Acute bilateral iliac artery occlusion secondary to blunt trauma: Successful endovascular treatment

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Introduction: Endovascular treatment of blunt vascular trauma has been infrequently reported.

Presentation: A 27-year-old man was crushed between a fork-lift truck and a concrete platform. The physical examination was remarkable for hemodynamic stability, significant lower abdominal ecchymosis and tenderness, obvious pelvic fracture, and gross hematuria. Vascular examination revealed no femoral pulses, no pedal signals bilaterally, and minimal left leg and no right leg motor function. Arteriograms revealed right common iliac artery and external iliac artery occlusion and a 2-cm near occlusion of the left external iliac artery.

Treatment: In the operating room, bilateral common femoral artery access was obtained, and retrograde arteriogram on the right side demonstrated free extravasation of contrast material at the level of the proximal external iliac artery. An angled glide wire was successfully traversed over the vascular injury, and two covered stents (Wallgraft, 10 × 50 mm and 8 × 30 mm) were deployed. The left iliac injury was similarly treated with an 8 × 30-mm covered stent. After calf fasciotomy, exploratory laparotomy revealed a severe sigmoid colon degloving injury, requiring resection and colostomy. A suprapubic catheter was placed because of bladder rupture, and an open-book pelvic fracture was treated with external fixation. Postoperatively the patient regained palpable bilateral pedal pulses and normal left leg function, but right leg paralysis persisted secondary to severe lumbar plexus nerve injury.

Conclusion: Endovascular repair of blunt intra-abdominal arterial injuries is possible and should be particularly considered when fecal contamination, pelvic hematoma, or multiple associated injuries make conventional repair problematic. (J Vasc Surg 2003;38:589-92.)

Treatment of traumatic vascular injury has traditionally been performed with conventional vascular reconstruction or direct repair. Endovascular treatment of penetrating vascular injuries is well described. However, use of such minimally invasive treatment for blunt vascular injury has been infrequently reported.

CASE REPORT

Presentation. A 27-year-old man sustained severe blunt injury to the lower torso after being crushed between a fork-lift truck and a concrete platform. At presentation to the emergency department within 20 minutes of the trauma, he had severe lower abdominal and pelvic pain. The initial examination was remarkable for hemodynamic stability, clear breath sounds, and no evidence of trauma above the abdomen. He had significant lower abdominal ecchymosis and tenderness, obvious pelvic fracture, and gross hematuria. Rectal examination showed normal tone, with no bony fragments appreciated. Vascular examination revealed no femoral pulses and no pedal pulses, and Doppler scanning signals were absent bilaterally. The left foot was modestly cool, with some capillary refill, whereas the right foot was cold and pallid. There was minimal left leg and no right leg motor function.

Radiographic studies confirmed an open-book pelvic fracture and associated right acetabular fracture. A retrograde urethrogram demonstrated a retroperitoneal bladder rupture, with extravasation extending over the left inguinal region. Computed tomography scans of the abdomen and pelvis showed no obvious aortic injury, a large abdominal wall disruption, a small pelvic hematoma, no free fluid, and no evidence of liver, spleen, or kidney injury. Arteriographic studies (Fig 1) via a brachial approach confirmed the absence of aortic injury. However, the entire right iliac artery was occluded 2 cm from its origin, with reconstitution at the bifurcation of the profunda and common femoral artery. The left proximal external iliac artery had a 2-cm occlusion, but was reconstituted with patent run-off vessels.

Vascular treatment. In the operating room, bilateral common femoral artery access was obtained via cutdown. Percutaneous access was not attempted because of massive swelling and deformity of the area secondary to the open-book pelvic fracture. In addition, it was thought that a limited thrombectomy might be
required on the right side. However, careful palpation of the right common femoral artery suggested the absence of thrombus. This vessel was then cannulated with a standard 18-gauge needle and J wire, and a 6F sheath was advanced approximately 2 cm. Retrograde arteriograms via the sheath demonstrated free extravasation of contrast material at the level of the proximal external iliac artery (Fig 2). The middle to distal external iliac artery was patent, without filling defects. An angled glide wire was carefully passed through the iliac vascular injury to the distal aorta. After confirmation of its intraluminal position with placement of a straight catheter and arteriography, the 6F sheath was replaced with a 10F sheath, and a covered stent (Wallgraft, 10 × 50 mm; Boston Scientific, Boston, Mass) was deployed proximally in the common iliac artery, extending into the external iliac approximately 1.5 cm.
A second covered stent (Wallgraft, 8 × 30 mm; Boston Scientific) was deployed distally, with 1 cm of overlap. Because of significant luminal narrowing, post-deployment angioplasty with a 6-mm balloon was performed within the distal half of the covered stents. Completion arteriograms revealed iliac lumen restoration without evidence of extravasation (Fig 3). The left external iliac artery injury was treated in similar fashion. A single 8 × 30-mm Wallstent was deployed across this injury and post-dilated with a 6-mm balloon (Fig 4).

Both hypogastric arteries were covered in this endovascular repair. Only regional anticoagulation with a dilute saline solution-heparin flush through the sheaths was used. Before closure of the femoral arteriotomies, bilateral antegrade arteriograms demonstrated no infrainguinal occlusion or filling defects. Four compartment fasciotomies of the right calf were performed.

**Treatment of associated injuries.** Immediate exploratory laparotomy revealed a severe sigmoid colon degloving injury that necessitated resection and colostomy. A suprapubic catheter was required because of the bladder rupture, and the large abdominal wall defect was repaired with mesh. The open-book pelvic fracture was treated with external fixation.

**Postoperative course.** After the operation palpable bilateral pedal pulses and normal left leg motor and sensory function were regained. Because of immobility and contraindications to anticoagulation therapy, a vena cava filter was placed for pulmonary embolism prophylaxis. A right thigh fasciotomy was necessary 36 hours after the initial surgery because of massive local swelling. However, the right leg paralysis persisted and was believed to be not due to ischemia but secondary to severe right lumbar plexus nerve avulsion injuries, as documented at subsequent electromyography.

The postoperative course was complicated by pelvic sepsis, which required operative drainage of an infected hematoma and drainage of large subcutaneous fluid collections in the sacral area. At transfer to a rehabilitation facility 62 days after the injury, the patient was tolerating a general diet, there was no evidence of sepsis, excellent granulation tissue was present at the fasciotomy sites, and pedal pulses were palpable bilaterally. The patient did not regain motor function of the right leg, presumably because of severe right lumbar plexus nerve avulsions.

**DISCUSSION**

Several factors made conventional open vascular repair of the bilateral iliac artery injuries in this patient rather problematic. Direct suture repair is rarely feasible in arterial blunt trauma, and even if this were possible with the aid of autogenous patching, this approach would require opening the retroperitoneum. Particularly in the face of a pelvic fracture, opening of the retroperitoneum can result in massive hemorrhage. In-line bypass with a prosthetic conduit (aortobifemoral bypass) presents risk for hemorrhage plus an unacceptable risk for infection because of colon injury. Anatomic bypass grafting with superficial femoral vein would obviate the risk for infection, but would require extra harvesting time in a critically ill patient with multiple traumatic injuries, contraindicating this procedure. Extra-anatomic prosthetic bypass grafting (axillofemoral bypass) also presents significant risk for infection due to urine extravasation in the left femoral area, proximity of the external pelvic fixation rods, and presence of the suprapubic urinary drainage catheter. Finally, time was a significant factor. The patient required surgical intervention from four services (general surgery, vascular surgery, urology, and orthopedics), so the most expedient treatment for the acute limb ischemia was ideal to minimize total time in the operating room.

Endovascular approaches for treating traumatic arterial lesions have been reported predominantly for penetrating injuries. However, there have been recent reports of extension of this minimally invasive treatment to blunt arterial trauma. Both infrarenal and thoracic aortic transsections have been successfully treated with placement of stent grafts. Aortoiliac dissections have also been successfully treated with endovascular methods.

Most trauma to the abdominal vascular structures is secondary to penetrating trauma. Blunt injury to these vessels is unusual, with a reported incidence of 11% to 12% in large series of vascular abdominal trauma. The mortality rate from iliac artery injury was 38% to 72% in these series. Common or external iliac artery injuries are rare, even in combination with pelvic fracture. In a report that focused on vascular injuries associated with pelvic fractures, no common or external iliac artery injuries were observed in 429 consecutive patients. In another study, a 4% incidence of iliac artery injury (8 of 224 arteries) was noted in association with pelvic fracture. In this series, 5 of 8 injuries were recognized within the first 6 hours after injury. All patients underwent open vascular reconstruction with either in situ interposition grafts or femorofemoral bypass grafts. The amputation rate was 25% (2 of 8); one patient died.

Many reports of blunt aortoiliac arterial trauma suggest that acute limb-threatening ischemia is an unusual presenting sign, and most injuries are recognized and treated days, months, and even years after the traumatic episode. A report from Tuech et al described nine patients with blunt iliac artery injury with median delay to operative repair of 15 days (range, 2 days to 36 years). All injuries were treated with conventional operative bypass grafting. These previous reports serve to underscore the rarity of acute limb-threatening ischemia in the setting of blunt abdominal trauma.

**Limitations of the present study.** Early or late infection of covered stents is possible and must be considered a theoretical limitation to this approach. While infection of bare stents is highly unusual, there are no data available regarding the propensity for secondary infection of covered stents. While in-stent recurrent stenosis from intimal hyperplasia should not occur in covered stents, “edge-effect” stenosis at the ends of such devices has been anecdotally noted. Therefore periodic duplex scanning surveillance should be considered.

**CONCLUSION**

Endovascular repair of blunt intra-abdominal arterial injury is possible and should be particularly considered
when fecal contamination, pelvic hematoma, or multiple associated injuries make conventional repair problematic.

REFERENCES


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