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CASE REPORT

Complete Disruption of The Iliac Vessels During Spinal Surgery With Delayed Presentation

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Introduction: The posterior approach to the lumbar spine is most commonly used to treat lumbar spine pathology. Vascular complications, although rare, have a high mortality rate. This is the report of an arterial lesion complicating a L5 hemilaminectomy and its surgical resolution. The need to remain vigilant for this condition, which requires prompt diagnosis and treatment, is emphasised.

Report: A 31 year old woman was admitted to the neurosurgery department with L5 right-sided sciatica and an associated radiculopathy, and paraesthesia of the first toe of the right foot. She had previously undergone surgical correction of a L4 — L5 lumbar disc herniation, as well as a left oophorectomy and chemotherapy for ovarian neoplasia. A right L5 hemilaminectomy associated with right L5 — S1 foraminotomy and L5 — S1 discectomy was performed with the patient in the ventral position. The procedure was carried out without any apparent complications. In the first three post-operative days the patient complained persistently of orthostatic hypotension and a drop in haemoglobin was observed. Computed tomography angiography revealed what appeared to be a complete transection of the right common iliac artery and vein, with active haemorrhage, and a large pseudoaneurysm. Immediate surgery was carried out with reconstruction consisting of a 9 mm Dacron graft interposed in the right common iliac artery, as well as ligation of the right common iliac vein, which was not amenable to repair. The post-operative period was uneventful. The patient was discharged on day 13 with normal lower limb pulses and mild oedema of the right lower limb, controlled with elastic compression stockings.

Discussion: Iatrogenic injuries of the large abdominal vessels during spinal surgery is rare but serious. Close patient surveillance and remaining vigilant for these life threatening vascular lesions are crucial in the peri-operative period of spinal surgery.

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INTRODUCTION

The posterior approach to the lumbar spine is the most commonly used approach for the surgical treatment of lumbar spine pathology and is associated with an overall incidence of complications of 2%—30%.[1,2] Although vascular injuries account for <1% of such complications, their incidence has remained static over the last 40 years,[3] and they remain one of the most feared operative accidents owing to their devastating consequences, which include a high mortality rate.

Risk factors for vascular injuries during lumbar disc surgery include a history of adhesions between the retroperitoneal vessels and vertebral bodies due to previous disc operations or other abdominal operations, improper positioning of the patient, and an incorrect retroperitoneal approach to the operated disc due to the misplacement of pillows under the abdomen in the prone position.[4]

A case of a vascular injury associated with a L5 — S1 hemilaminectomy is reported and its clinical presentation and treatment alternatives is discussed in order to remind physicians of the importance of remaining vigilant in order to achieve timely treatment in these critical patients.

CASE REPORT

A 31 year old woman, was admitted to the neurosurgery department with a lumbar hernia (L5 — S1), diagnosed by magnetic resonance imaging, with nerve root compression, causing sciatica on the right lower limb and paraesthesia of the first toe. She had undergone surgical correction of a L4 — L5 lumbar disc herniation two years previously, as well as a left oophorectomy and chemotherapy for ovarian neoplasia.

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The patient was placed in a ventral (or prone) position, placing the lumbar spine in flexion and increasing the L5 — S1 interlaminar space. After administration of local anaesthetic with epinephrine to the skin and deeper tissues, a small skin incision was made and extended as required. Electrocautery was used for subcutaneous dissection and to achieve haemostasis. Afterwards, a Cobb periosteal elevator was used to dissect the subcutaneous fat from the fascia on the right side in order to place a self retaining retractor (Gelpi Retractor), exposing the L5 lamina. After the correct level was identified, the space between the two laminae was accessed and a square right sided L5 — S1 hemilaminectomy was completed with 3—4 mm Kerrison rongeurs. A sharp right angled dissector was then inserted into the ligamentum flavum and used to pull it dorsally away from the thecal sac while cutting it along the instrument using a no. 11 blade. The ligamentum flavum was removed with a Kerrison rongeur to create the largest possible working window. A no. 11 blade was used to incise the posterior longitudinal ligament, allowing access to the disc space and a pituitary microrongeur was introduced to remove the disc material. A down going Epstein curette was then used to push down paracentral disc material into the decompressed disc space to enable a full discectomy and removal of the herniation. After the removal of the disc material and adequate decompression of the nerve root and thecal sac, the wound was closed in a layer by layer fashion. The procedure lasted approximately 60 minutes. The neurosurgeon was an experienced consultant, the operation was uneventful, and no evidence of haemorrhage in the operative field was reported. The patient was transferred back to the ward four hours after the procedure.

During the first three post-operative days the patient persistently complained of orthostatic hypotension and a haemoglobin drop (from 14 g/dL to 7.3 g/dL over 12 hours) was observed. She also had a systo-diastolic peri-umbilical murmur. Computed tomography angiography was performed, which revealed what appeared to be a complete transection of the right common iliac artery and vein, with active haemorrhage, a large pseudoaneurysm (PA) and an arteriovenous fistula (AVF) between the right common iliac artery and vein (Fig. 1).

Immediate surgery was carried out, which included a midline laparotomy and transperitoneal access to the retroperitoneum where a large haematoma was present. Arterial control was achieved by distal aortic and iliac cross clamping, and sponge stick compression was used to control venous bleeding. Arterial repair was achieved by common iliac interposition of a 9 mm Dacron graft (Fig. 2). The right common iliac vein was not amenable to repair and was ligated.

Estimated surgical blood loss was 3 000 mL and transfusion included eight erythrocyte packs, six fresh frozen plasma packs, and six pools of platelets. The post-operative period was uneventful; the patient was ventilated for 24 hours and no further inotropic support was needed. She was discharged on day 13 with normal lower limb pulses and mild oedema of the right lower limb, which was controlled with elastic compression stockings.

DISCUSSION

Iatrogenic vascular injuries complicating spinal surgery are rare but potentially life threatening, and early recognition and proper management can reduce mortality and morbidity.[3] Recent reports indicate that these injuries are recognised intra-operatively in only 36% of cases and within the first 24 hours in 28% of cases.[5]

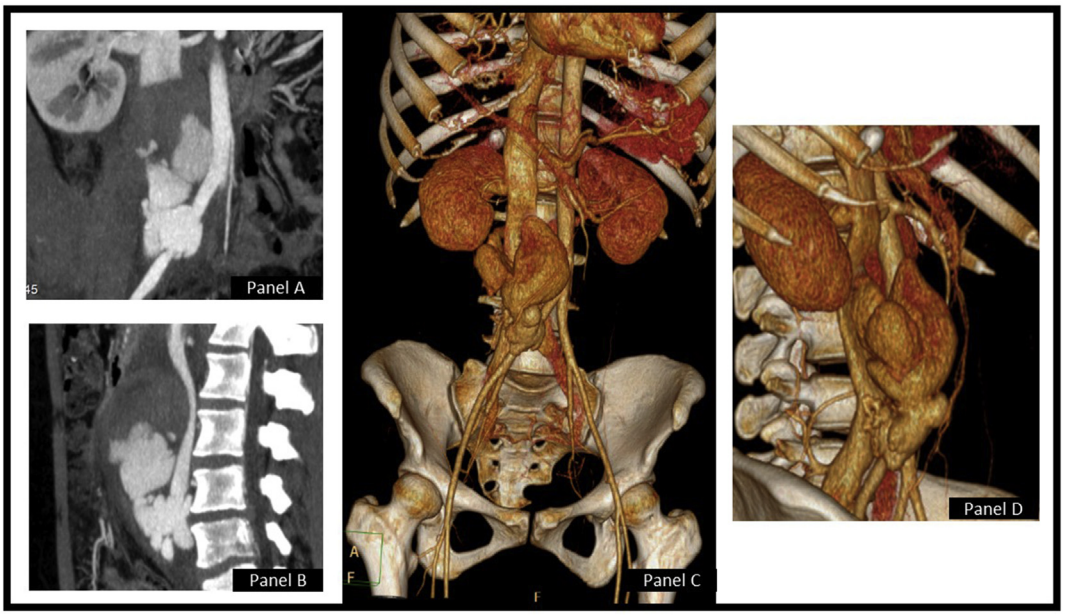

Figure 1. Computed tomography angiography revealed (A) complete transection of the right common iliac artery and vein, with (A—C) active haemorrhage, and a large pseudoaneurysm and (A, B, D) an arteriovenous fistula between the right iliac vein and the pseudoaneurysm.

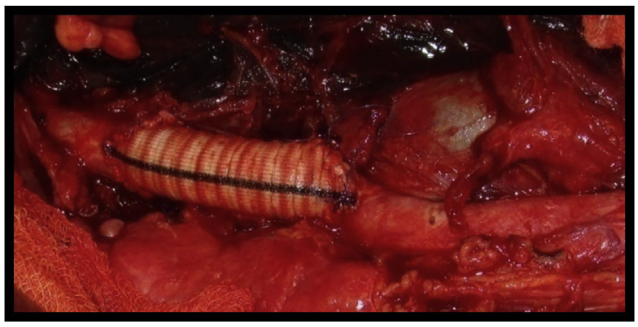

Figure 2. Reconstruction of the common iliac artery with the interposition of a 9 mm Dacron graft.

Vascular lesions in lumbar spine procedures are not necessarily associated with bad practice and can occur even in experienced hands. The proximity of the anterior longitudinal ligament and the major retroperitoneal structures located anteriorly determines the vulnerability of major vascular structures, and the left common iliac artery and vein are most frequently involved due to their anatomical position immediately anterior to the L4 — L5 intervertebral disc space.[6] In the case of the L5 — S1 approach, the right side is the most frequently reached.

There are some well known risk factors that are important to emphasise, including: (i) a history of previous disc or abdominal operations leading to adhesions between the retroperitoneal vessels and vertebral bodies; (ii) the disruption or degeneration of the anterior annulus fibrosus and anterior longitudinal ligament or peridiscal fibrosis, both associated with chronic disc pathology; (iii) an inappropriately deep intrusion of the “pituitary rongeur” (which is, however, required in the presence of advanced disc disease); (iv) improper positioning of the patient; (v) a reduction in the distance between the retroperitoneal vessels and the operated disc caused by the pillows placed under the abdomen in the prone position; and (vi) vertebral anomalies, such as hypertrophic spurs, which might compress the vessels during the operation.[7]

This patient had at least two of these factors: she had undergone previous surgery on a lumbar hernia in addition to having some possible fibrosis associated with the previous oophorectomy (even though this was on the opposite side to the vascular injury). Both of these situations might have weakened the anterior longitudinal ligament, changed the anatomical field, and created adhesions of the vessels to the disc. It is thought that injuries occur during intervertebral disc fragment removal and are the result of the posterior rongeur inadvertently penetrating the anterior longitudinal ligament. The prone position ensures that the abdominal structures become pressed against the vertebral bodies, rendering the retroperitoneal vessels fixed in close proximity to the anterior longitudinal ligament, and thus at risk of potential impingement and damage by the posterior rongeur.

The level of the spinal surgery also helps to determine which structures might be involved; the proximal lumbar (L3 — L4) level is associated with aorta and inferior vena cava (IVC) lesions, whereas at the distal lumbar (L4 — L5 and L5 — S1) levels, the most frequently injured vessels are the iliac artery and vein.[4] Other structures, such as abdominal viscera and the ureter might also be involved.[8]

Most of the lesions of major retroperitoneal vessels cause major bleeding that can quickly result in life threatening retroperitoneal haemorrhage,[8] which might be expected to be recognised immediately. If the lesions are smaller with no haemodynamic compromise, they might even remain undetected for years, thus contributing to an underestimation of the prevalence of this complication. Venous injuries might also be the underlying cause of a post-operative deep venous thrombosis.[7]

Symptoms and signs, such as hypotension with a dropping haematocrit, abdominal distension (suggesting retroperitoneal haematoma), high output cardiac failure, leg oedema, dyspnoea, and abdominal thrill (suggesting AVF),[4] are manifestations that should arouse suspicion of a vascular lesion complicating spinal surgery.

Gok et al.[4] showed that 54% lack an immediate diagnosis and, in general, lacerations are more prone to become immediately symptomatic, whereas AVF might be missed and only identified in the long term. Chronic AVF formation should be ruled out in the case of high output cardiac failure and/or lower leg oedema.[7]

The clinical presentation in the case reported here is suggestive of vascular injury, however although there was a major laceration of the iliac vessels, the diagnosis was not made immediately, and the patient remained relatively stable for three days. Some factors, such as containment of the haemorrhage in the retroperitoneal space (rather than into the operative field) and the self containment effect of the anterior longitudinal ligament,[9] might have contributed to this non-catastrophic presentation.

The rapid development of endovascular techniques in the last decade is changing the treatment of vascular injuries in general. With the latest improvements in stent technology, covered stent graft placement for traumatic lacerations[10] (PA and AVF) is the preferred endovascular technique.[11,12] However, this technique needs an adequate morphology, which was not the case for this patient, who had a complete arterial and venous avulsion. Although the common iliac artery seemed to have suitable proximal and distal landing zones for the deployment of a covered stent, it could have been technically difficult to catheterise the proximal end of the transected artery and, during such manoeuvres, catastrophic haemorrhage could have developed. Moreover, an endovascular approach would not have treated the venous injury. An expedited laparotomy ensured rapid control of the proximal artery by infrarenal aortic cross clamping, exposing the right common iliac vessels in a less haemorrhagic field. Whereas the arterial ends were easily dissected and clamped, the bleeding control from the venous ends was only partially achieved with difficulty by sponge stick compression and, as an end to end anastomosis was not technically feasible owing to the loss of venous substance, these ends were ligated. Nevertheless, it is widely accepted that large iliac vein injuries are difficult to handle and that

ligation might sometimes be necessary and is preferable to a technically poor venous repair, which predisposes to post-operative thrombosis and pulmonary embolism.[7]

Surgical exploration and repair remain the standard treatment of vascular injuries accompanied by haemodynamic collapse,[3] and, in a 2002 systematic review by Papadoulas et al.,[7] the most common surgical techniques used in the management of lower extremity AVF were (i) closure of the fistula through an arteriotomy and repair of the artery; (ii) resection of the fistula with primary closure of the vein and reconstruction of the artery with a graft; (iii) simple division of the fistula and primary closure of the fistula from the inside and re-anastomosis of the artery; (iv) simple ligation of the AVF; (v) multiple ligation; and (vi) an AVF exclusion procedure.[7]

The overall mortality of vascular injuries associated with spinal surgery might be as high as 10%, with a higher rate for arterial lacerations (20%—38%). The mortality rate is approximately 5% for AVF and is very low for chronic pseudoaneurysms. However, it must be taken into account that fatalities tend to be published less often, thus producing a selection bias.[7]

Large IVC or iliac vein injuries are difficult to handle, even with the use of balloon catheters or sponge stick compression. Ligation might be necessary, as in the case presented here, and is preferable if a repair is not technically possible.[7]

CONCLUSIONS

Iatrogenic injury of the large abdominal vessels during spinal surgery is rare but serious. Close patient surveillance and remaining vigilant for these life threatening vascular lesions are crucial in the peri-operative period of spinal surgery.

CONFLICTS OF INTEREST

None.

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