Case Report

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Treatment Experience Using a Stent Graft for Lumbar Artery Injury that Failed Coil Embolization

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Transcatheter embolization currently constitutes the primary treatment for lumbar artery injury due to blunt trauma. We present a case where a stent graft effectively treated a lumbar artery injury after coil embolization failed to achieve hemostasis. Aortic stent graft implantation is a safe procedure that can prevent surgical morbidity and has minimal complications. It may serve as an effective alternative for achieving hemostasis when coil embolization is not feasible or is unsuccessful.

Keywords: *Endovascular Treatment; Lumbar Artery Injury; Coil Embolization*

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INTRODUCTION

Today, endovascular treatment is a critical component of trauma patient care. In patients with lumbar artery injury (LAI), it is challenging to accurately control bleeding through surgery. Hence, endovascular treatment involving coil embolization is the preferred treatment option. Furthermore, a vascular injury in the retroperitoneal space can be simultaneously diagnosed and treated using arteriography. However, if coil embolization is not possible, an aortic stent can be placed to prevent persistent bleeding. Here we describe our experience of efficiently treating with a stent graft bleeding that persisted following coil embolization.

CASE PRESENTATION

A 53-year-old man was admitted to the hospital after becoming trapped between equipment while working in a factory. He reported severe back pain, weakness, and reduced sensation in both legs. He was rescued by paramedics and subsequently underwent a computed tomography (CT) scan at a nearby hospital. He arrived at our hospital five hours after the injury and, during this time, he received a transfusion of five bags of packed red blood cells. The patient's vital signs at the time of admission were as follows: blood pressure, 70/40 mm Hg; heart rate, 95 per min; respiratory rate, 23 per min; oxygen saturation SpO_2, 94% (room air); and a Glasgow Coma Scale score of 15. No external injury was observed, except for a facial laceration. No signs of internal bleeding were detected on ultrasonography employing the Focused Assessment with Sonography in Trauma protocol. However, retroperitoneal hematoma with overt bleeding due to LAI and multiple vertebral fractures were diagnosed after a CT scan at the first hospital (Figures 1 and 2).

The patient was transfused with two bags of packed red blood cells and two bags of fresh frozen plasma. The patient's blood pressure returned to 101/52 mm Hg following fluid resuscitation. Given the LAI and hemorrhage in other regions, the patient was transferred to the intervention room for embolization. During the angiography, multiple lumbar arteriograms revealed extravasation in the right lumbar arteries. Each lumbar artery was selected using an angiocatheter and microcatheter and then embolized with eight microcoils and a lipiodol–histoacryl mixture (Figures 3 and 4).

The patient's vital signs were consistently maintained without the necessity of vasopressors following

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Figure 1 Injuries of the lumbar vertebrae (L): L1 burst fracture, L2–4 recent compression fracture (arrows), and multiple fractures of both the transverse and spinous processes.

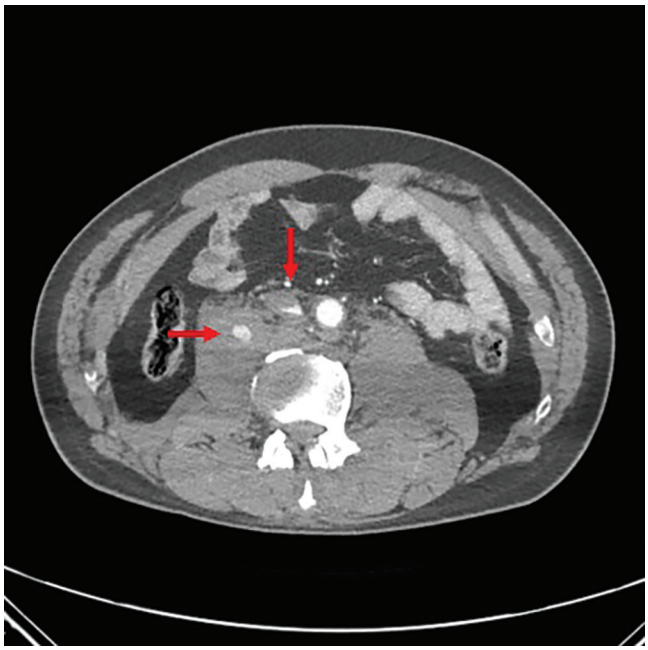

Figure 2 Extensive hematoma in the retroperitoneal space including the pararenal space. Right psoas muscle hematoma at the lumbar vertebrae L2 level indicative of acute arterial bleeding (arrows) originating from the lumbar artery.

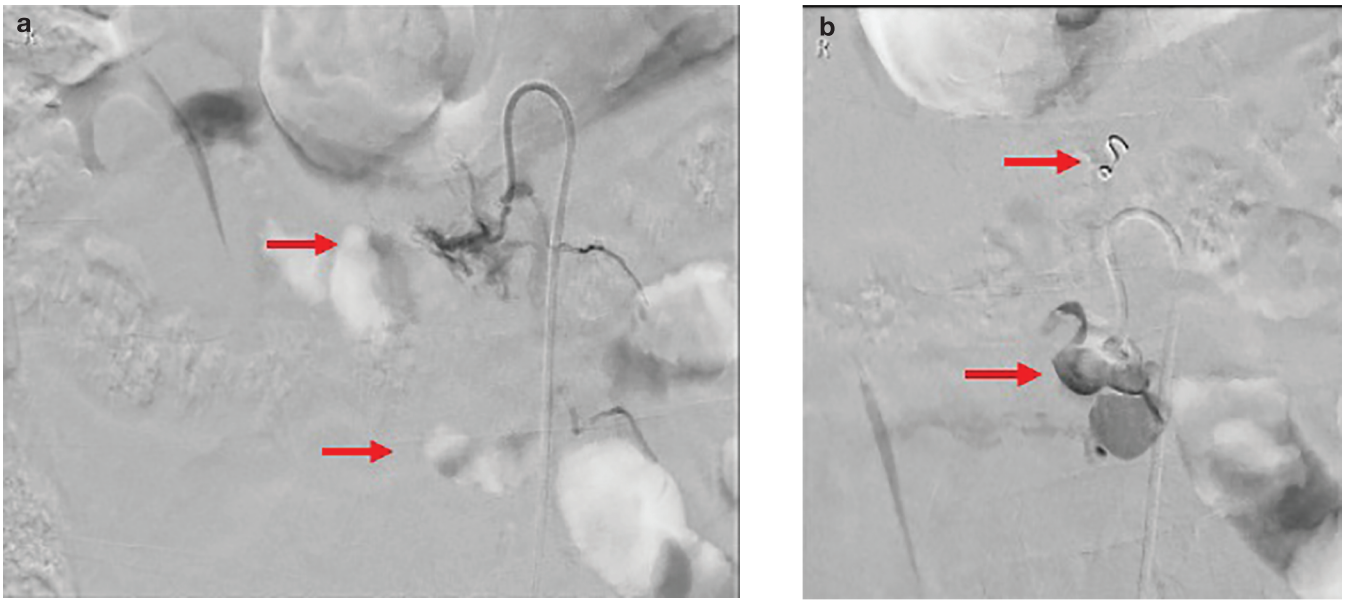

Figure 3 (**a**) Multiple lumbar arteriograms revealing extravasation from the right lumbar arteries (arrows). (**b**) Coil embolization and a lipiodol–histoacryl mixture (arrows) of selected lumbar arteries.

admission to the intensive care unit. However, on the second day after the injury, an abdominal CT scan was performed after the laboratory findings revealed that hemoglobin levels had dropped from 14.3 to 7.6 g/dL. The abdominal CT scan revealed continued overt bleeding at the site of the previous coil embolization, and therefore re-embolization was planned (Figure 5). However, the aortography demonstrated that there was insufficient space for coil embolization, and it was determined that an aortic stent placement would instead be implanted. The aortogram identified the tear at the origin of the lumbar artery. Therefore, a 20 mm × 20 mm × 80 mm stent graft (Medtronic, Minneapolis, MN, USA) was inserted and placed in the infrarenal aorta. The aortogram confirmed that the tear was covered and the lumen of the stent graft was patent (Figures 6 and 7). The patient's condition stabilized after stent insertion, and no complications were observed

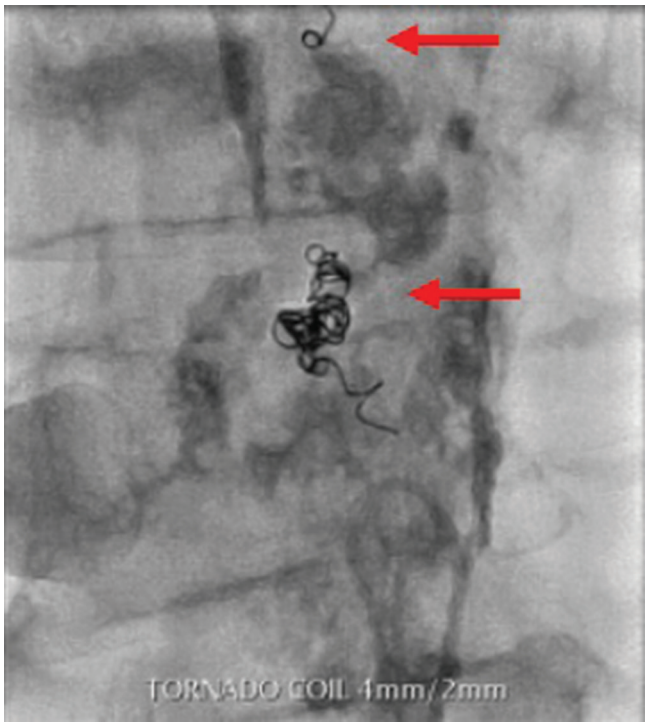

Figure 4 After identifying each lumbar artery using an angiocatheter and microcatheter, embolization was performed with eight microcoils (arrows) and a lipiodol–histoacryl mixture.

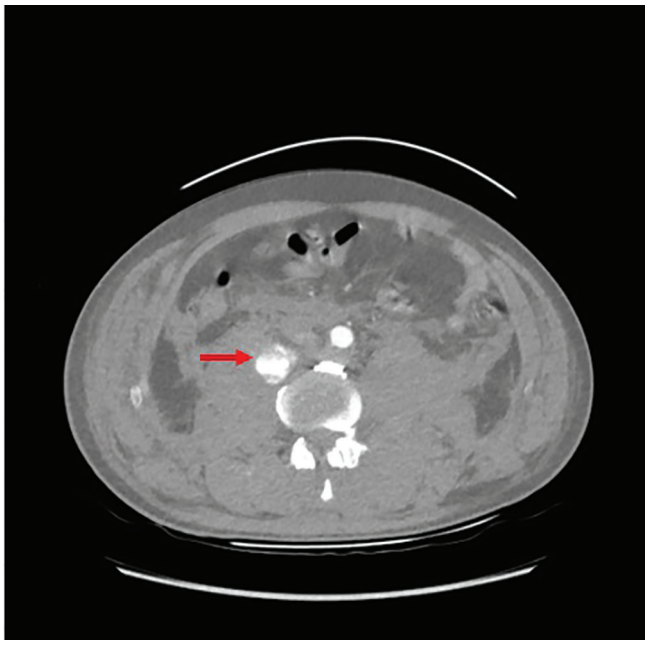

Figure 5 Post-embolization state following acute arterial bleeding from the paraspinal vessels (arrow), which originate from the abdominal aorta, visible at the right psoas muscle, lumbar vertebrae L2 level.

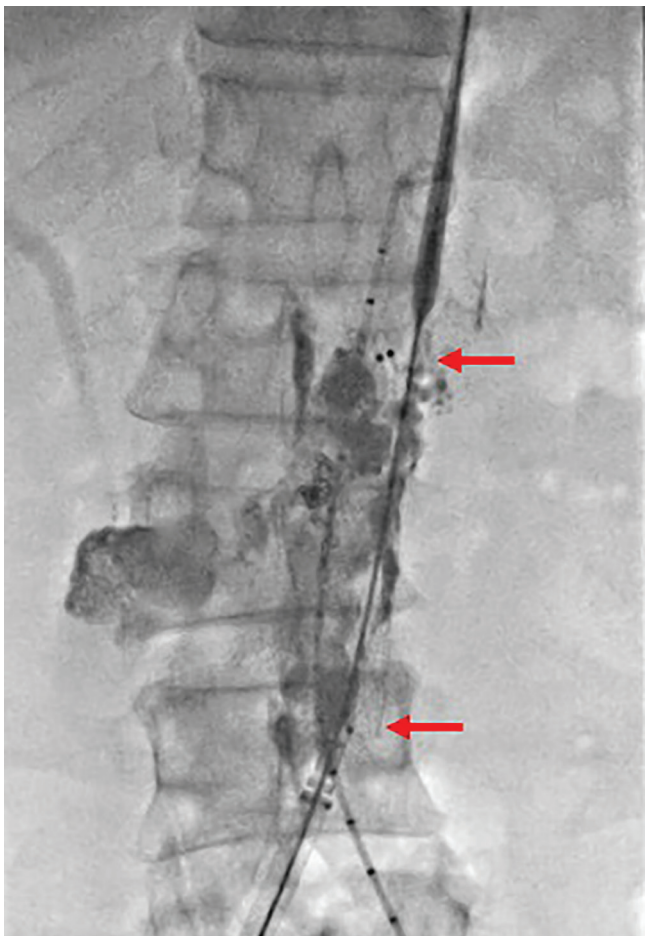

Figure 6 A 20 mm × 20 mm × 8 cm stent graft (Medtronic, Minneapolis, MN, USA) was placed in the infrarenal aorta (arrows).

Figure 7 Follow-up CT scan. The aortic stent is patent (arrows), and no findings to suggest active contrast leakage were observed in the current CT scan.

following the procedure. A magnetic resonance imaging scan was performed on the sixth day after the injury, prior to the spinal surgery. Following spinal fixation on the seventh day after the injury, the patient was transferred to the neurosurgery department and eventually monitored on an outpatient basis.

Ethical Approval and Informed Consent

This study was approved by the Institutional Review Board of Pusan National University Hospital, Busan, Korea, and was performed in accordance with the ethical standards set forth in the 1964 Declaration of Helsinki and its later amendments (IRB No.: 2048-011-142). Informed consent was waived owing to the retrospective nature of the study.

DISCUSSION

LAI frequently occurs concurrently with a fracture of the spine or pelvis in patients who have sustained blunt trauma. The treatment approach is determined based on the associated injuries and hemodynamic status. In hemodynamically unstable cases, lumbar artery injuries are treated surgically. However, it is challenging to localize the source of bleeding and, consequently, the mortality rate is high [1,2].

In the present case, coil embolization was implemented because the patient responded to fluid resuscitation; however, retroperitoneal exploration would have been performed if the fluid resuscitation were unsuccessful. However, identifying the bleeding site accurately and conducting proximal hemostatic procedures would have been difficult, resulting in a deterioration of the patient's condition.

In hemodynamically stable cases, the primary treatment for LAI is transcatheter embolization. During endovascular treatment, embolic substances such as coils or gelfoam are employed. However, coil embolization is preferred to prevent complications such as retroperitoneal infarction. Coil embolization has a hemostasis success rate of 70–100% and is a safe treatment modality with minimal complications [1–3]. However, if there is insufficient space for embolization or if the selection of the lumbar artery proves difficult, there is a risk of persistent bleeding. If hemostasis is not achieved, conservative management can be implemented, provided the patient's hemodynamic signs are stable [1]. Nevertheless, if persistent bleeding occurs, an aortic stent may be inserted to arrest the hemorrhage [4,5]. Aortic stents are currently employed extensively in trauma patients to treat thoracic aortic injuries. Placement of an aortic stent is a minimally invasive procedure that does not require aortic cross-clamping.

In addition, recent studies have demonstrated favorable outcomes in long-term follow-up, and it is considered a safe treatment that can reduce surgical morbidity [6]. Compared to thoracic aortic stents, abdominal aortic stent implantation is a safe procedure with fewer reported complications of spinal cord injury [7]. This procedure has been effectively employed in the treatment of lumbar artery pseudoaneurysms caused by specific diseases when coil embolization is difficult [8]. In conclusion, aortic stent placement may serve as an effective alternative to coil embolization when hemostasis proves difficult to accomplish.

Ethics Statement

(1) All the authors mentioned in the manuscript have agreed to authorship, read and approved the manuscript, and given consent for submission and subsequent publication of the manuscript.
(2) The authors declare that they have read and abided by the JEVTM statement of ethical standards including rules of informed consent and ethical committee approval as stated in the article.

Conflicts of interest

The authors declare no conflicts of interest.

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Author Contribution

Conceptualization, Chang won Kim and Jae Hun Kim. Writing – original draft, Gil Hwan Kim. Writing – review & editing, Sang Bong Lee and Chan Ik Park. All authors have read and agreed to the published version of the manuscript.

REFERENCES

[1] Yuan KC, Hsu YP, Wong YC, Fang JF, Lin BC, Chen HW. Management of complicated lumbar artery injury after blunt trauma. Ann Emerg Med. 2011;58:531–5.
[2] Akpinar E, Peynircioglu B, Turkbey B, Cil BE, Balkanci F. Endovascular management of life-threatening retroperitoneal bleeding. ANZ J Surg. 2008;78:683–7.
[3] Sofocleous CT, Hinrichs CR, Hubbi B, Doddakashi S, Bahramipour P, Schubert J. Embolization of isolated lumbar artery injuries in trauma patients. Cardiovasc Intervent Radiol. 2005;28:730–5.
[4] Schumacher H, Böckler D, von Tengg-Kobligk H, Allenberg JR. Acute traumatic aortic tear: open versus stent-graft repair. Semin Vasc Surg. 2006;19:48–59.
[5] Miura K, Komiya T, Matsushime S, Oka N, Kamo K. Stent graft placement for traumatic lumbar artery injury in which coil embolization is not feasible. Trauma Case Rep. 2023;43:100774.

[6] Rahman T, Halonen LM, Handolin L, Juvonen T, Jormalainen M, Dahlbacka S. 16-year outcomes of blunt thoracic aortic injury treated with thoracic endovascular aortic repair: a single-institution experience. Scand J Surg. 2024;25:14574969241255242.
[7] Morisaki K, Matsumoto T, Matsubara Y, et al. A rare complication of spinal cord ischemia following endovascular aneurysm repair of an infrarenal abdominal aortic aneurysm with arteriosclerosis obliterans: report of a case. Ann Vasc Dis. 2016;9:255–7.
[8] Tsuchida K, Kokaguchi K, Hasegawa T, Akamatsu D, Namiki K. Endovascular treatment for a ruptured lumbar artery aneurysm in a patient with neurofibromatosis type 1. J Vasc Surg Cases Innov Tech. 2023;9:101208.