Abdominal aortic rupture from an impaling osteophyte following blunt trauma

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Blunt injury of the abdominal aorta is highly fatal. We present an unusual case of an osteophyte impaling the abdominal aorta treated by endovascular repair. A 77-year-old man sustained a thoracolumbar fracture-dislocation with posterior aortic rupture between his celiac and superior mesenteric artery origins. His aortic injury was treated with a stent graft, excluding the celiac origin. He was dismissed on postoperative day 6. At 6 months, he had returned to most preinjury activities, and at 2-year follow-up, he continues to have good functional outcome. Endovascular repair may be successfully employed in select aortic injuries in hemodynamically stable patients. (J Vasc Surg 2014;59:1112-5.)

Aortic injuries after blunt trauma generally involve the thoracic aorta and carry a high mortality. Two recent studies demonstrated reduced operative time, procedural blood loss, and transfusions, as well as lower intraoperative and overall hospital mortality with use of endovascular repair.[1,2] In both studies, most endovascular complications were related to graft malposition. Blunt abdominal aortic injuries (BAAIs) are uncommon, with less than 200 cases reported in the world literature.[3-5] The incidence of BAAIs ranges from 0.04% to 0.67%, and the small subset with full-thickness rupture rarely reach the hospital alive.[3,4,6] Many patients with BAAIs have multisystem trauma and present with severe concomitant injuries typically involving the bowel, liver, spleen, bony pelvis, or spine.[6] Their pathogenesis and classification parallels thoracic aortic injuries and includes intimal flaps, pseudoaneurysms, and free rupture.[3,7] The abdominal aorta has been appropriately divided into three zones based on the major anatomic branches and open exposure.[3] Zone 1 is superior to the superior mesenteric artery (SMA), zone 2 is between the SMA and renal arteries, and zone 3 lies below the renal arteries.[3]

To the best of our knowledge, BAAI resulting from an osteophytic spur injury has not been reported. Herein, we present the first reported case of a posterior abdominal aortic-contained rupture resulting from an osteophytic spur piercing the aorta after a thoracolumbar fracture-dislocation. Additionally, this is the first example of a zone 1 traumatic abdominal aortic rupture managed without laparotomy and treated entirely with an endovascular approach.

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CASE PRESENTATION

A 77-year-old man was an unrestrained driver who reversed his van into a tree, breaking the driver chair backrest, and resulting in hyperextension of his thoracolumbar spine. He was initially evaluated at an outlying facility where he was hypotensive and complained of back pain. He was transferred to our American College of Surgeons-verified level I trauma center and arrived 3 hours postinjury. He received 3 liters of crystalloid en route and was hemodynamically stable throughout. Upon evaluation at our trauma center, his blood pressure was 124/46 mm Hg, pulse was 106, and respiratory rate was 18. His Glasgow Coma Scale score was 15, and his only complaint was of back pain. Physical examination revealed thoracolumbar tenderness, and he was neurovascularly intact. Pertinent labs included a hemoglobin of 7.6 g/dL, lactate of 4.6 meq/L, international normalized ratio of 1.1, glucose of 223 mg/dL, and a creatinine of 0.91 mg/dL. Past medical history was significant for diabetes mellitus, hypertension, coronary artery disease, congestive heart failure, and osteoarthritis. Past surgical history was positive for right hip replacement. Medications included clopidogrel and aspirin. A Focused Assessment with Sonography for Trauma and plain films of his chest and pelvis were unremarkable for injury. Computed tomography angiography (CTA) of his thorax, abdomen, and pelvis revealed the following: T12-L1 fracture-dislocation with a degenerative osteophyte piercing the aorta (Fig 1, *A*) and a retroperitoneal hematoma with pseudoaneurysm (Fig 1, *B*). The SMA, celiac origin, and renal arteries were patent and uninjured. The posterior aortic injury was 3 mm inferior to the origin of the celiac artery and 5 mm superior to the SMA, corresponding to a zone 1 injury. The aortic diameter was 26 mm at the injury site. The pseudoaneurysm neck measured 6 mm wide by 10 mm long.

Neurosurgery recommended posterior spinal stabilization following aortic repair. The patient was taken

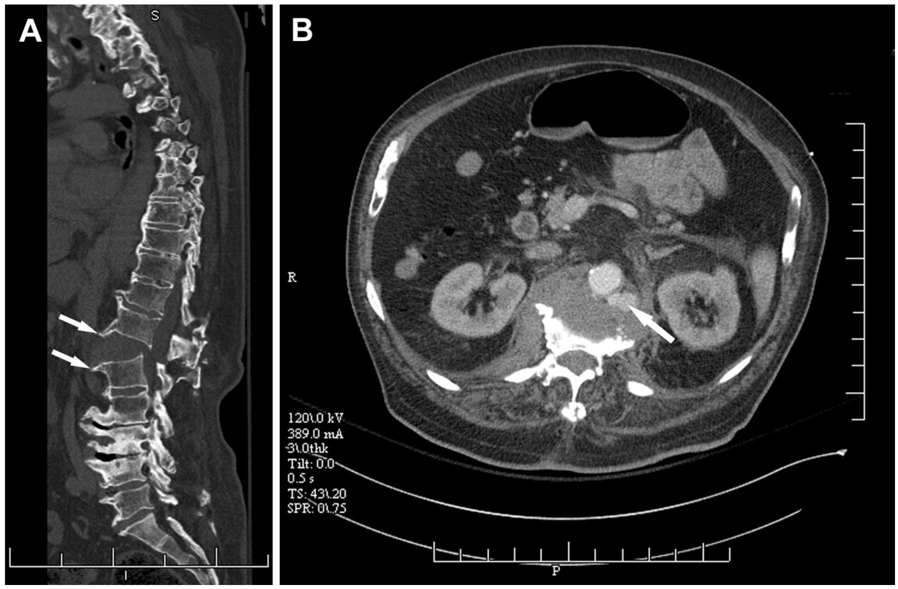

Fig 1. Computed tomography angiography (CTA) of the thorax, abdomen, and pelvis demonstrating **(A)** T12-L1 fracture dislocation with degenerative, spear-like osteophytes (*arrows*). **B,** Retroperitoneal hematoma with contrast extravasation (*arrow*) and zone 1 pseudoaneurysm just below the celiac artery.

emergently to our endovascular-capable operating room and prepped for celiotomy and thoracotomy. Single-lumen general endotracheal anesthesia was induced. We performed percutaneous left femoral and open right femoral access without systemic heparinization. Flush angiogram confirmed contrast extravasation between the celiac and SMA origins. A Zenith TX2 TAA 32-mm × 127-mm endovascular stent graft (Cook Medical, Bloomington, Ind) was deployed to cover the rupture site and celiac artery ostium, excluding celiac flow. The graft was oversized 23% to achieve this deployment exclusion. The uncovered fixation wires spanned the SMA and the fabric seated just superior to the SMA (Fig 2). Intraoperative postdeployment angiography revealed collateral flow through the pancreaticoduodenal arcade, gastroduodenal, and common hepatic artery (Fig 2). Since the arteriogram demonstrated collateral perfusion, we elected not to perform open debranching with bypass. Consideration was given to placing a spinal drain; however, due to the patient's severe arthritic spine disease and fracture-dislocation, neurosurgery and anesthesiology recommended not placing a spinal drain.

On postoperative day 1, the patient underwent posterior spinal stabilization. He was extubated on postoperative day 3 and was walking with physical therapy on postoperative day 4. The patient was dismissed to rehabilitation on postoperative day 6. His hemodynamics and renal function were maintained throughout the postoperative period without pressors. His creatinine never climbed above 0.90 mg/dL. Total contrast exposure was 285 mL (125 mL initial CTA, 60 mL during endovascular aneurysm repair, and 100 mL follow-up CTA on postoperative day 4). Intraoperative fluoroscopy time was under 7 minutes.

At 6 months postinjury, the patient was living independently on his farm and had returned to most preinjury activities. A 6-month follow-up CTA showed thrombosis of the celiac trunk, no endoleak or stent migration, and continued collateral flow through the proper hepatic artery (Fig 3). Serial CT was performed at 6-month intervals showing continued patency and no evidence of migration or other complication. The patient's medical comorbidities did progress, necessitating nursing home placement where he remains at the time of this article, 2.5 years postinjury.

DISCUSSION

Treatment of all aortic pathology has dramatically changed over the past decade as a result of advances in endovascular technology and its availability. From elective repair of aortic aneurysms and occlusive disease to emergent repair of thoracic transections, endovascular therapies play a major role in the treatment of aortic disease. The trauma literature continues to mount with regard to endovascular repair of thoracic aortic transection. In anatomically suitable patients, endovascular repair of thoracic aortic transection is now first-line therapy due to reduced morbidity and mortality as compared with open repair.[1,2,8] The natural progression of applying similar techniques to BAAI is clearly underway, as reported in case series from others.[5-7,9,10] The rarity of BAAI makes this entity difficult to study. The limited evidence available suggests its use is feasible in certain patients. Some have reported on the use of endovascular stent grafts to repair sequelae of BAAIs or after damage-control laparotomy identified an injury.[4-6,9,10] This combined technique may be particularly enticing when one encounters concomitant hollow viscus injury with contamination.