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Segmental artery injury during transforaminal percutaneous endoscopic lumbar discectomy: Two cases report with literature review

Segmental artery injury during transforaminal PELD

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Abstract

BACKGROUND

Since Kambin can experimentally induce arthroscopy to treat herniated nucleus pulposus, percutaneous endoscopic lumbar discectomy (PELD) has been developed. The branch of the segmental artery around the neural foramen may be damaged during PELD using the transforaminal approach. We report two rare cases in which segmental artery injury that occurred during PELD was treated with emergency embolization.

CASE SUMMARY

In case 1, a 31-year-old man was transferred to our emergency department with left lower quadrant abdominal pain after PELD at a local hospital. On lumbar spine magnetic resonance imaging after the surgery, hematoma of the left retroperitoneal area and the psoas muscle area was founded. Under suspicion of vascular injury, arteriography was performed. Pseudoaneurysm and blood leakage from the left 4th lumbar segmental artery into the abdominal cavity were identified. Emergency transarterial embolization was performed using fibered microcoils for bleeding of segmental artery. In case 2, a 75-year-old woman was transferred to our emergency department with low blood pressure, right flank pain, and drowsy mental status after PELD at a local hospital. When the patient arrived at the emergency room, the measured blood pressure (BP) decreased from 107/55 mmHg to 72/47 mmHg. Low BP persisted. Under suspicion of vessel injury, arteriography was performed and the right 4th lumbar segmental artery rupture was confirmed. Emergency transarterial embolization was performed for bleeding of segmental artery.

CONCLUSION

We were able to find the bleeding focus by angiography and treat the injury of the segmental artery successfully through emergency transarterial embolization.

Key Words: Percutaneous endoscopic lumbar discectomy; Segmental artery injury; Transarterial embolization; Case report

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Core Tip: The branch of the segmental artery around the neural foramen may be damaged during PELD using the transforaminal approach. When segmental artery rupture is suspected, angiography is helpful in finding the bleeding focus, and emergency embolization is considered an effective treatment method. In our two cases, clear bleeding focus was found by angiography and the bleeding was controlled successfully through emergency transarterial embolization.

INTRODUCTION

After endoscope was developed, it began to be actively used in the field of spinal surgery. Since Kambin can experimentally induce arthroscopy to treat herniated nucleus pulposus, percutaneous endoscopic lumbar discectomy (PELD) has been developed.^[1] PELD has several advantages, including less paravertebral muscle injury, preservation of bony structure, and rapid recovery.^[2] On the other hand, surgery-related complications of PELD including dural tear, intervertebral infection, hypoesthesia, bleeding, and recurrence are common.^[1] Lumbar segmental arteries originate from the aorta and mainly distribute on the lateral surface of the vertebrae, forming an extensive arterial network that feeds the nerve root, vertebral body, and associated muscles or extradural structures.^[3] The segmental artery branches into the intercostal branch, muscular branch, and spinal artery near the neural foramen.^[4] Of these, spinal arteries enter the vertebral canal and divide into postcentral, prelaminar, and radicular branches.^[5] The branch of the segmental artery around the neural

foramen may be damaged during PELD using a transforaminal approach. Here we report two rare cases of segmental artery injury during PELD.

CASE PRESENTATION

Imaging examinations

Case 1: On lumbar spine magnetic resonance imaging (MRI) after the surgery, hematoma of the left retroperitoneal area and the psoas muscle area was founded (Figure 1).

Case 2: Computed tomography (CT) scan of the abdomen aorta showed hemorrhage in the right retroperitoneal area without a no clear bleeding focus (Figure 3A-B).

Laboratory examinations

Case 1: When the patient arrived at the emergency room, laboratory investigations revealed low levels of hemoglobin (Hb, 11.9 g/dL, normal range: 14.0~18.0) with low levels of hematocrit (Hct, 35.0 %, normal range: 42.0~52.0). ³White blood cell count was $10.65 \times 10^9/\text{L}$ (normal range: $4.0 \sim 10.0 \times 10^9$) and platelet count was $170 \times 10^9/\text{L}$ (normal range: $150 \sim 450 \times 10^9$). At 2 h after arrival, follow-up laboratory investigations showed a rapidly decreasing trend to Hb 10.0 g/dL and Hct 29.2%.

Coagulation function test: Prothrombin time (PT): 10.3 s (normal range: 9.7~13.3); PT%: 106.1% (normal range: 77~120); international normalized ratio: 0.97 (normal range: 0.88~1.20); activated partial thromboplastin time: 24.9 s (normal range: 23.1~37.3). These results were all within normal ranges.

Case 2: When the patient arrived at the emergency room, laboratory investigations revealed low levels of Hb (9.4 g/dL, normal range: 12.0~16.0) with low levels of Hct (27.5%, normal range: 37.0~47.0). ³White blood cell count was $15.52 \times 10^9/\text{L}$ (normal range: $4.0 \sim 10.0 \times 10^9$) and platelet count was $170 \times 10^9/\text{L}$ (normal range: $150 \sim 450 \times 10^9$).

Coagulation function test: Prothrombin time (PT) : 10.7 s (normal range: 9.7~13.3); PT%: 93.4% (normal range: 77~120); international normalized ratio: 1.03 (normal range:

0.88~1.20); activated partial thromboplastin time: 20.4 s (normal range: 23.1~37.3). These results were all within normal ranges.

Chief complaints

Case 1: A 31-year-old man presented with left lower quadrant abdominal pain after PELD at a local hospital.

Case 2: A 75-year-old woman presented with low blood pressure, right flank pain, and drowsy mental status after PELD at a local hospital.

Physical examination

Case 1: Tenderness in the left lower quadrant area was observed. He had no neurologic deficit.

Case 2: There was no neurologic deficit other than the right flank pain.

2

Personal and family history

Cases 1 and 2: There were no specific family health histories.

2

History of past illness

Case 1: The patient was medically healthy without taking any medications.

Case 2: diabetes mellitus, hypertension, and hyperlipidemia as underlying diseases

History of present illness

Case 1: He was transferred to the emergency department at our hospital 17 h after surgery. When the patient arrived at the emergency room, abdominal pain worsened

Case 2: She was transferred to the emergency department of our hospital at eight hours after the surgery. When the patient arrived at emergency room, the measured BP decreased from 107/55 mmHg to 72/47 mmHg. Her low BP persisted

FINAL DIAGNOSIS

Case 1

Pseudoaneurysm and blood leakage from the left 4th lumbar segmental artery into the abdominal cavity were identified by arteriography (Figure 2A).

Case 2

The right 4th lumbar segmental artery rupture was confirmed by arteriography (Figure 4).

TREATMENT

Case 1 and 2

Emergency transarterial embolization was performed using fibered microcoils for bleeding of segmental artery (Figure 2B).

OUTCOME AND FOLLOW-UP

Case 1

After the embolization, the pain improved. The patient was discharged in a tolerable state in the first week after the procedure.

Case 2

After the procedure, the patient's flank pain improved. Her vital sign was maintained stable. The patient was discharged in a tolerable state on the 4th day after the procedure.

DISCUSSION

PELD can be broadly divided into percutaneous endoscopic transforaminal discectomy (PETD) and percutaneous endoscopic interlaminar discectomy (PEID) with different characteristics and indications depending on the surgical approach.^[6] Huang *et al* revealed that PEID had a shorter operation time, decreased intraoperative blood loss, and lower fluoroscopy times compared with PETD for treating herniation of nucleus pulposus.^[6] PEID approach is familiar to surgeons, with its anatomical orientations involved similar to an open surgery. It has an easier identification of microscopic vision.

However, since the transforaminal approach has different anatomical similarities to an open surgery, it may be difficult to perform the technique. We were able to find a total of 7 cases of vessel injury that occurred during PELD.^[7-10] In particular, in 6 of 7 cases, vessel injury occurred during a transforaminal approach. Our two cases also had a segmental artery injury during transforaminal PELD. The segmental artery branches into the intercostal branch, muscular branch, and spinal artery near the neural foramen. Accordingly, during a transforaminal approach, the guide wire may come close to the branch of the segmental artery, causing injury. During guide wire insertion, before reaching the disc, place the guide tip behind the posterior vertebral line to avoid damage to the segmental artery terminal branch.^[7] In the extraforaminal area, the arterial branches are complex and care must be taken because vascular damage may occur during exploration.^[7] If blood vessel damage is found, hemostasis can be attempted by electrocautery or compressing a gelatin sponge. If bleeding persists even after trying the above method, an artery injury is suspected, and transarterial embolization can be performed as in our case. Complications of transarterial embolization include contrast reaction, vascular injury, and coil migration, but the incidence is known to be low.^[11]

In the literature, symptoms complained by patients with a vessel injury included flank pain and inguinal pain. However, one of our two cases complained of abdominal pain and the other case complained of flank pain. Of the seven cases reported so far, only two cases on which angiography was performed could detect an accurate bleeding focus in a segmental artery. For the other five cases, both CT and MRI were performed. However, no bleeding focus was found because angiography was not performed. Of the five cases where no bleeding focus was found, three cases received conservative treatment and two cases underwent abdominal exploration (Table 1). In our two cases, clear bleeding focus was able to find by angiography and the bleeding was controlled successfully through emergency transarterial embolization. Therefore, when segmental artery rupture is suspected, angiography is helpful in finding the bleeding focus, and emergency embolization is considered an effective treatment method.

CONCLUSION

We report two rare cases of segmental artery injury during transforaminal PELD. We were able to find the bleeding focus by angiography and treat the injury of the segmental artery successfully through emergency transarterial embolization.

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SIMILARITY INDEX

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