

Case Report

Management of Lumbar Artery Injury Related to Pedicle Screw Insertion

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We report on 2 patients who experienced injury to one of their lumbar arteries related to pedicle screw misplacement. In this report, the lumbar pedicle screw holes were made laterally with resultant injury to the lumbar artery. During surgery, arterial bleeding was controlled with pressure and gauze; however, the patients experienced vital shock after surgery. Vital shock ensued and they were rescued by catheter embolization. If patients receiving lumbar instrumentation surgery experience severe anemia or vital shock postoperatively, the surgeon should assume lumbar artery injury as a differential diagnosis.

Key words: catheter embolization, complication, lumbar artery injury, pedicle screw

Although vascular injuries during lumbar spinal surgery are uncommon, they are serious complications. There have been several case reports presented by spine surgeons, cardiovascular surgeons and radiologists [1–3]. Several authors have reported injuries to the abdominal aorta, common iliac artery, inferior vena cava and common iliac vein that were related to posterior discectomy [4, 5], pedicle screw insertion [2] and anterior or direct lateral approaches [6]. Lumbar artery injury is also a serious complication [2, 6–9]. Bleeding from a lumbar artery secondary to pedicle screw misplacement is an extremely rare but life-threatening complication and requires prompt diagnosis and treatment [2]. It may be overlooked during surgery, and patients experience vital shock and hemoglobin drop postoperatively [2].

In the current report with 2 cases, we describe the

clinical course of 2 patients who experienced injury to one of their lumbar arteries related to pedicle screw misplacement. Vital shock ensued and they were rescued by catheter embolization. Informed consent was granted by both patients and their families for collection and publication of data. We stress the importance of knowing how to manage this complication, should it occur.

Case Reports

Case 1. A 65-year-old man slid down a mountain slope, resulting in an L1 burst fracture and cauda equina syndrome with incomplete paraplegia. Reconstructed CT showed the L1 burst fracture without injury to the posterior elements. Preoperative CT did not show lumbar arterial bleeding.

The next day, the patient underwent lumbar posterolateral fusion from Th12 to L2 using pedicle screw fixation. We inserted pedicle screws by the free hand technique, and just after tapping on the right side of

L2, we saw profuse bright red blood flowing from the base of the L2 transverse process. We were able to stop the bleeding with pressure and gauze, but there was intraoperative blood loss of 600ml. The pedicle screw was inserted at the proper trajectory. Two days after surgery, the patient's hemoglobin had dropped from the preoperative level of 14.0g/dl to 6.4g/dl (Fig. 1) An emergency contrast-enhanced CT showed a large hematoma at the right psoas muscle with active extravasation (Fig. 2). The radiologist advanced a catheter into the second right lumbar artery (Fig. 3) and performed a selective angiogram and embolization with microcoils of the second right lumbar artery.

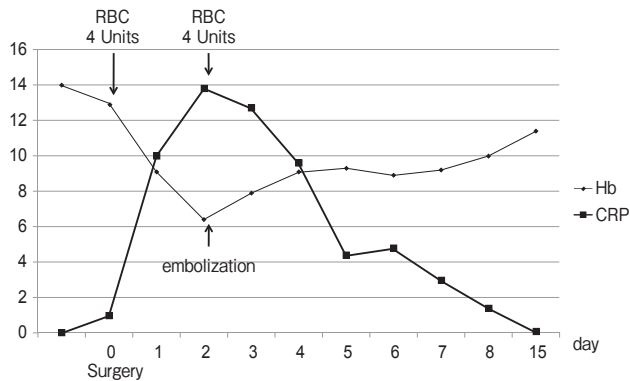


Fig. 1 Laboratory data of Case 1. RBC, red blood cell transfusion; Hb, hemoglobin; CRP, C-reactive protein.

This procedure effectively controlled the bleeding.

Case 2. An 82-year-old man had degenerative spondylolisthesis at L4/5 and intermittent claudication. The patient underwent posterior lumbar interbody fusion at L4/5 using pedicle screws. Intraoperative radiographs showed the left L4 screw was placed laterally, and we removed it (Fig. 4). Just after removal, arterial bleeding was encountered from the screw hole. We were able to stop the bleeding with pressure and gauze; there was resultant blood loss during surgery of 420ml. The pedicle screw was

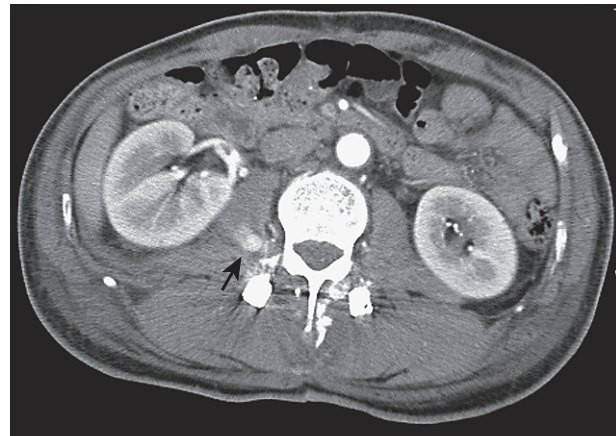


Fig. 2 Contrast enhanced CT. An emergency contrast enhanced CT showed a large hematoma at the right psoas muscle with active extravasation (black arrow).

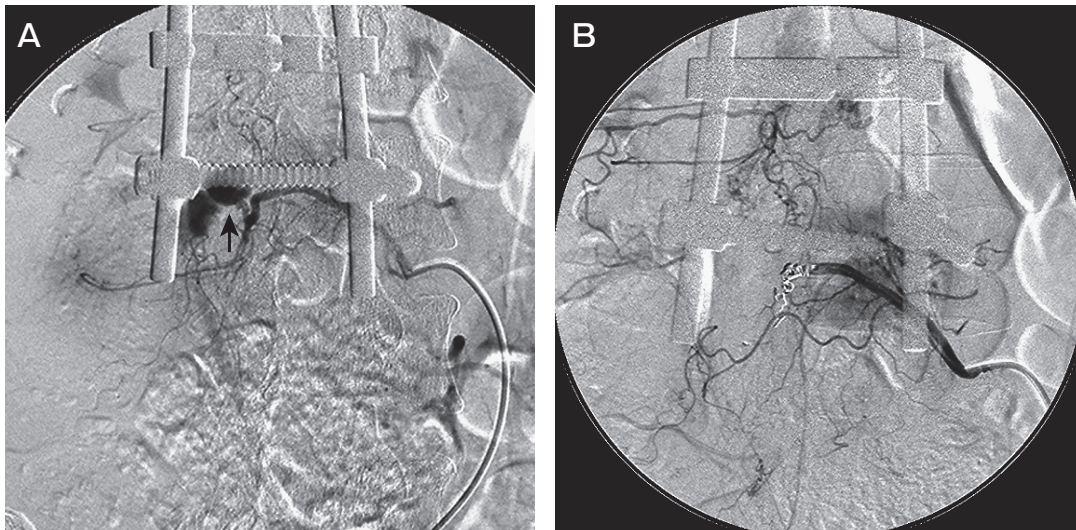


Fig. 3 A selective angiogram and embolization. A, catheter angiogram showed active extravasation (black arrow); B, post embolization.

placed at the proper trajectory. After surgery, abdominal CT showed lumbar arterial bleeding and intramuscular hemorrhage. We did not perform catheter embolization because the hemoglobin drop was slow, and bleeding was controlled with continued blood infusion (Fig. 5). One week after surgery, the patient started experiencing atrial fibrillation. The cardiologist administered heparin (12,000 U per day) and the patient's hemoglobin dropped again. Enhanced

CT showed an enlarged hematoma at his left psoas muscle. We performed a selective angiogram and embolization with microcoils of the fourth left lumbar artery. This procedure controlled the bleeding.

Discussion

Lumbar artery injury related to surgery is an extremely rare but serious complication. Several authors have reported lumbar artery injury secondary to pedicle screw insertion and discectomy [2, 7-9]. According to a cadaveric study of the lumbar artery and its branches (dorsal branch, spinal branch and ganglionic branch), the first 4 lumbar arteries originate from the iliolumbar artery or medial sacral artery [10]. Clinical manifestations of a lacerated vessel include hypotension, hemoglobin drop, and abdominal pain and distension. Enhanced CT is a useful diagnostic tool for detecting lumbar arterial bleeding and hematoma in the psoas muscle; the patient sometime is in a psoas-relaxed position.

It was difficult to repair the bleeding vessel during posterior approach surgery. Traditionally, lumbar artery injury has been managed by emergent exploratory laparotomy and direct repair of the bleeding vessel. However, this approach is associated with increased risks due to the need for a second operative site and position change [9]. Recently, selective embolization has been recommended as the first-line treatment method for iatrogenic lumbar arterial bleeding [2, 3, 5, 8, 9]. If the patient is hemodynamically stable after fluid resuscitation and transfusion, the next step should be a contrast enhanced abdominal CT and angiography to evaluate the bleeding site and treatment [2]. Karaikovic *et al.* reported on the successful use of coil embolization of a lumbar artery to control vascular injury during intradiscal surgery [9].

The detection time of arterial injuries in spinal surgery can be divided into 3 groups: intraoperative, immediate postoperative and late postoperative [8, 9]. In this report, the lumbar pedicle screw holes were made laterally with resultant injury to the lumbar artery. During surgery, arterial bleeding was controlled with pressure and gauze; however, the patients experienced vital shock after surgery. Sandri *et al.* reported on lumbar pedicle misplacement during a scoliosis surgery [2]; 5h postoperatively, the patient suffered a hypotensive attack and her abdomen had

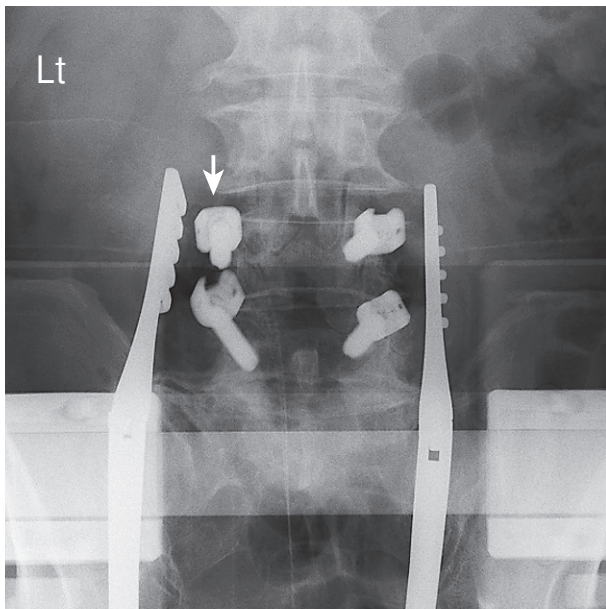


Fig. 4 Intraoperative radiograph. The left L4 screw was placed laterally (white arrow), and we removed it.

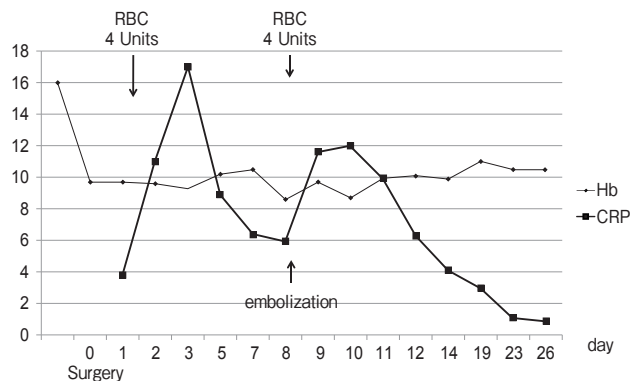


Fig. 5 Laboratory data of Case 2. RBC, red blood cell transfusion; Hb, hemoglobin; CRP, C-reactive protein.

become distended [2]. If we observe arterial bleeding from the screw hole, it is very important to assess the postoperative CT immediately. We should consult a radiologist while vital signs are still stable. Treatment after the patient has had severe anemia or vital shock could be too late. The clinical course of these patients shows that postoperative hemoglobin drop may occur even if intraoperative bleeding is controlled. To avoid pedicle screw lateral perforation, it could be useful to use a navigation system.

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