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CASE REPORT

Iliac vascular complication after spinal surgery: immediate endovascular repair following CT angiographic diagnosis

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ABSTRACT

Iliac arterial injuries are rare but important complications that can develop after spinal surgery. The presentation of these injuries is usually late, with symptoms such as leg swelling or cardiac failure. However, acute massive bleeding may be a sign of early presentation as in our patient. Herein, we present a case of life-threatening bleeding with early computed tomography angiographic diagnosis of common iliac artery pseudoaneurysm and iliac arteriovenous fistula secondary to spinal surgery which was successfully managed by endovascular stent graft treatment.

Key words: • *arteriovenous fistula* • *spinal surgery* • *endovascular repair* • *stent graft* • *computerized tomography*

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Major vascular injuries are rare but life-threatening complications that may occur during spinal surgery. Early presentation is acute massive hemorrhage and subsequent shock caused by laceration or rupture of the retroperitoneal large vessels. Late complications include development of pseudoaneurysm and arteriovenous fistula (AVF), presenting with back pain, leg edema, and high output cardiac failure (1).

Although AVFs are generally described as late complications, this reflects late diagnosis (2). When associated with significant bleeding, it can be recognized earlier. Endovascular treatment has been an increasingly important option for treatment of vascular injuries in recent years; this treatment is less invasive than surgery and is particularly useful in patients with existing comorbidities.

We present a case of iatrogenic iliac AVF with massive retroperitoneal bleeding. The ilio-iliac fistula and associated pseudoaneurysm were initially located by computed tomographic angiography (CTA); the fistula and pseudoaneurysm were then repaired by endovascular stent graft placement. Six-month clinical and CTA follow-up are also presented.

Case report

A 36-year-old woman underwent a lumbar disc surgery at the levels of L4-5 and L5-S1. Sudden arterial bleeding occurred during the laminectomy, which was thought to be controlled during the rest of the surgical procedure. Postoperative imaging studies were performed because the patient's hemoglobin dropped from 13 g/dL preoperatively to 8 g/dL postoperatively. Ultrasound (US) revealed retroperitoneal hemorrhage. Hypotension, tachycardia, and an abdominal bruit were noted the day following surgery. Subsequent CTA with 16-row multidetector computed tomography (MDCT) showed retroperitoneal hemorrhage and pseudoaneurysm around the infrarenal aorta and inferior vena cava (IVC). In addition, there was contrast enhancement of the IVC and iliac veins on the arterial phase dilatation of iliac veins; these findings plus the abdominal bruit suggested an AVF (Fig. 1). The source of the arterial injury appeared to be the right common iliac artery, since there was no hemorrhage density or soft tissue density between the right common iliac artery and the extraluminal contrast agent.

The patient was then brought to the angiography suite. An abdominal aortogram was performed via the right iliac artery which revealed an iliac pseudoaneurysm and AVF between the right common iliac artery and left common iliac vein (Fig. 2). A 10 × 40 mm endovascular stent graft (Fluency® Plus, Bard Peripheral Vascular Inc., Tempe, Arizona, USA) was placed across the injury at the right common iliac artery following accurate localization of the arterial injury with different projections, protecting the ipsilateral internal iliac artery. Control

Figure 1. Reconstructed CT angiography image revealing pseudoaneurysm *(*)* and arteriovenous fistula to the left common iliac vein *(arrow)* with early opacification of inferior vena cava *(arrowhead)*.

Figure 2. Pelvic arteriogram via introduced pigtail catheter advanced through the right common femoral artery. The site of the arterial injury *(arrow)*, pseudoaneurysm, and arteriovenous fistula is seen. Dilated left iliac vein with early opacification of the inferior vena cava is also seen.

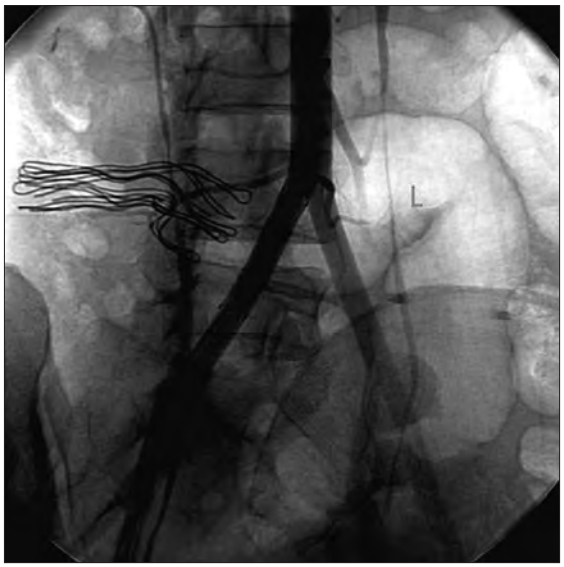

Figure 3. Post-stent pelvic arteriogram showing patent stent-graft across the right common iliac artery with no evidence of filling of the fistula and pseudoaneurysm.

Figure 4. Six-month follow-up CT angiography image shows patent stent graft with no residual/recurrent fistula or pseudoaneurysm.

angiograms showed closure of the fistula and no evidence of filling of the pseudoaneurysm (Fig. 3). The right common femoral artery puncture was closed with a vascular closure device (*Angio-Seal*™, St. Jude Medical, Minnetonka, Minnesota, USA). The patient was kept in the intensive care unit for 24 hours and then discharged. She was put on 75 mg clopidogrel per day for 3 months (after a 300 mg loading dose the day of the procedure) and 100 mg acetylsalicylic acid per day indefinitely. One-week follow-up Doppler US revealed patent stent graft with normal flow in distal iliac and femoral arteries, as well as normal venous flow in iliac veins and IVC. The patient did well for the next six months, and six-month follow-up CTA showed a patent stent graft with completely resolved retroperitoneal hemorrhage and pseudoaneurysm (Fig. 4).

Discussion

Early symptoms of vascular injuries include hypotension, tachycardia, wide pulse pressure, and abdominal distension secondary to hypovolemia (1). Symptoms of retroperitoneal hemorrhage may be useful for early detection of vascular injuries after spinal surgery. Most of the time, the diagnosis is made weeks or years after the surgery because of the asymptomatic development of a pseudoaneurysm or an AVF. The most common late presentation of asymptomatic vascular injuries is AVF (3). High-output cardiac failure, leg edema, dyspnea, and back pain develop in the late phase as a result of high-flow AVF (1).

Among patients with vascular injuries during laminectomy, external bleeding occurs in only 25% of cases (3). Bleeding may be tamponaded within the retroperitoneal space, and unexplained anemia may be the only clue to the injury. AVF may occur if the arterial and venous lacerations were formed together. In our case, AVF may occur after penetration of the anterior longitudinal ligament with aortic, iliac arterial and venous (IVC or iliac) injuries (4). The most commonly injured artery reported in the literature is the left common iliac artery, which lies anterior to the L4-L5 vertebral disc (5).

Traditionally, conventional angiography is accepted to be the gold standard modality for the diagnosis and guidance of the treatment. US is generally preferred as the first-line diagnostic tool for detecting the retroperitoneal hemorrhage because of cost and availability for bedside evaluation. In our case, US was the initial imaging modality, followed by 16 detector-CTA, which demonstrated the extent of the injury.

The mortality of surgical treatment of the vascular injuries has been reported to be between 10% and 66%, even in hemodynamically stable patients (6). Mortality is related to the size of the injured vessel, the size and location of the laceration, and the time required to control the bleeding (5). Today, endovascular approaches provide alternatives to surgical repair. Endovascular approaches are associated with shorter duration of hospitalization and are less invasive than surgery, which is especially important for high-risk surgical patients (7). Endovascular methods are well tolerated by the patients with only local anesthesia.

There are few reports in the literature about the treatment of iliac AVF following spinal surgery (8, 9). Stent graft placement was first reported by McCarter et al. in 1996 that described endoluminal stent graft treatment of an ilio-iliac fistula after disc surgery (10). Although use of stent grafts has increased in the peripheral arteries in recent years; stent occlusion, deformation, intimal hyperplasia, and stenosis are common concerns for long-term follow-up (7).

CTA is a valuable noninvasive tool in diagnosis of peripheral arterial lesions (11). There are studies in the literature showing an excellent concordance between the multislice CT and digital subtraction angiography (11–13). In our experience, CTA is a particularly useful initial diagnostic tool in iatrogenic complications, particularly in identifying the site of arterial injuries in patients with retroperitoneal hemorrhages. Despite the established role of CTA in follow-up of patients after endovascular aortic aneurysm repair, experience in peripheral stent graft follow-up with CTA is rather limited in the literature (14). In our experience, as a noninvasive tool, CTA provides information on the total occlusion of the aneurysm, fistula, and vessel patency after stent grafting. Commenting on the in-stent stenosis as a result of intimal hyperplasia by CTA follow-up is, however, still difficult, particularly in small-caliber arteries. In cases with clinical or other signs (e.g., US, CTA) of stent stenosis during follow-up, angiography should be obtained for further diagnosis and management.

CTA has evolved in the last decade. By using MDCT equipment, the quality of angiography has increased dramatically. We believe that it is crucial to evaluate the possibility of such vascular complications after spinal surgery. In case of hemodynamic instability in a high-risk surgical patient, endovascular treatment should be kept in mind. CTA can provide valuable information for tailoring the management, as in our case when it helped us localize the injury. It was difficult to determine the point of injury solely by angiography in our case because of high-flow AVF. Of note, long-term durability of stent grafts even in iliac arteries is a concern; therefore, stent grafting should be reserved for high-risk surgical patients, particularly young patients, because of the lack of randomized long-term trials.

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