Case Reports

Splenic Rupture after Anterior Thoracolumbar Spinal Fusion Through a Thoracoabdominal Approach

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Abstract The anterior approach in spinal deformity surgery has increased in popularity in recent years. The thoracoabdominal approach to the thoracolumbar spine is associated with numerous possible complications, including injury to vital intraabdominal structures in close proximity to the area of exposure, such as the spleen. We describe the case of a 44-year-old woman who underwent an emergent exploratory laparotomy for progressive abdominal pain and hemodynamic instability that revealed splenic rupture two days after single-stage anterior spinal fusion with instrumentation for thoracolumbar kyphoscoliosis. Because the suspected etiology of the splenic hemorrhage was related to retraction, surgeons using the anterior approach should consider intermittent release of retractors and inspection of intraabdominal structures. Splenic rupture should be considered as part of the differential diagnosis for patients with hemodynamic instability after anterior approaches to the thoracolumbar spine.

Introduction

The thoracoabdominal approach to the thoracolumbar spine is associated with numerous possible complications, including injury to vital intraabdominal structures in close

proximity to the area of exposure such as the spleen. Only two reports of splenic rupture associated with spine surgery have been published [2, 3]. We present the case of a 44-year-old woman who underwent an emergent exploratory laparotomy for progressive abdominal pain and hemodynamic instability that revealed splenic rupture 2 days after single-stage anterior spinal fusion with instrumentation for thoracolumbar kyphoscoliosis.

Case Report

A 44-year-old woman with a history of adolescent idiopathic scoliosis presented with painful, progressive thoracolumbar kyphoscoliosis. She was diagnosed with scoliosis as a teenager and treated with bracing at another institution. She remained active and pain-free until she was approximately 34 years old, when she presented to our clinic. At that time she reported thoracolumbar back pain worsened by activity but not preventing her from leading an active life. She was followed with serial radiographs and physical examinations. Her back pain slowly worsened during the ensuing 10 years, until she reported that her pain had begun to limit her ability to exercise comfortably or perform activities of daily living, such as pick up and carry her children or heavy objects. She was otherwise healthy, and she had never had surgery.

On physical examination, she showed 1 cm decompensation to the left in the coronal plane. She had a 20° left thoracolumbar prominence and a 7° right thoracic prominence. Radiographs revealed a left thoracolumbar curve measuring 53° from T11 to L3 and a right thoracic curve from T6 to T11 measuring 50° and bending to 20° (Fig. 1). The apical thoracolumbar vertebrae were rotated 25° and displaced 4 cm from the center sacral line. The apical

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Our institution's board of ethics does not require formal informed consent for participation in this type of study.

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Fig. 1 A preoperative anteroposterior scoliosis spine radiograph shows the patient's coronal plane deformity.

thoracic vertebrae were rotated 5° and displaced 3.4 cm. She had normal sagittal alignment with the exception of kyphosis measuring 20° from T10 to L2 (Fig. 2). Surgical indications therefore included progressive kyphoscoliosis and thoracolumbar back pain.

A left-sided thoracolumbar approach for a selective thoracolumbar fusion was performed. She was positioned in the lateral position and a standard curvilinear incision was used. The tenth rib was removed and the thorax was entered. The diaphragm was taken down sharply, leaving a cuff of muscle attached to the chest wall. The peritoneum was elevated gently over the psoas, exposing the spine. A Buchwalter retractor was used with moist laparotomy sponges protecting the retractor blades. Segmental vertebral arteries were clipped and ligated. The intervertebral discs were excised, and their contents were replaced with cages filled with allograft and local bone from the tenth rib. Bicortical vertebral screws were placed and fixed to two rods contoured to recreate the normal sagittal alignment of the thoracolumbar spine. A chest tube was placed and the

Fig. 2 A preoperative lateral scoliosis spine radiograph shows the patient's sagittal plane deformity.

wound was closed in layers. Intraoperative anteroposterior and lateral radiographs revealed good hardware position and curve correction. The patient was estimated to have lost 250 mL of blood, which was replaced with 3500 mL of Lactated Ringer's (Baxter, Deerfield, IL) during the 3.5-hour surgery. The patient remained hemodynamically stable throughout the procedure.

During the first 24 hours after spine surgery, the patient remained hemodynamically stable with mild incisional pain controlled with intravenous patient-controlled anesthesia. On the night of postoperative Day 1, the patient became tachycardic and hypotensive and reported increasing diffuse abdominal pain. Physical examination revealed a clean, dry incision over the left upper quadrant and flank, diffuse

Fig. 3 An abdominal CT scan obtained on postoperative Day 1 revealed an intracapsular hematoma (arrow) adjacent to the spleen (triangle), with extracapsular extension into the abdominal cavity.

pallor of the skin, scleral icterus, diffuse abdominal tenderness, and guarding. Computed tomographic scans revealed intracapsular splenic hematoma with extracapsular extension into the abdominal cavity (Fig. 3). In the early morning of postoperative Day 2, emergency laparotomy was performed, which revealed a massive hematoma in the left parasplenic gutter and a bleeding short gastric artery in the gastrosplenic ligament. Approximately 70% of the capsule of the spleen was a single free-floating piece of tissue in the hematoma, with the other 30% of the capsule still adherent to the parenchymal surface of the spleen, which was bleeding diffusely. Splenectomy and ligation of the bleeding artery were performed, and the abdomen was left open because of excessive tissue edema and covered with a VICRYL (Polyglactin 910) woven mesh graft (Ethicon Endo-Surgery, Inc, Cincinnati, OH) and bio-occlusive dressing. Four days later, the abdomen was closed without complication. The patient was discharged 2 weeks after the initial surgery and achieved spinal fusion within 4 months. At a post-operative visit one year following the procedure, the patient denied back pain, abdominal pain, or other symptoms, and reported full return to activities of daily living. Radiographs from this visit (Figs. 4, 5) demonstrated intact hardware, bony spinal fusion, and good sagittal and coronal balance.

Discussion

This case of splenic rupture after anterior thoracolumbar spinal fusion in a 44-year-old woman underscores the major risks associated with the anterior approach in spine surgery, particularly at the thoracoabdominal level. Although the exact etiology of the splenic injury in this

Fig. 4 A postoperative anteroposterior scoliosis spine radiograph shows bony fusion with instrumentation, level shoulders, a level pelvis, and no evidence of coronal decompensation. The persistent thoracic curve of approximately 35° is consistent with our expectations for selective thoracolumbar fusion, and is thought to be necessary for the patient to maintain coronal balance.

case remains uncertain, we surmise traction on the spleen or its adjacent viscera caused avulsion of one of the vessels in the suspensory ligaments of the spleen. In this case, the gastric artery in the gastrosplenic ligament was bleeding during laparotomy. An intracapsular hemorrhage progressed to capsular rupture during the first 36 hours after surgery, causing life-threatening intraperitoneal bleeding.

Although splenic rupture after other procedures such as colonoscopy [4], open repair of abdominal aortic aneurysm or aortoiliac occlusive disease [8] has been described in the general surgery literature, to our knowledge, there are only two previous reports in the literature describing splenic rupture after anterior spinal surgery. In 1983, Hodge and DeWald reported two similar cases of splenic injury after

Fig. 5 A postoperative lateral scoliosis spine radiograph shows bony fusion with instrumentation and no evidence of sagittal decompression.

the anterior approach of planned staged anteroposterior fusions [3]. In one case, performed on a 48-year-old woman with a 74°-thoracolumbar scoliotic curve, gentle bleeding was noted on the surface of the capsule of the spleen after blunt dissection of the peritoneum from the posterior gutter. In the second case, a 46-year-old woman with severe thoracolumbar scoliosis had acute abdominal pain and hypotension develop 9 days after anterior fusion and instrumentation. Paracentesis revealed frank blood, and a laparotomy was performed showing the spleen completely avulsed from the hilum and free-floating in a 15-cm hematoma. Ligation of the hilum was performed,

and the patient recovered. The authors recommended direct inspection of the spleen during any thoracoabdominal approach for correction of rigid lumbar curves [3].

Another case of splenic rupture after the posterior approach to the spine was described more recently [2]. Four days after posterior instrumentation and fusion performed on an adolescent female with Marfan's syndrome and an 84°-right thoracic curve and 58°-left lumbar curve, which involved a T6 to T9 right thoracoplasty, the authors performed intraperitoneal lavage for persistent hemodynamic instability and abdominal dullness. The intraperitoneal lavage revealed frank blood, and laparotomy revealed a contained intracapsular hematoma with two 1.5-cm capsular tears in the upper pole of the spleen, which prompted a splenectomy.

The four described cases, including the current case, of splenic injury after surgery for spinal deformity, involved female patients, with the three anterior cases occurring in women in their 40s. However, it seems unlikely any anatomic or physiologic features distinct to females or this age group play a role in the etiology of their injuries.

Several reports of injury to other retroperitoneal or intraabdominal structures have been published. Rajamaram et al described a case of acute pancreatitis complicating anterior lumbar interbody fusion in a patient who had abdominal symptoms develop on postoperative Day 3 [6]. The diagnosis was made based on elevated pancreatic enzymes and confirmed by a CT scan showing swelling of the tail of the pancreas [6]. Their case highlights the possibility of injury to the delicate tissue of the pancreas, even when surgery is performed at sites remote from the organ. Another report of sympathetic nerve injury, vascular injury, and bowel injury also was published [7].

Use of the anterior approach in spinal deformity surgery has become increasingly popular in recent years. However, it is debatable whether it is the optimal approach for various conditions requiring surgery. Bridwell reported anterior-only surgery is more applicable to younger, healthier patients with good bone stock and limited spinal disease [1], a profile exemplified by the patient in our case. Although our patient had physical manifestations of an acute abdomen 1 day after spine surgery, several reports describe the onset of symptoms many days into the postoperative course [2, 3]. We recommend close monitoring of patients who have undergone anterior spine surgery for as much as 1 to 2 weeks postoperatively and an aggressive workup for any patient with abdominal complaints or hemodynamic instability, including full laboratory assessment, general surgery consultation, and use of a contrast CT scan of the abdomen early during the diagnostic process. The incidence of splenic injury after thoracolumbar approaches to the spine is unknown. Although catastrophic injury is uncommon, it is possible many asymptomatic

injuries to the spleen go undetected. Hemodynamically stable patients with splenic injuries after blunt trauma are successfully treated nonoperatively in greater than 70% of cases [5].

Splenic injury after the thoracolumbar approach to the spine is a rare but potentially deadly complication. It should be considered as part of the differential diagnosis for patients with hemodynamic instability after anterior approaches to the thoracolumbar spine.

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