

Case Report

Endovascular Treatment for Common Iliac Artery Injury Complicating Lumbar Disc Surgery : Limited Usefulness of Temporary Balloon Occlusion

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Vascular injury during lumbar disc surgery is a rare but potentially life-threatening complication. It has been managed by open vascular surgical repair. With recent technologic advance, endovascular treatment became one of effective treatment modalities. We present a case of a 32-year-old woman who suffered with common iliac artery injury during lumbar disc surgery that was treated successfully by endovascular repair with temporary balloon occlusion and subsequent insertion of a covered stent. Temporary balloon occlusion for 1.5 hours could stop bleeding, but growing pseudoaneurysm was identified at the injury site during the following 13 days. It seems that the temporary balloon occlusion can stall bleeding from arterial injury for considerable time duration, but cannot be a single treatment modality and requires subsequent insertion of a covered stent.

KEY WORDS : Endovascular repair · Covered stent · Balloon occlusion · Lumbar disc surgery · Common iliac artery · Pseudoaneurysm.

INTRODUCTION

Vascular injury during lumbar disc surgery, although rare, can result in devastating consequences. When it is clinically apparent that vascular injury has occurred, the mortality can be quoted at 40-100%^{4,13}. Although the exact incidence is uncertain, it has been reported that the incidence of serious vascular injuries such as arteriovenous fistulas, laceration and pseudoaneurysms had been reported as 1-5 per 10,000 during disc surgery¹⁰. According to the report of Health Insurance Review and Assessment Service of Korea in 2007 (<http://www.hira.or.kr>), 149,525 spine surgeries were done in South Korea. Number of lumbar discectomies during the same period was about 65,000, which was about 45% of total spine surgery. Considering the reported incidence rate of vascular injury during lumbar disc surgery, there seems to be larger number of vascular

complications than that we expected. The complication has traditionally been treated by open vascular surgical repair. Recent technological advances in endovascular techniques have changed the management of the vascular complication.

We present a case of a 32-year-old woman who sustained right common iliac artery (CIA) injury during lumbar disc surgery that was successfully treated with an endovascular balloon and a covered stent.

CASE REPORT

A 32-year-old woman with herniation of nucleus pulposus on L4-5 level underwent a partial hemi-laminectomy and discectomy under general anesthesia. The operation was done uneventfully except temporary hypotension (70/50 mmHg) and tachycardia (up to 120/min) for 5 minutes during operation. Vital sign was normalized by volume replacement. The patient was transferred back to general ward postoperatively. In postoperative laboratory tests, her hemoglobin level was dropped to 7.5 mg/dl from pre-operative level of 14 mg/dl. Nevertheless, the patient was hemodynamically stable and had no symptom. Under suspicion of intra-abdominal vascular injury, abdominal

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CT scan was performed immediate postoperatively and showed retroperitoneal hematoma and contrast medium leakage (Fig. 1). Conventional abdominal angiography

revealed right CIA injury and active contrast medium extravasation (Fig. 2A).

Even though her vital sign was stable, we used endovascular balloon occlusion in order to stop bleeding as soon as possible (Fig. 2B, C). We could stop contrast medium extravasation with of balloon occlusion for 1.5 hours (Fig. 2D), and additional balloon occlusion was done for 1.5 hours after 20 minutes of balloon deflation for recirculation. On angiogram at 1 hour after the second balloon occlusion, there was no leakage of contrast medium (Fig. 2E).

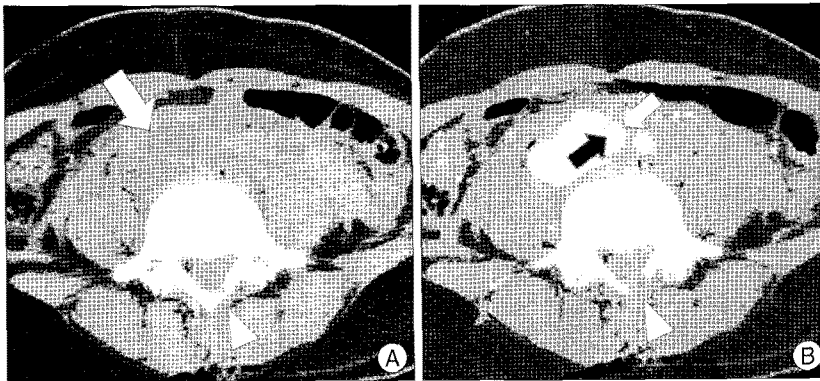


Fig. 1. Immediate postoperative abdominal computed tomography (CT). A : Pre-enhance axial image of abdominal CT scan at the L4 laminectomy site (arrow head) level shows hematoma (white arrow). B : Enhanced axial image at the L4 laminectomy site (arrow head) shows high-density extravasated contrast medium from the injury site (black arrow) of right common iliac artery (white arrow).

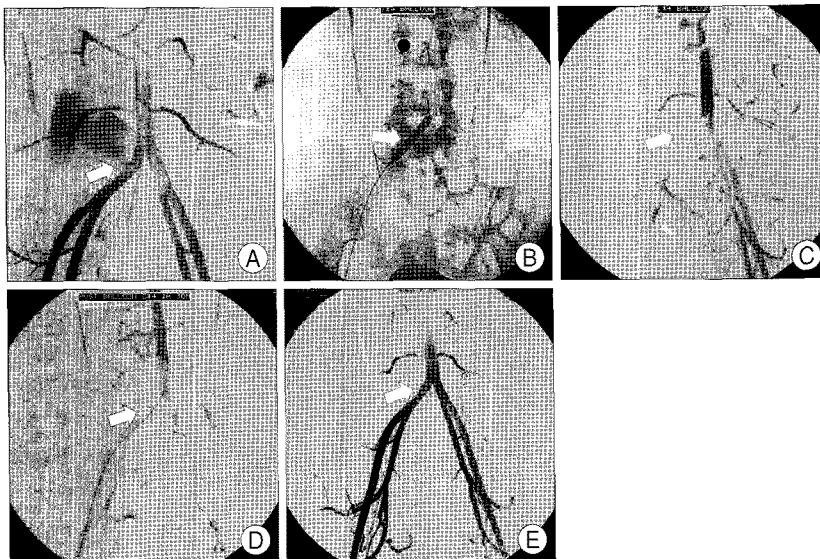


Fig. 2. Balloon occlusion. A : Angiogram shows active extravasation of contrast medium from right common iliac artery (arrow). B : An inflated balloon (arrow) is placed at right common iliac artery. C : Angiogram with balloon inflation shows no leakage of contrast medium (arrow). D : After temporary balloon occlusion for 1.5 hours, angiogram shows no leakage of contrast medium (arrow). E : There is no contrast medium extravasation after 1 hour of balloon deflation.

We had to finish the procedure without stent insertion because we did not have any proper-sized covered stent at that time. Follow-up abdominal CT angiographies were checked at 3 days and 10 days after balloon occlusion. A pseudoaneurysm appeared and enlarged gradually at the injury site (Fig. 3). On 13th day after balloon occlusion, a covered stent (40 mm × 10 mm, graft length 30 mm, Niti-S Vascular Stent, TaeWoong medical Co. Ltd., Seoul, Korea) was placed at right CIA covering from aortic bifurcation to right CIA bifurcation and the pseudoaneurysm was disappeared in the post-stent angiogram (Fig. 4A, B). Follow-up angiogram checked at 1 month after stent insertion showed no evidence of contrast medium extravasation or arterial stenosis (Fig. 4C).

The patient was discharged at 1 week after the endovascular repair with a covered stent. She had taken

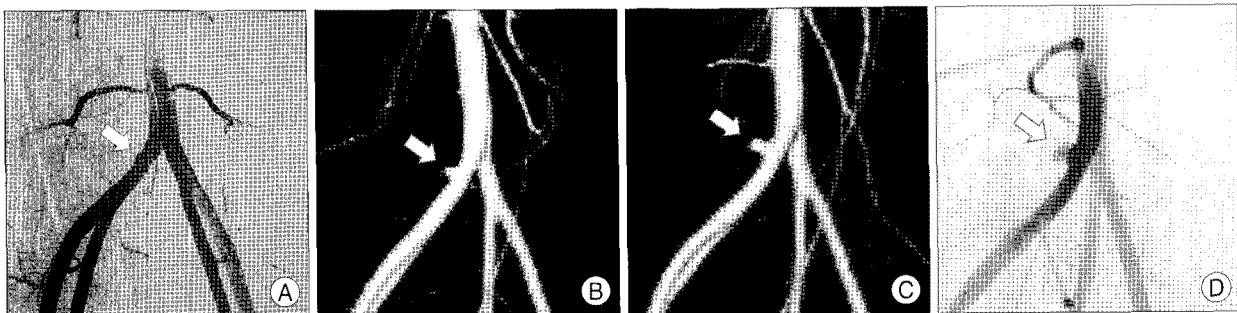


Fig. 3. Change of the pseudoaneurysm after balloon occlusion. Angiograms at immediate (A), 3 days (B), 10 days (C), and 13 days (D) after temporary balloon occlusion show growing pseudoaneurysm (arrow) at right common iliac artery.

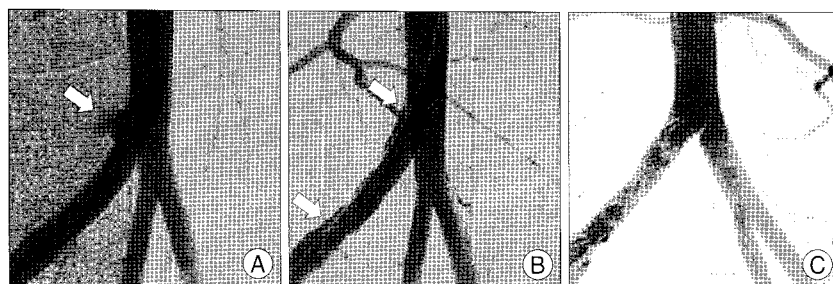


Fig. 4. Endovascular repair with a covered stent. A : A pseudoaneurysm (arrow) at right common iliac artery. B : A covered stent (between arrows) extending from aortic bifurcation to right common iliac artery bifurcation. C : No pseudoaneurysm on follow-up angiogram at 1 month after stent insertion.

aspirin as anti-thrombotic agent for 6 months and followed up for two years without any symptom or sign.

DISCUSSION

Vascular injury as a complication of disc surgery was first reported in 1945 by Linton and White⁷. Some authors reported that the incidence of symptomatic vascular complications ranges from 0.016 to 0.17%^{1,11,12}. However, the true incidence of occurrence is uncertain because many cases might be undetected clinically or not reported.

The intra-abdominal vascular damage has been most frequently reported in L4-5 disc surgery^{3,5}. Arterial lacerations usually present immediately, and represent 30% of vascular injuries¹⁴. The right and left common iliac arteries are the most commonly injured vessels (43% and 29%, respectively). Szolar and associates¹⁵ summarized risk factors for vascular injury during lumbar discectomy as preexisting degenerative disc surgery, retroperitoneal inflammatory processes leading to adhesion between the vessels and the disc, aggressive discectomy, possibly increased intra-abdominal pressure that may force vessels against or close to the disc, and revision discectomy. Other risk factors can be defined such as the weakness of the anterior longitudinal ligament due to chronic disc disease, ventral disc herniation, and unfamiliar environment such as operative table, instruments and position^{3,5,9}.

The high mortality rate is attributed to a combination of rapid blood loss into the retroperitoneal or intraperitoneal space, and the failure to recognize the cause of the deteriorating patient¹⁴. Mortality rate varied from 16% to 100%, depending on the timing of treatment and the type of vascular injuries^{1,4,11-13}. Therefore, early diagnosis and urgent treatment for the patients with vascular injuries are very important.

Intraoperative recognition of vascular injury depends on brisk bleeding or blood welling up in the disc space, and hypotension with associated tachycardia³. Other suspicious findings include finding fat or mucosa in the

pituitary rongeur during discectomy suggestive of retroperitoneal adipose tissue, vessel, or visceral wall³. Notwithstanding, there are no pathognomonic findings. Hemorrhage occurring in the retroperitoneal or peritoneal space may not be observed from the disc space. Blood filling in the disc space due to intra-abdominal vascular injury was reported to be recognized intraoperatively less than 50% of

cases². Young and healthy patients may not develop clinical signs until a large volume of blood has been lost⁸. Moreover, hypotension and tachycardia can be encountered in myocardial infarction, pulmonary emboli and in circulatory collapse developing in connection with anesthesia and this may misled the surgeon and anesthesiologist into being late for exact diagnosis⁹. In this case, transient tachycardia and hypotension were misunderstood as signs related with anesthetic agents. Therefore, intra-abdominal vascular injury should be taken into consideration until final diagnosis is confirmed, especially in the presence of unexplained pulsatile hemorrhage from the disc space, tachycardia and sudden decrease in blood pressure during operation.

If vascular injury is suspected and the patient condition allows, CT with CT angiography is a good first line investigation. Ultrasonography is of value in confirming the presence of intra-abdominal fluid, when it is not appropriate to transfer the patient to a CT scanner. However, the angiography has the advantage of providing definitive arterial anatomy and allows immediate endovascular therapy if feasible. If vascular injury is clinically definite and the patient's vital sign is unstable, blood and fluid replacement must be initiated immediately, and angiography should be done as soon as possible.

Intravascular balloon occlusion would be an effective first step management to control massive bleeding from arterial fistula⁶. However, interventional balloon occlusion and insertion of covered stent are possible only in about 100 hospitals which are about 10% of clinics performing lumbar disc surgery in South Korea according to the data from Health Insurance Review and Assessment Service of Korea. If a simplified kit for intraoperative balloon occlusion under C-arm fluoroscopic exam is developed, it will be helpful to stall bleeding until endovascular treatment with a covered stent or surgical repair are available and will reduce mortality rate.

In this case, fortunately, we had a team including neurosurgeon, vascular surgeon and interventional radiologist, and early diagnosis and proper management were possible.

Although surgical repair is still considered as a definitive treatment modality by many vascular surgeons, interventional endovascular repair has advantages of less invasiveness with high success rate of occluding arterial fistula and unnecessariness of general anesthesia. But, it also had disadvantages of risk of stenosis and embolism, and of requirement of long term anti-thrombotic medication. According to our experience, a temporary balloon occlusion alone seems not to be a definitive treatment modality because of growing pseudoaneurysm after procedure.

CONCLUSION

As a result, the endovascular repair with balloon occlusion and subsequent insertion of a covered stent would be an effective and safe treatment modality in the vascular injury during lumbar disc surgery. Balloon occlusion can stall bleeding for more than several days until proper treatment modalities are available, and would not be a single definitive treatment modality by itself.

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