Herniation after Blunt Trauma

Pelvic fractures account for approximately 3 per cent of all blunt traumatic skeletal injuries. Pelvic fractures are most commonly caused by motor vehicle accidents (60%), falls from a height (30%), and crush injuries (10%).¹ Pelvic fractures are a marker for high-energy trauma and are often associated with other life-threatening

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injuries. Over 80 per cent of patients with unstable pelvic fractures are found to have additional musculo-skeletal injuries.² Although the mortality rate in patients with pelvic fractures has been declining in recent years because of the robustness of the United States trauma system, the incidence is increasing due to the higher rate of high-speed motor vehicle collisions.³

Because of the rising incidence of traumatic pelvic fractures, care must be taken to recognize and appropriately treat associated injuries. Intra-abdominal injuries associated with pelvic fractures are not unusual given the associated high-energy trauma; however, herniation of abdominal viscera is a rarely reported but potential complication.⁴ Though bowel herniation has been reported to occur after autogenous bone grafting from the iliac crest, there has been approximately 30 cases of bowel herniation associated with traumatic pelvic fractures described in the literature over the last 100 years.^{5, 6} This rare complication requires a high index of suspicion for timely diagnosis. Furthermore, even when appropriately identified, treatment can be challenging. There is no consensus for the ideal method or timing of surgical repair.^{5, 7, 8}

We describe a case of large bowel herniation with associated iliac crest avulsion fracture and concomitant intraperitoneal bladder rupture after blunt trauma.

Case

A 52-year-old male was a helmeted motorcyclist, struck by a motor vehicle traveling at an unknown speed. He was initially taken by an emergency medical service to an outlying hospital where he became hemodynamically unstable. He was resuscitated and CT scans were performed, including CT of the head, c-spine, chest, abdomen, and pelvis. He was transported to our institution via aeromedical transport to receive a higher level of care. He received 8 units of packed red blood cells and 2 units of fresh frozen plasma before arrival. Massive transfusion protocol was initiated. CT scans were reviewed, and the injuries encountered included a pelvic ring fracture, a right iliac crest avulsion with active arterial extravasation in the left hemipelvis (Fig. 1), multiple rib fractures, retroperitoneal hematoma, extraperitoneal bladder rupture, and multiple vertebral fractures. He was able to protect his airway and did not require intubation. He was taken immediately from the trauma bay to interventional radiology for a pelvic angiogram. No active bleeding was identified; however, gel-foam embolization of the right internal iliac artery was performed due to a large surrounding hematoma seen on previous CT scan. Postprocedurally, he was taken to the intensive care unit for resuscitation and monitoring. Over the next few hours, the patient developed increased abdominal

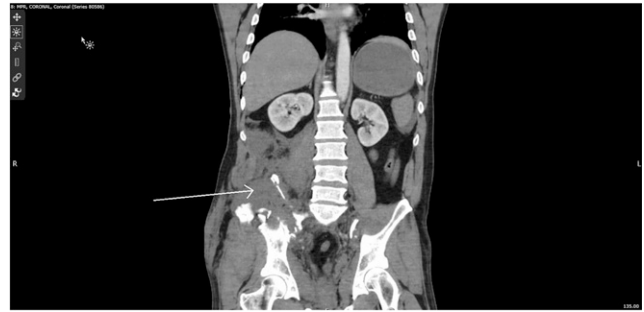


FIG. 1. Complex right iliac crest avulsion fracture.



FIG. 2. Extraperitoneal air locules with associated iliac crest fracture.

pain and distention. The patient was taken to the operating room for exploratory laparotomy due to concern for hollow viscus injury. Intra-operatively, a defect through the retroperitoneum with protruding cecum was encountered (Figs. 2 and 3). Additional injuries included full thickness bladder injury and a small bowel mesenteric rent, which were repaired primarily. There were no identified injuries to the small bowel or colon. There was an approximately 1 cm retroperitoneal defect noted with cecal herniation. The cecal herniation was easily reduced, and the peritoneal defect was repaired primarily with 3 to 0 Vicryl suture. Cecopexy was also performed. The patient was returned to the intensive care unit and was extubated on postoperative day 1. Postoperatively the patient did well and underwent open reduction with internal fixation of unstable posterior pelvic ring fractures by orthopedic surgery. The patient's hospital stay was complicated by urinary retention requiring prolonged Foley catheter placement, delirium, and hospital-acquired pneumonia. He was ultimately discharged to inpatient rehabilitation on postoperative day 20. He has been followed for six months and has had no sequela from his hernia repair.

Discussion

Bowel herniation through iliac crest after iliac crest bone harvests has been described in orthopedic literature.⁷⁻⁹ The iliac crest is commonly used as harvest



FIG. 3. Extraperitoneal air locules with associated iliac crest fracture.

site for bone grafts in orthopedic procedures. The incidence rate of bowel herniation after iliac crest harvest has been estimated to be 5 to 9 per cent, and approximately 40 cases have been described in the literature.¹⁰ Presentation is usually delayed occurring on postoperative day 11 up to 15 years postoperatively.⁷ On the contrary, little is known about this phenomenon in a traumatic context. The first reported case of bowel herniation as a result of a traumatic pelvic fracture was documented in 1907, with small bowel herniation occurring in association with a pubic rami fracture. Since that report, bowel entrapments have been recorded in sacral, iliac wing, and acetabular fractures.¹¹ Although this is a rare complication, but when left unrecognized it can prove fatal.¹²

Part of the challenge in treating these injuries is timely diagnosis. Of the 30 cases described in the literature, just over half were identified at the time of presentation.⁵ A lack of oral contrast in trauma protocol CT scans may contribute to delayed diagnosis. Furthermore, bowel herniation is not readily apparent as in our case where diagnosis was made at the time of exploratory laparotomy. In addition, associated injuries may complicate the clinical picture, causing abdominal symptoms to be attributed to adynamic ileus, rather than bowel herniation or injury, further delaying the diagnosis.⁶ Bowel herniation may even occur years after initial injury, as in the case of a patient that presented with right gluteal bulge and right lower quadrant abdominal pain six years after blunt trauma.⁵

The repair of these injuries should follow the same basic tenants of all hernia repairs, including reduction of herniated contents and obliteration of the defect with tension-free repair.⁷ Repair options vary based on timing of diagnosis, associated health of the bowel, and level of intra-abdominal contamination. When diagnosed immediately after trauma, the injury will likely be approached via transperitoneal abdominal exploration. When the defect is less than 2 cm it can be repaired primarily. The challenge of appropriate treatment occurs if the defect is larger than 2 cm, as there is no consensus in the literature due to the small number of cases reported. Consideration should be given to a mesh repair, *e.g.*, tantalum mesh scaffolding

of bony defects as described for larger hernia defects.¹³ However, this is not often possible in the setting of trauma due to open contaminated wounds or bowel disruption.⁵ When the hernia is repaired in a delayed manner after trauma or iliac crest harvest, several other repair options have been described including a transperitoneal, retroperitoneal, and posterior approach.^{7, 8, 13} Moon et al. described a retroperitoneal approach utilizing fibular bone scaffolding to repair a traumatic hernia, which was discovered six years after injury.⁵ Repair of herniation after iliac crest harvesting has commonly been described via a posterior approach through previous scar from grafting site. The defect has been obliterated with soft tissue of gluteal fascia, iliacus muscle, and external oblique muscle. In the case of our patient, a transperitoneal approach was used. Because of a concomitant open right flank wound, the use of mesh was not possible. The peritoneal defect was therefore repaired primarily. The patient was counseled on the high likelihood of hernia in the future, which would warrant formal hernia repair, and a high index of suspicion remains during this patient's follow-up care.

Conclusion

Bowel herniation associated with pelvic fracture is a rare but potentially fatal injury. Diagnosis is difficult because of lack of oral contrast in routine trauma CT scans and complicated clinical picture due to multiple injuries. A high index of suspicion is required for diagnosis in a patient with a worsening abdominal exam and associated pelvic fractures. When defect is less than 2 cm, a primary repair is indicated. When larger than 2 cm, a mesh repair should be considered. If the use of mesh is precluded, soft tissue or surrounding muscle can be used for coverage. If discovered in a delayed manner, a transperitoneal or retroperitoneal approach may be utilized.

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