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SHORT REPORT

Endovascular Management of Traumatic Iliac Vessel Disruption—Report of Two Cases**B. Mahendran, N. Hynes, Y. Akhtar, A. Jawad, S. Tawfik, D. Courtney and S. Sultan****Department of Vascular and Endovascular Surgery, Western Vascular Institute, University College Hospital, Galway, Ireland*

Vascular injuries in a multi-trauma patient are associated with significant cardiovascular instability and organ injury. Injuries with active bleeding are best treated with a quick, safe and the least less invasive procedure available to the trauma surgeon. We report two cases of blunt trauma induced common and external iliac vessel injury, managed by endovascular treatment. In the second case, endovascular treatment prevented histological examination of the artery, which would have revealed an alternative diagnosis.

Keywords: Blunt trauma; Iliac artery injury; Iliac vein injury; Pelvic fracture; Stent-graft; Cystic median necrosis; Endovascular.

Introduction

Endovascular methods are evolving to treat arterial trauma.¹ Endovascular intervention can be successfully extended to vascular trauma by the use of covered stent-grafts.² Parodi³ was the first to successfully treat of an arterio-venous fistula after a traumatic vascular injury. Vascular injuries in a multi-trauma patient are associated with significant cardiovascular instability and organ injury. Contamination of wounds in the acute setting, either due to visceral injury or open wound, makes non-autogenous repair of such injuries less appealing. However, vascular injury with active bleeding in a trauma patient is best treated with a quick, safe and less onerous procedure available to the trauma surgeon. We report two cases of blunt trauma induced common and external iliac vessel injury, managed by endovascular treatment.

Case 1

A 66-year-old female pedestrian was admitted following a road traffic accident. She had sustained a head injury, severe lower abdominal injury with marked bruising of the upper legs and an ischemic right leg. She was unstable on arrival with hypotension. Following resuscitation, a computed tomography (CT) scan was performed that showed a large pelvic haematoma and a complex pelvic fracture (Fig. 1). In the operating room, arteriogram showed right external iliac artery rupture that was crossed by a 9 mm Jomed[®] covered stent with good angiographic result and complete resolution of extravasation. On the left, avulsion of common iliac vein to IVC was demonstrated by venography and a 12 mm Jomed[®] covered stent was used with good immediate result (Fig. 2). The ruptured left sapheno-femoral junction was surgically repaired. The right leg required fasciotomy. Pelvic fracture was stabilised with an external fixator (Fig. 3). At 6 months the patient is fully ambulatory with patent right iliac arterial stent and left distal DVT. She is on long-term anticoagulants and elastic stocking.

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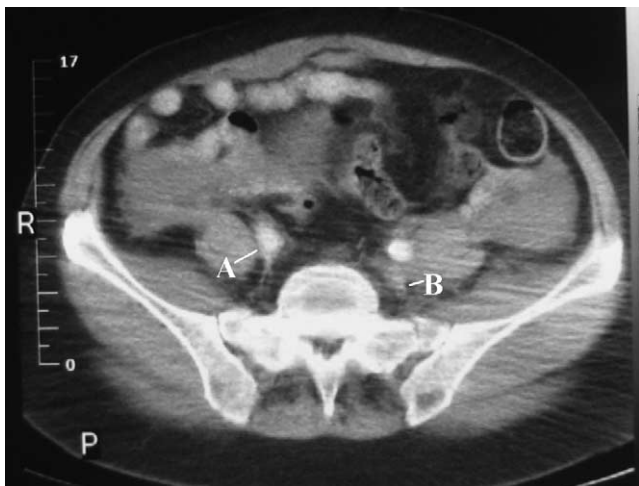


Fig. 1. Case 1. Preoperative CT scan showing contrast extravasation from right common iliac artery injury (A), and from left common iliac vein injury (B).

Case 2

A 42-year-old male presented a few weeks after sustaining a kick from a farm animal. He was found to have a saccular aneurysm of the left common iliac artery. This aneurysm was excluded with a Wall[®] 9 mm stent-graft. He presented 8 months later to our department, complaining of pain in his left leg with weakness, numbness and pallor. He had two episodes of these symptoms lasting about 2–3 h each. He underwent an

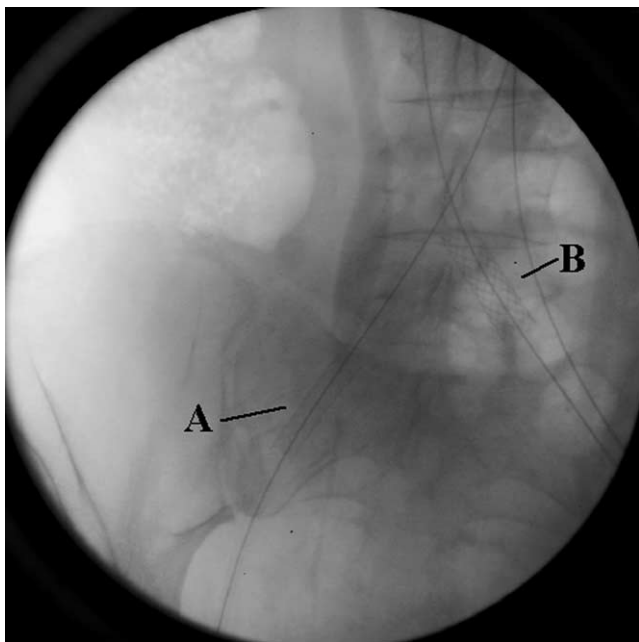


Fig. 2. Case 1. Completion picture following right common iliac artery stent-graft (A) and left common iliac vein stent-graft (B).

angiogram, which showed intimal hyperplasia within the Wall[®] stent and encroachment into the lumen. A Cordis SMART[®] stent 9 mm by 6 cm was inserted with good post procedural angiographic results and palpable femoral pulse. He was discharged with good symptom relief and reviewed in OPD. Six months later he was admitted to another hospital following chest pain and collapse while working in his field. Post mortem showed complete aortic dissection and myocardial infarction (Figs. 4 and 5). Histological sections of the aorta demonstrated cystic medial necrosis.

Discussion

Arterial and venous injuries involving large calibre vessels are common in unstable pelvic fractures with hypotension and significant blood loss occurs from arterial and venous haemorrhage and fractured bone edges. The first case, had suffered injury to both iliac vessels, venous injury on the left and arterial injury on the right. The aorta and the iliac vessels are protected by their location in the abdomen and the bony pelvis. Iliac vein injuries caused by blunt trauma are uncommon.⁴ However, hyperextension injuries cause intimal tears with resultant thrombosis.⁵ Bleeding in pelvic fractures is from injury to internal iliac and its branches and is common in posterior pelvic fractures. Lateral compression fractures often causes bleeding from pudendal and obturator vessels.⁶ This lady had suffered a complex pelvic fracture. Injuries to Iliac veins with low-pressure and high-flow are complicated by higher morbidity and mortality due to difficult anatomic exposure and substantial blood loss. Although the venous system is a low-flow state, iliac vein injuries carry up to a 51% mortality rate.⁷ Evaluation is made by CT.⁸ Survival of the patient depends upon the time interval between the occurrence of the injury and operative repair. The active arterial bleed is isodense with intra-arterial contrast and can be seen as a focal hyperdense region in the early arterial phase and the venous extravasation is seen in the later equilibrium phase, adjacent to venous structures. Immediate surgical intervention is indicated in the presence of contrast extravasation in an unstable patient.

Surgical options, both endovascular and open will depend upon the associated injuries and the endovascular expertise of the trauma surgeon. Direct suture repair of iliac vessels with autogenous patching, would result in massive haemorrhage from the retroperitoneum. Extra-anatomic bypass with a prosthetic conduit presents risk of infection and late haemorrhage. Ligation of either veins or arteries in an

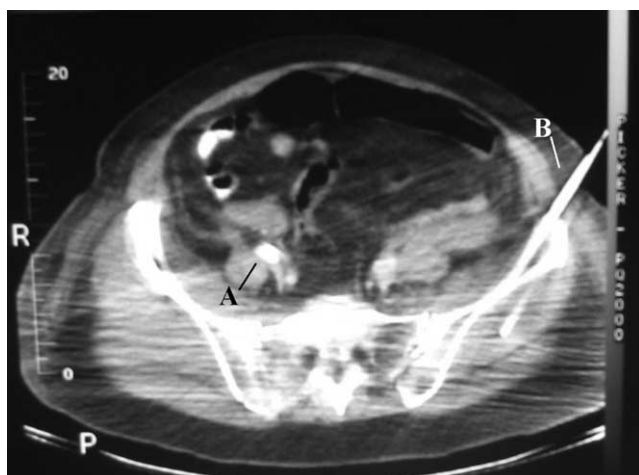


Fig. 3. Case 1. Post-operative CT scan showing stent in right common iliac artery (A) and external fixator (B).

unstable patient has been shown to be an acceptable option.⁹ Delayed vascular reconstruction can be performed with adequate planning on a stable patient. This option was precluded in our patient due to acutely ischaemic leg. Endovascular approach in pelvic fractures with injuries involving branches of the internal iliac or deep femoral arteries can be effectively treated by catheter-directed arterial embolisation.^{10,11} The use of stent-grafts is associated with decreased blood loss, a less invasive procedure, reduced requirements for anaesthesia, and a limited need for an extensive dissection in the traumatised field. These advantages are particularly important to those patients who are critically ill from other coexisting injuries or medical co-morbidities.¹² This was the ideal option in the first case and was successfully executed. Her iliac arterial stent was



Fig. 4. Case 2. Post-mortem appearance of stent-graft in diseased common iliac artery.

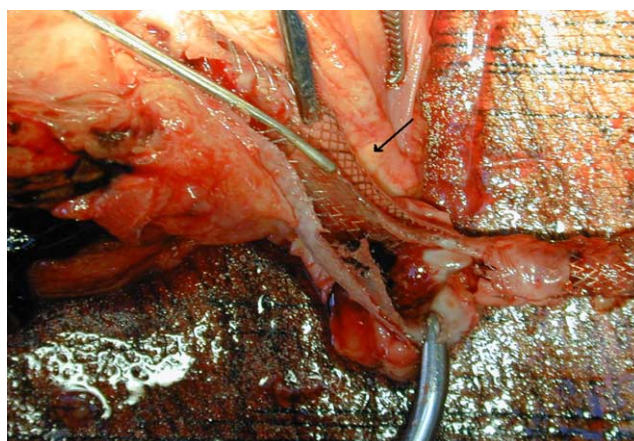


Fig. 5. Case 2. SMART stent within Wall stent-graft and intimal hyperplasia.

functioning normally at 6 months. On the other hand, in spite of the left iliac venous stent was patent, she developed left limb DVT in the early post-operative period due to her prolonged immobility. Reports regarding patency of stent in venous occlusive disease are about 50% at 1 and 4 years.¹³ However, the objective in this patient was immediate control of bleeding and survival, which was achieved with minimal morbidity.

In the case of the young male patient, a history of trauma had played a major part in the clinical decision. This patient presented with a stable isolated saccular iliac aneurysm. Given the literature on the nature of trauma required to cause iliac arterial injury, there was a suspicion of other causes. Though rare, isolated iliac artery aneurysms occurring on the background of cystic medial necrosis have been reported.^{14,15} There are no reports of in-stent restenoses in connective tissue disorder. Had the patient undergone standard surgical procedure, the pathological diagnosis would have been established and appropriate further investigations, long-term medical management and follow-up would have been initiated.

Conclusion

The endovascular management of haemodynamically unstable patient is an exciting and promising application of covered stent-grafts. As operative identification and exposure of injured vessels can be technically difficult, endovascular approach permits minimally invasive alternative treatment procedures to be performed from remote, easily accessible site. However, in stable patients one should rely on clinical insight to deduce pathology before treatment.

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