Endovascular repair of iliac artery injury complicating lumbar disc surgery

P. Skippage · J. Raja · R. McFarland · A. M. Belli

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Abstract Vascular injury as a complication of disc surgery was first reported in 1945 by Linton and White. It is a rare but potentially fatal complication. The high mortality rate (40–100%) is attributed to a combination of rapid blood loss and the failure to recognise the cause of the deteriorating patient. Early diagnosis and treatment is essential. Treatment has traditionally been by open vascular surgical repair, however with modern imaging and endovascular techniques, minimally invasive treatment should be considered first line in patients who are stable. We present the case of a 51-year-old woman who sustained common iliac artery injury during lumbar spinal surgery that was treated successfully using a covered stent.

Keywords Iliac artery · Endovascular repair · Covered stent · Disc surgery

Introduction

Vascular injury as a complication of disc surgery was first reported in 1945 by Linton and White [7]. It is a rare complication. However, the true incidence of occurrence is uncertain, as many injuries go undetected clinically. Yu-Ling Hui et al. postulate that up to 2.4% of lumbar laminectomies

may be complicated by vascular injury [6]. When clinically apparent that vascular injury has occurred, the mortality is quoted at 40–100% [5, 10]. The high mortality rate is attributed to a combination of rapid blood loss into the retroperitoneal and intraperitoneal spaces, and the failure to recognise the cause of the deteriorating patient. Early diagnosis and treatment is essential due to the high rates of associated mortality and morbidity [3]. Treatment has traditionally been by open vascular surgical repair, however with modern imaging and endovascular techniques, minimally invasive treatment is a therapeutic option.

We present the case of a 51-year-old woman who sustained common iliac artery injury during lumbar spinal surgery that was diagnosed by computed tomography and treated by percutaneous placement of a covered stent.

Case report

A 51-year-old woman was admitted for an L5/S1 stabilisation procedure and L5 nerve root decompression following failure of an L4/5 discectomy 4 months previously to relieve her right-sided sciatic symptoms. She was otherwise fit and well with no significant co-morbidity.

At operation the right L5 nerve root was compressed in both the lateral recess and exit foramen due to facet joint hypertrophy. There was a residual lateral disc bulge at L4/5 and a focal disc bulge at L5/S1 contributing to foraminal stenosis at this level. The superior margin of L5 and inferior margin of L4 lamina were identified on the right after scar tissue was excised. The laminae on the right were resected to allow probing of both the L4 and L5 nerve roots and to provide a good view of the L4/5 disc. This was mobilised from the overlying dura by breaking down post-operative adhesions with blunt dissection. The discs at this

P. Skippage (✉) · J. Raja · A. M. Belli
Department of Interventional Radiology,
St George's Hospital, Blackshaw Road,
Tooting, London SW17 0QT, UK
e-mail: pippa.skippage@gmail.com

R. McFarland
Department of Vascular Surgery,
St George's Hospital, Blackshaw Road,
Tooting, London SW17 0QT, UK

level and at L5/S1 were decompressed and a foraminotomy was performed at L5/S1 on the right. Probing revealed a generous decompression of the L5 nerve root to beyond the exit foramen and exploration of the disc space and spinal canal revealed no sequestered segments. The interspinous ligament was cleared down to the ligamentum flavum between the L4/5 interspace and a size 8 WallisTM implant inserted and secured to the L4 and L5 spinous processes.

The surgery proceeded uneventfully, with blood loss estimated at 350 mls, and the patient was transferred back to the ward for post-operative recovery.

In the 24 h following surgery, the patient complained of worsening back and abdominal pain. She became haemodynamically unstable with a significant deterioration in her blood pressure. Resuscitation was commenced with intravenous fluids and subsequently a blood transfusion, and once stabilised the patient was transferred for an emergency CT scan.

This revealed evidence of active contrast extravasation at the level of the aortic bifurcation (Fig. 1). Retroperitoneal haematoma was noted extending cranially to the level of the renal arteries and inferiorly into the pelvis along the course of both iliac arteries (Fig. 2). The findings were in keeping with right common iliac artery damage, sustained during the surgical procedure.

The management of the patient was discussed with the Vascular Team at our institute and urgent transfer was arranged as the patient was deemed potentially suitable for endovascular repair and was cardiovascularly stable.

A flush aortogram was performed via a right common femoral artery puncture, which confirmed contrast

Fig. 2 CT scan showing haematoma extending into pelvis along the course of the contrast enhanced iliac arteries

extravasation around the right common iliac artery (Figs. 3, 4). A pseudoaneurysm of the common iliac artery was identified and the catheter tip advanced into the sac of the pseudoaneurysm. One millilitre of thrombin was injected directly into the pseudoaneurysm immediately followed by placement of an 8 mm × 5 cm FluencyTM (Bard, Karlsruhe, Germany) covered stent graft across the right common iliac artery to seal the site of injury (Fig. 5). The covered stent was ballooned to 8 mm using a standard balloon (Smash, Boston Scientific Int, France). A final

Fig. 1 CT scan at the level of L5 showing active contrast extravasation behind the right common iliac artery. Site of previous laminectomy indicated

Fig. 3 Flush aortogram showing active contrast extravasation from right common iliac artery

Fig. 4 Selective catheterisation of pseudoaneurysm

Fig. 5 Flush aortogram post stent insertion and ballooning. This shows the covered stent extending from the origin of the right common iliac artery to its bifurcation

arteriogram showed no evidence of contrast extravasation from the right common iliac artery.

The patient was stable following the procedure and ultrasound follow-up confirmed no further bleeding from the common iliac artery. The patient was transferred back to the referring hospital 3 days later. The patient was

reviewed at 6 months and found to be clinically well, with no symptoms of vascular ischaemia.

Discussion

The incidence of serious vascular injuries, such as arteriovenous fistulas, lacerations and pseudoaneurysms, during disc surgery is 1–5 per 10,000 [9]. Arteriovenous fistulas are the commonest complication, occurring in 67% of such cases and usually presenting 1 month after surgery. Arterial lacerations usually present immediately, and represent 30% of vascular injuries.

The interspace most frequently associated with vascular injury is L4/5 [10]. This corresponds to the level of the common iliac vessels and at this site the disc is separated from the vessels by the anterior spinal ligament alone. Chronic disc disease may weaken this ligament and prior surgery at this site can alter the relationship between the ligament and the adjacent vascular structures [6]. The patient in this report had a 12-year history of back pain prior to her referral and had also recently undergone a prior lumbar discectomy. Although the original operation was planned as an L5/S1 procedure, the operative findings meant that further levels and more extensive surgery had to be carried out.

The operative level is directly related to the vessel most commonly injured. The right and left common iliac arteries are the most commonly injured vessels (43% and 29%, respectively), with the least commonly injured vessel being the right common iliac vein [10].

The fact that vascular injury has occurred may not be immediately recognised at the time of surgery, as young and healthy patients may not develop clinical signs until a large volume of blood has been lost. The prone position in which the patients are operated on may confer a degree of vascular compression during surgery, and as such, may temporarily tamponade any vascular tears [3]. Therefore, a high index of suspicion is required in the post-operative period.

If vascular injury is suspected and the patient condition allows, CT is a good first line investigation as it will identify the extent of bleeding that has occurred. CT may also allow differentiation between arterial and venous injury as well as determining the site of vascular injury and whether active bleeding is still present. Ultrasound is of value in confirming the presence of intra-abdominal fluid, when transfer to a CT scanner is not appropriate. However, angiography has the advantage of providing definitive arterial anatomy and allows immediate endovascular therapy if feasible [10].

The majority of case reports and literature to date have reported on open surgery to control vessel bleeding, including repair with Dacron mesh, Prolene sutures and

bypass grafts [3, 4, 6, 11]. Whilst endovascular repair has been widely advocated for the treatment of arteriovenous fistulas following lumbar disc surgery [10, 1], it has, to our knowledge, only been reported once before as definitive management for vessel perforation [2].

Thrombin injection is not usually necessary in these procedures. Generally a covered stent graft is sufficient to create a seal at the site of perforation. In this situation, we had cannulated the site of perforation and identified a pseudoaneurysm. Due to this, we felt it was prudent to inject thrombin to thrombose the pseudoaneurysm sac. However, thrombin alone is not definitive treatment and if used, should always be in conjunction with a covered stent graft. The use of thrombin injection is well recognised in the treatment of femoral pseudoaneurysms and is very effective with only small volumes required (usually less than 0.5 ml).

Recent technological advances have changed the management of patients presenting with arterial injury. Endovascular options are now possible for many situations and have the advantage of being minimally invasive and avoiding a general anaesthetic. The ease with which they can be applied, and the fact that they can be instituted at the time of angiographic diagnosis means that they are rapidly becoming the procedures of choice. Following the NCE-POD report [12] all interventional radiology departments performing iliac angioplasty should have a range of covered stents available for the complication of iliac artery rupture. The availability of these devices means that treatment of iliac artery rupture from any cause can be performed immediately.

Conflict of interest statement None of the authors has any potential conflict of interest.

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