

## Iliac Crest Herniation Secondary to Autogenous Bone Grafting Found on Osteopathic Examination

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**Surgical repair of difficult or nonunion fractures is frequently performed with autogenous bone grafts, most commonly from the iliac crest. Complications from this procedure may include vessel injury, nerve injury, pelvic instability, bowel herniation, and ileus. The authors report a case of iliac crest herniation in a patient presenting with a small-bowel obstruction 2 years after anterior iliac crest graft harvest for an open reduction and internal fixation repair of a right humeral shaft fracture. An emergency operation revealed that the right colon had herniated through an opening in the right iliac crest. The appendix had adhered to new osseous bone formed postoperatively, requiring an appendectomy. The hernia defect was successfully repaired with polypropylene mesh. A high index of suspicion for graft site herniation is needed for patients with a history of iliac crest bone grafting who present with symptoms of abdominal pain, flank or hip pain, ileus, or small-bowel obstruction.**

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**A**utogenous bone grafting is a common procedure for orthopedic surgeons. Such grafts are often used when a patient has a difficult fracture, bone defects, or a nonunion fracture. One of the most common locations for autogenous grafting is the iliac crest, a source of cortical and cancellous bone.<sup>1</sup> Although this surgical procedure is widely used, it has been associated with rare complications, including arterial injury, nerve injury, ureteral injury, ileus, hematoma, pelvic instability, fracture, and herniation.<sup>2</sup>

Herniation through the iliac crest graft site is a rare but serious complication, with an incidence rate of 5% to 9%.<sup>3,4</sup> To our knowledge, the first documented hernia through the iliac crest was reported in 1945.<sup>5,6</sup> Iliac crest herniation has an associated 25% risk of incarceration and 10% risk of strangulation.<sup>7,8</sup> Patients usually present with symptoms of abdominal distension, tenderness at the site of herniation, palpable soft-tissue mass, recurrent abdominal pain, changes in bowel habits, or signs of small-bowel obstruction.<sup>9-11</sup> Risk factors are associated with age, female sex, obesity, and poor musculature.<sup>1,3,6</sup>

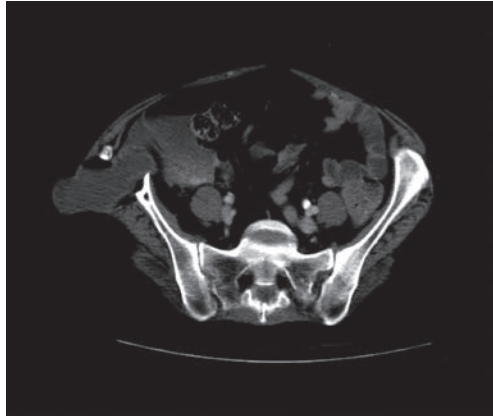
We report findings in a patient who presented with a small-bowel obstruction 2 years after anterior iliac crest graft harvest for open reduction and internal fixation repair of a right humeral shaft fracture.

## Report of Case

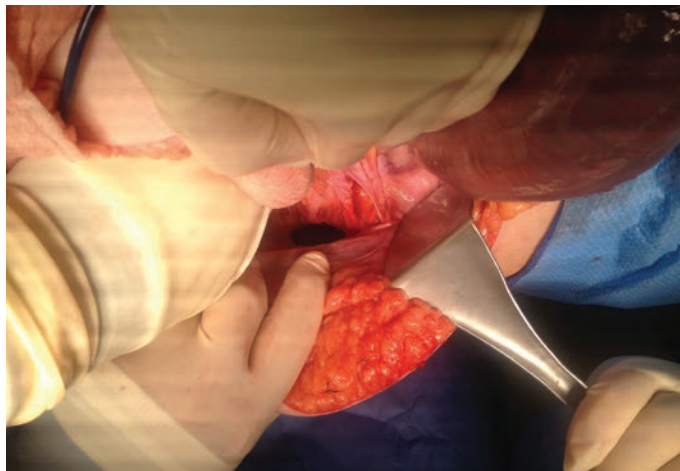
A 43-year-old woman presented to the emergency department with a 2-day history of back pain radiating to the epigastric region, as well as nausea and vomiting. She had been having regular bowel movements before hospital admission. At physical examination, she had a distended abdomen with decreased bowel sounds and a soft mass protruding from her right hip area at the level of the iliac crest, along with scarring from a previous operation. The mass was tender when palpated, and it was irreducible. The patient's surgical history and operative reports revealed autogenous iliac crest bone grafting to repair a right humeral shaft fracture 2 years earlier.

Because of a high index of suspicion for herniation at the site of the previous operation, a computed tomographic (CT) scan of the abdomen and pelvis was obtained in the emergency department (*Figure 1*). The CT images revealed dilated intestinal and colonic loops, with a right lateral abdominal wall hernia through a previous osseous defect in the anterior superior iliac spine. The patient underwent emergent exploratory laparotomy.

The right side of the patient's colon had herniated through a 4×7-cm<sup>2</sup> opening in the right iliac crest. After careful dissection and reduction of the hernia, the surgeon discovered that the tip of the appendix was adhered to the new osseous bone that formed after the previous bone grafting. Extensive dissection and appendectomy was performed before closure of the iliac crest defect (*Figure 2*). The hernia defect was repaired with polypropylene mesh tacked to the iliac bone with suture anchors, and the peritoneum was closed with a running polypropylene suture. The patient did well postoperatively and was discharged to home 3 days later. Two follow-up visits revealed no further complications.



**Figure 1.** Computed tomographic scan of the patient's abdomen and pelvis. The mass is visible on the right iliac crest, protruding through the defect.



**Figure 2.** Intraoperative view of right iliac crest hernia defect with appendix adhered to iliac crest.

## Discussion

### Pathogenesis and Epidemiology

Although herniation through the iliac crest is rare, physicians should include it in their differential diagnosis when presented with a patient who has a small-bowel obstruction and a history of iliac crest bone grafting. An iliac crest bone graft can be harvested as a partial-thickness or a full-thickness graft; both have the potential for complications.<sup>11</sup>

### Diagnosis

Patients usually present clinically with abdominal pain, abdominal distension, a palpable soft-tissue mass, nausea, and vomiting. Abdominal radiography or CT scan of the abdomen and pelvis can help the physician reach a diagnosis by delineating the defect of the iliac crest, defining the fascial planes, and displaying the contents of the herniated sac.<sup>12</sup> Hernias may contain retroperitoneal fat, kidneys, spleen, liver, and bowel.<sup>1</sup>

Regarding the current case, we later discovered a radiograph obtained 2 years after bone grafting, taken after an unrelated fall on the ice 1 year before presentation. The radiograph showed an opening in the iliac crest at the donor graft site that was not described in the radiologist's report. This finding highlights the need to make both patients and health care professionals aware of possible adverse events related to donor grafts and encourage them to monitor those sites proactively.

Typically, patients' medical and surgical history and clinical presentation should guide the focused structural examination. In particular, examining physicians should observe patients as they enter the room, noting gait and posture, using structural examination to detect any asymmetrical abnormalities, and palpating the area in question for any changes, defects, or discomfort. The examination should include the innominate, sacroiliac dysfunctions, and soft-tissue changes. Had our patient's previous operation been reported to her primary care physician, that physician could have monitored the operation site for potential herniation. This extra attention would have

prompted elective repair when the hernia was first detected, obviating the need for an emergency operation.

### Management of Iliac Crest Hernias

Our patient presented with an unusual complication that, to our knowledge, has not been previously associated in the literature with iliac crest bone harvesting or iliac crest herniation. The tip of her appendix had adhered to new osseous bone formed after the initial graft harvest. The location and positioning of the appendix against the graft site prevented operative closure of the iliac crest defect. Careful, extensive dissection of the appendix was required, to prevent rupture and spillage, and an appendectomy was performed, with the appendix removed intact. This unexpected complication prolonged surgical time and limited the choice of material for surgical repair.

Operative repair is recommended to reduce the hernia and prevent future complications of incarceration, strangulation, or intestinal obstruction.<sup>13</sup> Tension-free mesh repair can be performed through a transabdominal, retroperitoneal, or laparoscopic approach.<sup>13-15</sup> The use of polypropylene mesh is 1 form of repair.<sup>3,6,16</sup> Flap tissue repair is another option; the defect can be repaired with the iliopsoas, the aponeurosis of the gluteus medius muscle, a graft of the fascia lata, or the lateral flap of the aponeurosis of the external oblique muscle rotated over the defect.<sup>9-20</sup>

The decision to use a polypropylene mesh in our patient was based on the size of the defect and the need to remove an intact appendix. With the appendix adhered to the bone, we elected to perform an appendectomy and remove the lead point that was causing the herniation. The procedure was classified as class II/clean-contaminated according to the Surgical Wound Classification System, because it was performed without bowel spillage, and the patient had received preoperative antibiotics. The iliac crest defect needed to be bridged, and we selected stronger reinforcement with a polypropylene (rather than biologic) mesh for the repair based on the wound classification.<sup>21,22</sup> After closing the defect, we used polypropylene mesh to close over the peritoneum as well.

## Prevention of Iliac Crest Hernias

Repair of the hernia contents with closure of the defect is essential to ensure prevention of future hernia, volvulus, obstructions, or strangulations.<sup>10,13,20</sup> Reviewed cases were primarily single patients with a variety of graft site hernias repaired utilizing mesh. None reported long term follow-up and none were specific to mesh repair of iliac crest graft site herniation with appendix adherence to postoperative osseous bone.<sup>23-25</sup>

## Conclusion

In a patient with a small-bowel obstruction and a history of iliac crest grafting, a high index of suspicion and a thorough physical examination may help identify iliac crest herniation. All patients and health care professionals should remain vigilant about proactively monitoring the graft site for potential complications during routine or unexpected health care visits. Our patient's appendix had adhered to the iliac crest graft site, which was found incidentally during the hernia operation. We plan long-term follow-up to monitor the outcomes in this unusual case.

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