Vascular injury in tubular lumbar microdiscectomy, case report and literature review

Ghazwan Abdulla Hasan1, Hayder Qatran Raheem2, Akeel Yuser3, Luay M Al-Naser4 and Reda Ali Sheta5

Abstract
Vascular injury in lumbar disk disease is a common complication reviewed in the literature. In our study, we reviewed the rare complication of vascular injury that occurs during lumbar microscopic tubular discectomy. The patient is a 46-year-old male, diabetic, hypertensive and a smoker who presented with a history of backache and right-sided radiculopathy to S1 dermatome for 6 weeks. Conservative measures failed, and we planned and performed microscopic tubular discectomy at the level of L5-S1. Immediately postoperatively, the patient developed acute, sharp, burning pain in the left leg, partially relieved on hip flexion, with diminished distal pulsation of dorsalis pedis, popliteal and femoral. Urgent consultation with a vascular surgeon included a computed tomography angiography which confirmed a vascular injury of the left iliac artery and vein near the bifurcation. The plan involved urgent retroperitoneal exploration of the left iliac vessels, and primary repair with synthetic graft was done with distal embolectomy to regain distal pulsation postoperatively. Further follow-up revealed that the repair was successful.

Keywords
Vascular injury, lumbar microdiscectomy, case report

Date received: 10 January 2019; accepted: 26 April 2019

Introduction
Minimally invasive spinal surgery has been growing and expanding in recent years. Different approaches have been described, but the minimally invasive posterior approach is still the most common one for treating herniated disk prolapse in the lumbar spine.1,2

Vascular complication in posterior lumbar spine surgery is not common, with an incidence less than 1%,3 and with a high mortality rate, 10% to 65%.4,5

Early recognition, diagnosis and treatment are key factors and are essential in preventing a life-threatening outcome.1

The treatment depends on the presenting symptoms and complications intra- or postoperatively.

Many risk factors have been identified in the vascular injury which may develop and lead to lumbar spine surgery, although no single dominant factor has been confirmed. The anterior longitudinal ligament’s defect may increase the risk of abdominal vascular injury, multiple co-morbidities, abdominal radiotherapy, peridiscal fibrosis, recurrent disk surgery and ventral disk herniation.6

The risk of vascular injury intraoperatively can be explained by the close proximity of the retroperitoneal vessels to the vertebral column. After injury to the anterior longitudinal ligament, this can give access to the retroperitoneal space.7

Some presenting symptoms emerge immediately, with direct injury to the blood vessels (artery or vein) by laceration, presented with hypotension in 81%,3 and tachycardia. Other presenting symptoms have a delayed emergence (postoperatively) when A-V fistula or pseudoaneurysm is the cause.8,9

Concerning the posterior approach in the lumbar spine, the most common site for vascular injury is L4-L5, with an incidence of 84.4% of all the lumbar levels.8

1 Al-alamy Hospital of Specialized Surgeries, Baghdad, Iraq
2 Al-Mustansiriyah College of Medicine, Baghdad, Iraq
3 Ibn Al Nafees Teaching Hospital, Baghdad, Iraq
4 Department of Orthopedics, Baquba Teaching Hospital, Baquba, Iraq
5 Al Ahrar Specialist Hospital, Cairo, Egypt

Corresponding Author:
Hayder Qatran Raheem, Al-Mustansiriyah College of Medicine, 10015 Baghdad, Iraq.
Email: aljoubourhayder@yahoo.com
The location of vascular injury will depend mainly on the level of surgery. With high incidence, about 71% of cases involve the left common iliac vein. In our study, we reviewed a case with vascular injury of the common iliac artery and vein during tubular microdiscectomy at the level of L5-S1 with delayed presentation. Exploration and repair with synthetic graft was performed.

Case report

History and physical examination

A 46-year-old male was presented with a history of low backache and radiation to the right lower limbs for 2 months duration at S1 root distribution.

The pain started 2 months ago, with sudden onset of lower backache, then progressed 1 week later to the right lower limb with paresthesia nerve lateral aspect of the calf muscle and button of the foot. It was severe in nature, progressive, aggravated by cough, straining and sitting for long durations, partially relieved by lying down and taking pain killer.

On examination, the straight leg-raising test of the right leg was positive at 40° with no obvious weakness in the leg. Magnetic resonance imaging (MRI) findings revealed L5-S1 a right-sided posterolateral disk herniation with foraminal stenosis (Figure 1).

A course of conservative treatment was given, which included rest, NSAID, and Paracetamol for 6 weeks. This failed to relieve the symptoms.

Operation

Surgery was planned to relieve the symptoms in the form of tubular microdiscectomy. Surgery was performed with pre-incision antibiotic under general anesthesia; prone position; under C-arm guides, a K-wire was inserted to L5-S1 level at right paramedian site; followed by 2 cm skin and fascia incision, then tubular dilators were inserted to 22 mm, with the aid of Loop magnification; identification of Lamina and partial laminotomy with flavectomy was performed using high-speed burr and bionate kerrison; the right S1 nerve root was explored and retracted; a large sequestrated disk was identified and removed using bionate pituitary rongeur, and further discectomy was performed to remove the remaining nucleus pulposus. At the end of discectomy, the site was irrigated with Amikacin, and the wound was closed by subcuticular suturing, with uneventful recovery. Two hours postoperatively, the patient began to complain of severe, continuous, burning pain in the entire left lower limb, partially relieved by flexion of hip and knee, not relieved by analgesia. Examination of distal pulsation was negative in comparison with another site (negative dorsalis pedis, posterior tibia and popliteal artery, weak femoral pulsation). Consultation with the vascular surgeon included a computed tomography (CT) angio request which revealed pseudoaneurysm of the common iliac vessels (Figures 2–4). An emergency operative procedure was performed for retroperitoneal exploration, and repair of the defect using a synthetic graft, with distal embolectomy at the end of the repair. Postoperatively, the pain subsided, distal pulsation was regained, and the patient was discharged from the hospital 5 days later. Follow-ups at 2 weeks, 6 weeks, 3 months, 6 months and 1 year revealed a complete recovery from vascular injury with no signs or symptoms of ischemic pain.

Discussion

The concept of microdiscectomy was applied by Caspar and Yasargil in 1977 when they used the microsurgical technique to minimize the incision size and spare the paraspinal
Raheem et al.

muscles using a smaller and more targeted surgical exposure than that used in open discectomy. Their aim was to decrease the approach-related morbidities and improve the patient outcome.10

These principles remain the goals of all minimally invasive spinal surgical procedures. Then, microendoscopic discectomy was developed11 by using a small diameter tubular retractor 14–18 mm, placed after inserting serial dilators and avoiding multifidus muscle detachment, to maintain the position tube retractor, an articulated, repositionable arm that was secured to the operating table.

Vascular injuries are rare, critical and life-threatening complications. In the review of previous literature, the incidence is less than 1%,3 and the first reported case was as early as 1945.12 Few surgeons have had experience with more than one or two cases in their careers, and the exact incidence remains unknown.13 The location of vascular injuries mainly depends on the level of the surgery. In the lumbar discectomy operation, at the level of L1-L4, the vascular structures at risk are the aorta and the inferior vena cava, while at L4-L5 and L5-S1, the iliac vessels are at risk.5,14,15 In our case, the level of surgery was L5-S1 with right-sided disk prolapse, and the injured vessels were the left common iliac artery and vein. The pituitary rongeur is the common cause of vascular injury in which, during discectomy, the rongeur perforates the anterior longitudinal ligament and catches the nearby retroperitoneal structures.5,7,16 In our case, as the level of surgery was L5-S1, right-sided, the injured vessels were the left common iliac artery and vein. We did the microdiscectomy using the Tubular system and bionate instruments, which are longer than the usual kerrison that is used in open surgery. The injury occurred with kerrison rongeur during discectomy to the contralateral side, as the patient has diabetes and hypertension, with a risk of atherosclerosis, making the vessels less elastic and viable to tear on traction, which might explain the injury in our case (Figure 5).

The presenting symptoms of vascular injury intraoperatively are hypotension in 81%3 and tachycardia, which could be life threatening and both carry a high risk. The presenting symptoms postoperatively, when pseudoaneurysm or A-V fistula is the cause,4 are abdominal pain, pulsatile abdominal mass, ischemic leg pain and pulmonary embolism secondary to thrombus or delay rupture of pseudoaneurysm which are present as acute abdomen and life-threatening conditions. In our case, the patient presented postoperatively with severe, intractable pain in the entire left leg, continuous and burning in nature, partially relieved with flexion of hip joint, with negative distal pulsation (dorsalis pedis, posterior tibial and popliteal arteries).

Figure 2. CT Angiogram: pseudoaneurysm at the left common iliac artery and vein.

Figure 3. Coronal CT: pseudoaneurysm of the left common iliac vessels.
Consultation with the vascular surgeon included a request for an urgent CT angio of the pelvis and lower limb vessels. The result was pseudoaneurysm of the left common iliac vessels at the level of L5-S1. For diagnosis of delayed vascular injuries, the most sensitive tool that allows for the best illumination of the injured vessels is angiography. We used the CT angio in our case because it is the most accessible tool in our hospital, and also is regarded as a sensitive tool for the diagnosis of vascular injury.

After confirmation of diagnosis, we planned for urgent vascular exploration and repair with synthetic graft. After the repair, and at the end of surgery, a distal thrombectomy was performed to ensure the patency of the distal vessels.

Postoperatively, the patient recovered, pain decreased and distal pulsation decreased. Follow-up at 6 weeks, 3 months, 6 months and 1 year revealed a symptom-free patient who was able to return to his normal daily activities.

With most of the spine surgeons trained in traditional open techniques, including the surgeons in our center, the challenge is to overcome the learning curve and to master the minimally invasive Spinal surgery, including the tubular microdiscectomy, as one must operate through a narrow field. Previous literature reviews support that most complications in minimally invasive spinal surgery occur in the initial experience with a low learning curve.

### Conclusion

We present a case of vascular injury during Tubular Microdiscectomy which is the first case using this technique. This complication is serious and life threatening. Delay in presentation is possible, however, early detection, investigation and intervention of this complication will improve the outcome. A learning curve is essential in mastering the minimally invasive spine surgery (MISS) and decreasing the complication rate.

### Acknowledgements

All authors are equally conceived and designed the study, conducted research, provided research materials and collected and organized data, analyzed and interpreted data.

### Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

### Ethical approval

Ethical approval to report this case was obtained from Iraqi Ethics Committee (104/2018)
Funding
The author(s) received no financial support for the research, authorship, and/or publication of this article.

Informed consent
Written informed consent was obtained from the patient for their anonymized information to be published in this article.

ORCID iD
Reda Ali Sheta https://orcid.org/0000-0001-9845-5246

References
1. Jung HS, Kim DJ, Kim HS, et al. Vascular complications related to posterior lumbar disc surgery. Vasc Specialist Int 2017; 33(4): 160–165.
2. Dosoglu M, Is M, Pehlivan M, et al. Nightmare of lumbar disc surgery: iliac artery injury. Clin Neurol Neurosurg 2006; 108(2): 174–177.
3. Erkut B, Unlu Y, Kaygin MA, et al. Iatrogenic vascular injury during lumbar disc surgery. Acta Neurochir 2007; 149(5): 511–515.
4. Ewah B and Calder I. Intraoperative death during lumbar discectomy. Br J Anaesth 1991; 66(6): 721–723.
5. Papadoulas S, Konstantinou D, Kourea HP, et al. Vascular injury complicating lumbar disc surgery. A systematic review. Eur J Vasc Endovasc Surg 2002; 24(3): 189–195.
6. Bolesta MJ. Vascular injury during lumbar disectomy associated with peridiskal fibrosis: case report and literature review. J Spinal Disord 1995; 8(3): 224–227.
7. Fruhwirth J, Koch G, Amann W, et al. Vascular complications of lumbar disc surgery. Acta Neurochir 1996; 138(8): 912–916.
8. Liu Y. Analysis of vascular injury. Pak J Med Sci 2012; 28(5): 791–794.
9. Sande E, Myhre HO, Witsoe E, et al. Vascular complications of lumbar disc surgery. Case report. Eur J Surg 1991; 157(2): 141–143.
10. Yasargil MG (ed.). Microsurgical operation of herniated lumbar disc. Berlin: Springer, 1977.
11. Perez-Cruet MJ, Foley KT, Isaacs RE, et al. Microendoscopic lumbar discectomy: technical note. Neurosurgery 2002; 51(5 Suppl.): S129–S136.
12. Derincek A, Wood KB and Muench CA. Superior mesenteric artery syndrome following correction of kyphosis in an adult. J Spinal Disorder Tech 2004; 17(6): 549–553.
13. Inamasu J and Guiot BH. Vascular injury and complication in neurosurgical spine surgery. Acta Neurochir 2006; 148(4): 375–387.
14. Bierdrager E, Van Rooij WJ and Sluzewski M. Emergency stenting to control massive bleeding of injured iliac artery following lumbar disk surgery. Neuroradiology 2004; 46(5): 404–406.
15. Hui YL, Chung PC, Lau WM, et al. Vascular injury during a lumbar laminctomy. Chang Gung Med J 2003; 26(3): 189–192.
16. Davis RA. A long-term outcome analysis of 984 surgically treated herniated lumbar discs. J Neurosurg 1994; 80(3): 415–421.
17. Sadhasivam S and Kaynar AM. Iatrogenic arteriovenous fistula during lumbar microdiscectomy. J Neurosurg 1994; 80(3): 415–421.
18. Perez-Cruet MJ, Fessler RG and Perin NI. Review: complications of minimally invasive spinal surgery. Neurosurgery 2002; 51(5 Suppl.): S26–S36.
19. Sclafani JA and Kim CW. Complications associated with the initial learning curve of minimally invasive spine surgery: a systematic review. Clin Orthop Relat Res 2014; 472(6): 1711–1717.