

ILIAC VESSELS INJURY DURING DISC HERNIATION SURGERY - CASE REPORT

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ABSTRACT

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Iliac vessel injuries during spinal surgery are rare but can be fatal. The incidence of these injuries is approximately 0.04%, with the first description dating back to 1945 by Linton and White. Clinical presentation can range from acute hemorrhagic shock to subtle injuries with asymptomatic progression. We present the case of a 53-year-old previously healthy female undergoing planned surgical treatment for a disc hernia at the L4-L5 level on the left. Postoperatively, she experienced hemorrhagic shock with a decrease in hemoglobin to 35g/l. An emergency MSCT angiography verified a vascular lesion. During urgent surgical intervention, a lesion of the common iliac vein was observed, which was sutured directly, and a lesion of the right common iliac artery, which was managed by interposition of an 8mm Dacron graft. Follow-up MSCT angiography showed normal findings. During spinal surgery, it is essential to be aware of the possibility of vascular lesions. Due to the potential occurrence of delayed massive bleeding, intensive peri- and postoperative monitoring of patients after spinal surgery is necessary.

Keywords: Iatrogenic iliac artery injury, iatrogenic iliac vein injury, disc herniation surgery, spinal surgery complications, iatrogenic bleeding.

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INTRODUCTION

The surgery for lumbar-sacral disc herniation and/or spinal canal stenosis is commonly performed and considered a low-risk procedure. However, peri- and postoperative complications can occur, ranging from superficial infections of the surgical wound to deeper infections, cerebrospinal fluid leakage, persistence or onset of neurological deficits, and even life-threatening iatrogenic injuries to major blood vessels (1-3). Besides serious vascular complications, other non-neurological complications such as ureter necrosis or the occurrence of hemothorax have been described (4-6). Injuries to major blood vessels in the retroperitoneum can occur not only during neurosurgical interventions but also during hip surgery, kidney transplantation, and various interventional radiological procedures (7, 8).

The first vascular injury as a complication of disc herniation surgery was described in 1945 by Linton and White (9). Although these injuries are rare, they can be fatal. The literature reports an incidence of iatrogenic vascular injuries around 0.04%, with a high mortality rate ranging from 15 to 60% (10). Despite their rarity, the frequency of vascular injuries has remained consistent over the last few decades (11).

Injuries to vascular structures represent one of the most dreaded surgical complications due to their consequences. These complications can range from acute hemorrhagic shock requiring urgent intervention to insidious injuries with asymptomatic progression. It is crucial to carefully study these manifestations to determine the most appropriate therapeutic approach (12).

Here, we present a case of injury to the right common iliac artery and right common iliac vein in a patient operated on for disc herniation at the L4-L5 level.

CASE PRESENTATION

A 53-year-old female was admitted for planned operative treatment of neuroradiologically verified disc herniation at the L4/L5 level on the left and spinal canal stenosis. She had been experiencing lumbar-sacral back pain and pain along the left leg for several months. Magnetic resonance imaging (MRI) revealed a disc prolapse at the L4-L5 level with compression of the dural sac and anular rupture at the L5-S1 level with dorzomedial protrusion. The patient had no previous illnesses, allergies, injuries, or surgeries.

The surgery was performed in the typical genitopectoral position, involving interhemilaminectomy. Intraoperatively, the yellow ligament was noted to be extremely hypertrophic. The L5 root and the protrusion of the disc below the root shoulder were visualized. The posterior ligament and anulus were opened, and the nucleus was removed. During the surgical intervention, there was a drop in systolic arterial pressure to 50 mmHg. Administration of therapy by the anesthesia team led to the normalization and stabilization of arterial pressure.

Postoperatively, after 4-5 hours, there was a drop in arterial pressure. Patient was pale, tachycardic, and hypotensive, with gas analysis showing an estimated hematocrit below 15%. After consultation with a vascular surgeon, urgent MSCT angiography was indicated, revealing active bleeding and a rupture of the right common iliac artery (Figure 1). It was also impossible to exclude the presence of iliacocaval fistula or pseudoaneurysm. A large retroperitoneal hematoma on the right side was also observed (Figure 2). Emergency surgical intervention was necessary.



Figure 1. Lesion of the right common iliac artery with signs of bleeding (red arrow shows extravasation of contrast from right common iliac artery)



Figure 2. Large retroperitoneal hematoma (red arrows show a big retroperitoneal hematoma around injured right common iliac artery)

Due to the pronounced hemodynamic instability of the patient, a medial laparotomy was performed, clamping the abdominal aorta initially for temporary hemostasis. During aortic access, a large retroperitoneal hematoma was observed. Subsequently, a defect was noted on the posterior wall of the dissected right common iliac artery, with bleeding, and on the posterior-inner wall of the right common iliac vein was defect too. To stop venous bleeding, we made I decision to cut the artery. The common iliac artery was cut, the defect on the vein was sutured directly, while the right iliac artery, due to the impossibility of end to end anastomosis reconstruction, was reconstructed by interposing an 8mm Dacron graft. Blood derivatives and other resuscitation

therapy were administered to the patient during the surgical intervention and immediately after.

Postoperatively, the patient was hemodynamically stable, with palpable pulses in the main arteries of the right leg. Color Doppler ultrasound examination detected physiological flows in the tibial arteries of the right leg, with no signs of deep vein thrombosis. After 14 days, she was discharged home.



Figure 3: Normal findings on control MSCT angiography (red arrows show right common iliac artery and right common iliac vein on 3 years after intervention)



Figure 4. Control MSCT angiography after three years (red arrow shows patent synthetic graft)

On the follow-up MSCT angiography performed 3 years after the intervention, the findings were normal (figure 3). There were no hemodynamically significant stenoses on the right common iliac artery, and the graft was patent (figure 4). The finding on the right common iliac vein was also normal.

DISCUSSION

During spinal surgery, serious vascular injuries can involve laceration of blood vessels, formation of pseudoaneurysms, and arteriovenous fistulas. These injuries are rare, Akhade et al. in their literature review from 2022 state that from 1969 to 2018, about 100 cases of vascular injuries during posterior approach lumbar disc surgery have been reported (13).

Despite the use of optimal surgical techniques, lumbar disc surgery is often performed in a space with limited maneuvering possibilities. There are numerous risk factors for vascular injuries mentioned by S. Papdoulas et al. in a 2002 study, including previous disc or abdominal surgeries with adhesion formation, disruption or degeneration of the anterior annulus fibrosus and anterior longitudinal ligament, inadequate patient positioning, excessively deep instrument intrusion during surgery, close proximity between the disc and large retroperitoneal blood vessels, further increased by placing a pillow under the abdomen during surgery, as well as vertebral anomalies (14). Although these risk factors are important, none of them individually were pronounced in the case of our patient. Radiological (MRI) and clinical examinations did not reveal the presence of any of the mentioned factors.

The blood vessel that is injured can be arterial, venous, or both simultaneously, as was the case with our patient. Clinically, the injury can manifest immediately intraoperatively, later, or immediately postoperatively. Delayed onset of bleeding in such injuries poses a significant problem, as described in the case report by Moutinho et al. in 2019 (15). Lacerations, pseudoaneurysms, and AV fistulas are the most common, but vasospasm can also occur.

The most commonly injured blood vessels are the common iliac artery, common iliac vein, aorta, inferior vena cava, but also smaller blood vessels such as the lumbar artery or inferior mesenteric artery (16-18). Clinical manifestations of injuries vary depending on the type of blood vessel and the pathoanatomical substrate. In laceration, hypotension occurs, signs of hemorrhagic shock, a suddenly formed mass in the abdomen, and/or abdominal distension (19).

In contrast to lacerations, arteriovenous fistulas can cause symptoms such as abdominal bruit, leg swelling, pulmonary thromboembolism, abdominal pain, chest pain, hematuria, renal failure, varicose veins in the legs, thrombophlebitis, or deep vein thrombosis, depending on the time when the problem is noticed (20-23). Naouli et al. describe late complications of arteriovenous fistulas due to constant increased inflow into the right heart and increased preload, leading to heart failure of varying degrees, even in younger people (24).

Treatment of such injuries, especially lacerations of large blood vessels in the retroperitoneum, requires urgent surgical intervention. Treatment can be endovascular or open surgery. In endovascular interventions, a stent graft is placed in the area of the injured artery to stop the bleeding. A limiting factor of this type of treatment can be the availability of an angiography suite, availability of suitable stent grafts, as well as difficulties in identifying simultaneous injuries to venous blood vessels if not clearly visible on CT angiography, which may require later reinterventions. One complication described by Sahinoglu et al. in 2019 during endovascular treatment is the occurrence of abdominal compartment syndrome if a large hematoma forms, which may require post-

procedural medial laparotomy and subsequent reconstruction of the anterior abdominal wall (25, 26).

Open surgical treatment for lacerations of large blood vessels can take the form of direct suturing, patch plastic surgery, graft interposition (autovenous or synthetic), anastomosis with the contralateral internal iliac artery, internal arteriotomy suturing, ligation of the blood vessel, or conservative treatment. Papadoulas et al. state that the most common form of open surgical treatment for common iliac artery injuries is direct suturing. According to their review of studies from 2002, covering studies from 1965, almost a third of 30 patients with common iliac artery injuries were treated with direct suturing. However, in the case of our patient, we did not have adequate conditions for this form of surgical treatment (14).

In our case, due to the simultaneous injury to the iliac vein, it was necessary to cut the already injured common iliac artery to stop venous bleeding. Subsequently, considering the patient's very poor general condition and significant bleeding, we opted to use an 8mm synthetic Dacron graft instead of an autologous vein graft, which would have prolonged the duration of the operation. It is important to note that in such injuries, retroperitoneal or intraperitoneal bleeding may be

overlooked if there are no clear intraoperative signs of bleeding. In young and healthy individuals, even when bleeding reaches 40% of the circulating volume, a clear clinical picture or signs of hemorrhagic shock may be absent, leading to delays in diagnosis and treatment (27).

Literature indicates that the overall mortality rate from vascular injuries during spinal surgery is around 10%, with a higher percentage if it involves an arterial blood vessel (20-38%). The mortality rate in the presence of arteriovenous fistula is around 5%, while it is very low in chronic pseudoaneurysms. It is important to note that data on mortality outcomes are less frequently published compared to data on successfully completed treatments (15).

In light of the complexities and potential severity of iliac vessel injuries during spinal surgery, we have summarized the critical aspects of this condition in a concise table 1. This table is designed to serve as a quick reference for clinicians, providing essential information on incidence, typical injuries, clinical presentations, diagnostic and surgical interventions, outcomes, risk factors, and management strategies. The aim is to enhance the understanding and readiness of healthcare professionals when faced with such challenging scenarios. Refer to the table below for a comprehensive overview:

Table 1. Summary of Key Clinical Information on Iliac Vessel Injuries During Spinal Surgery

Aspect	Details
Incidence & Severity	Rare but potentially fatal, with a reported incidence of 0.04% and mortality rates between 15-60%.
Common Injuries	Iliac artery and vein injuries are common, with risks of laceration, arteriovenous fistulas, and pseudoaneurysms.
Clinical Presentation	Symptoms range from immediate hemorrhagic shock to asymptomatic progression. In the presented case, postoperative hemorrhagic shock occurred with a hemoglobin drop to 35g/l.
Diagnostic Approach	Utilization of MSCT angiography is critical for identifying active bleeding and vascular lesions.
Surgical Intervention	Emergency surgery often necessary; techniques include direct suturing and graft interposition (e.g., 8mm Dacron graft for iliac artery reconstruction in the case study).
Risk Factors	Previous surgeries, close proximity of the disc to major vessels, and intraoperative challenges such as excessive instrument intrusion and inadequate positioning.
Management Strategies	Vigilant peri- and postoperative monitoring is vital due to the risk of delayed massive bleeding. Both endovascular and open surgical interventions are viable depending on the scenario.

CLINICAL PRACTICE ALGORITHM FOR ILIAC VESSEL INJURIES DURING SPINAL SURGERY

Iliac vessel injuries during spinal surgery represent a significant clinical challenge due to their potential for severe complications, including hemorrhagic shock and even mortality. This clinical practice algorithm has been developed to guide surgeons, anesthesiologists, and perioperative teams through the systematic approach required for the prevention, diagnosis, and management of iliac vessel injuries during spinal procedures. It encompasses a series of meticulously

outlined steps that facilitate early detection and effective intervention, thereby minimizing patient morbidity and improving outcomes.

Step 1: Preoperative Assessment

1.1 Evaluate Patient History: Check for prior abdominal or spinal surgeries which might increase risk of adhesions.

1.2 Radiological Examination: Preoperative MRI or CT scan to assess the relationship between vascular structures and the surgical site.

Step 2: Intraoperative Monitoring

2.1 Vital Signs: Continuously monitor blood pressure and heart rate to detect signs of bleeding.

2.2 Surgical Technique: Utilize precise and gentle maneuvers to minimize risk of vascular injury.

Step 3: Identification of Vascular Injury

3.1 Detection: Look for signs of significant blood loss or a drop in blood pressure.

3.2 Initial Response: Stabilize the patient by pausing the surgery and preparing for diagnostic assessment.

Step 4: Diagnostic Confirmation

4.1 Intraoperative Ultrasound: Quick assessment to locate the injury.

4.2 Confirmatory Imaging: Perform MSCT angiography for a detailed view of the vascular injury.

Step 5: Management of Vascular Injury

5.1 Immediate Hemostasis: Apply manual pressure or vascular clamps to control bleeding.

5.2 Surgical Repair:

5.2.1 Minor Lacerations: Direct suturing.

5.2.2 Major Injuries: Use of vascular grafts or stenting.

Step 6: Postoperative Care

6.1 Intensive Monitoring: Monitor hemodynamics and hematocrit levels closely in the immediate postoperative period.

6.2 Follow-up Imaging: Schedule postoperative MSCT angiography within 24-48 hours, then periodically.

Step 7: Long-term Monitoring

7.1 Regular Follow-ups: Perform periodic Doppler ultrasounds to ensure proper blood flow and check for late complications.

7.2 Patient Education: Advise the patient on symptoms of complications such as swelling, pain, or color change in the extremities.

CONCLUSION

Iatrogenic vascular injuries during spinal surgery are rare but can have potentially fatal outcomes. To promptly establish a diagnosis, it is crucial for both the anesthesiology and surgical teams to be aware of the possibility of such injuries during spinal surgery, as clinical manifestations may occur with delayed effects, as was the case with our patient. Due to the potential for life-threatening bleeding resulting from vascular injuries, careful and intensive perioperative monitoring of patients after spinal surgery is extremely important.

REFERENCES

1. Nesnídal P, Štulík J, Štulík J Ml, Kryl J, Vyskočil T, Barna M. Komplikace ve spondylochirurgii: prospektivní 13leté sledování neplánovaných revizních operací páteře [Complications in Spine Surgery: Prospective 13-year follow-up of unplanned revision spinal surgeries]. *Acta Chir Orthop Traumatol Cech.* 2022;89(4):243-51.
2. Zileli M. Complication Avoidance in Spine Surgery. *Acta Neurochir Suppl.* 2023;130:141-56.
3. Still MEH, Venturini S, Vycheth I, Nang S, Vuthy D, Park KB. Predictive Factors of Spine Surgery Complications at a Major Government Hospital in Cambodia. *World Neurosurg.* 2019;122:e1172-e80.
4. Fuquan J, Gang Z, Jianlin X, Yin R. Complete ureteral necrosis after injury sustained during lumbar disc surgery: A case report. *Medicine (Baltimore).* 2020;99(33):e21727.
5. Turgut M, Turgut AT, Dogra VS. Iatrogenic Ureteral Injury as a Complication of Posterior or Lateral Lumbar Spine Surgery: A Systematic Review of the Literature. *World Neurosurg.* 2020;135:280-96.
6. Maruo K, Tachibana T, Inoue S, Arizumi F, Yoshiya S. Hemothorax caused by the trocar tip of the rod inserter after minimally invasive transforaminal lumbar interbody fusion: case report. *J Neurosurg Spine.* 2016;24(3):394-7.
7. Hou ZJ. [A case of hip joint disconnection caused by iatrogenic external iliac artery injury]. *Zhongguo Gu Shang.* 2023;36(6):589-90. Chinese.
8. Khankan AA, Maeda M, Osuga K, Murakami T, Nakamura H. Post-kidney transplantation iliac artery stenosis due to iatrogenic injury: case report. *Cardiovasc Intervent Radiol.* 2003;26(2):186-8.
9. Skippage P, Raja J, McFarland R, Belli AM. Endovascular repair of iliac artery injury complicating lumbar disc surgery. *Eur Spine J.* 2008;17 Suppl 2(Suppl 2):S228-31.
10. Wang J, Hu Y, Wang H. Acute abdominal aortic injury during posterior lumbar fusion surgery: A case report. *Medicine (Baltimore).* 2022;101(35):e30216.
11. Uribe JS, Deukmedjian AR. Visceral, vascular, and wound complications following over 13,000 lateral interbody fusions: a survey study and literature review. *Eur Spine J.* 2015;24 Suppl 3:386-96.
12. Gok M., Aydin E., Guneyli S., Akay A., Cinar C., Oran I. Iatrogenic vascular injuries due to spinal surgeries: endovascular perspective. *Turk Neurosurg.* 2018;28:469-73.
13. Akhaddar A, Alaoui M, Turgut M, Hall W. Iatrogenic vascular laceration during posterior lumbar disc surgery: a literature review. *Neurosurg Rev.* 2021;44(2):821-42.
14. Papadoulas S, Konstantinou D, Kourea HP, Kritikos N, Haftouras N, Tsolakis JA. Vascular injury complicating lumbar disc surgery. A systematic review. *Eur J Vasc Endovasc Surg.* 2002;24(3):189-95.
15. Moutinho M, Silvestre L, Belo D, Soares T, Pedro LM. Complete Disruption of The Iliac Vessels During Spinal Surgery With Delayed Presentation. *EJVES Short Rep.* 2019;43:33-6.

16. Liu L, Li N, Wang Q, Wang H, Wu Y, Jin W et al. Iatrogenic Lumbar Artery Injury in Spine Surgery: A Literature Review. *World Neurosurg.* 2019;122:266-71.
17. Aljohani AK, Khalid Bin Yunus M, Fallatah AA, Kheder OM, Almolki KS, Alawad H et al. Inferior Mesenteric Artery Injury in Post-lumbar Microdiscectomy: A Case Report. *Cureus.* 2023;15(8):e42998.
18. Ventura F, Barranco R, Bernabei C, Castelletti L, Castellan L. A fatal and unusual iatrogenic fourth right lumbar artery injury complicating wrong-level hemilaminectomy: a case report and literature review. *Br J Neurosurg.* 2019;33(4):434-6.
19. Mehdorn AS, Mehdorn M, Mehdorn HM. Vascular Injury During Lumbar Disc Surgery: Case Report. *Acta Neurochir Suppl.* 2023;130:185-9.
20. Tang K, Zhang YB, Fang J, Shi T, Shen CY. Iatrogenic arteriovenous fistula after lumbar discectomy surgery: a case report. *J Surg Case Rep.* 2023;2023(2):rjac576.
21. Kim C, Hwang D, Yun WS. Endovascular Repair of an Ilio-Iliac Arteriovenous Fistula with Pseudoaneurysm after Lumbar Disc Surgery: A Case Report. *Vasc Specialist Int.* 2021;37:30.
22. Alshabat A, Srayrah S, Aljfoot S, Obiedat L, Alsharoa S, Janho K et al. Endovascular treatment of iatrogenic iliocaval fistula post lumbar disc surgery. *J Surg Case Rep.* 2019;2019(11):rjz313.
23. Pechlivanis I, Engelhardt M, Scholz M, Harders A, Schmieder K. Deep venous thrombosis after lumbar disc surgery due to compression of the vena cava caused by a retroperitoneal haematoma. *Eur Spine J.* 2008;17 Suppl 2(Suppl 2):S324-6.
24. Naouli H, Jiber H, Bouarhroum A. Iliac arteriovenous fistula following lumbar disc surgery. A case report. *J Med Vasc.* 2022;47(4):199-202.
25. Sahinoglu M, Arun O, Orhan A, Nayman A, Calısır A, Böcü Y et al. Iliac Artery Injury During Lumbar Disc Hernia Surgery. *World Neurosurg.* 2019;125:347-51.
26. Jin SC, Park SW, Cho DS. Management of Proximal Iliac Artery Injury during Lumbar Discectomy with Stent Graft. *J Korean Neurosurg Soc.* 2012;51(4):227-9.
27. Torun F, Tuna H, Deda H. Abdominal vascular injury during lumbar disc surgery: report of three cases. *Ulus Travma Acil Cerrahi Derg.* 2007;13(2):165-7.