

Left İliac Artery Pseudoaneurysm Mimicking Urinary Infection Findings, During Lumbar Discectomy: Case Report Literature Review and Vascular Injury Classification with Surgical Experience

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Abstract

Objective: To share experience on the mechanism, diagnosis and management of vascular injury, one of the complications of lumbar discectomy, and to review the literature in order to prevent this complication.

Materials and methods: Due to risky surgical manipulation during lumbar microdiscectomy operation, the patient was followed up and treated closely. Vascular injury types in lumbar discectomy were classified by analyzing publications that included sharing of surgical experience.

Results: During L4-5 right microdiscectomy, it was felt that the tissue held by the pituitary rongeur was harder and stronger than the disc, mobilized by pulling, and vibrating. On the other hand, it was noticed that the device had penetrated more than 2.5 cm and it was suspected that it had passed into the prevertebral area. Laceration findings did not develop. The patient, who was normal in the postoperative period, was examined further, although there were signs of urinary infection. Contrast-enhanced lumbar MRI and abdominal USG were requested in the patient who did not have any complaints when the urinary infection was treated. On the 28th postoperative day, vascular injury was detected by USG and lumbar MRI, and cardiovascular surgery consultation was requested. Contrast-enhanced abdominal CT angiography was performed and iliac artery pseudoaneurysm was detected and repaired with ilio-iliac bypass.

Discussion: The complication of vascular injury during lumbar discectomy can be basically divided into two types; It was concluded that it can be classified as 1-Bottomless pit type direct vascular injury

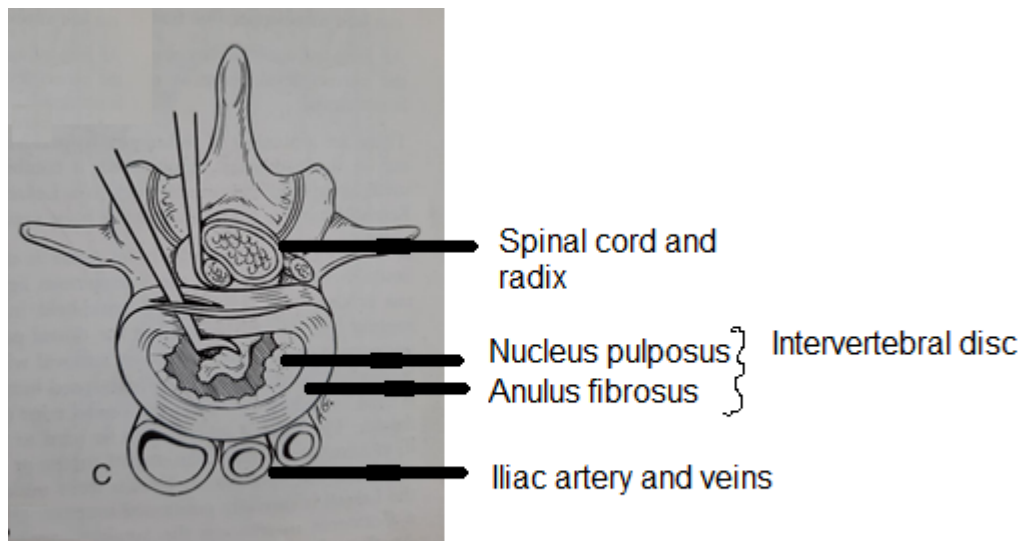
and 2-Indirect vascular injury due to adhesions. It was concluded that a more detailed description of the surgical technique with further investigations is needed to avoid these two types of injury.

Conclusion: It was concluded that considering unbleeded pseudoaneurysm as a silent complication during lumbar discectomy and investigating it with imaging methods in suspected cases can prevent mortality and morbidity.

Keywords: Vascular injury as a complication of lumbar microdiscectomy; Iliac artery pseudoaneurysm; Anterior longitudinal ligament tear; Anterior annular tear; Lumbar disc anterior herniation; Peridiscal fibrosis

Introduction

There is a risk of vascular injury in lumbar discectomy operations. Common iliac artery injuries are most common [1]. The most important reason for this is; Discectomy has to be performed invisible through a small incision made in the incision made in the Posterior Longitudinal Ligament (PLL) by entering the intervertebral disc with a surgical instrument (Figure 1) [2]. Previously, May et al. [3] emphasized the importance of performing the disc surgery without seeing due to its nature in vascular injury.

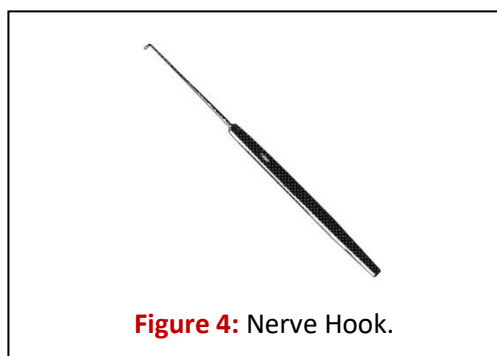
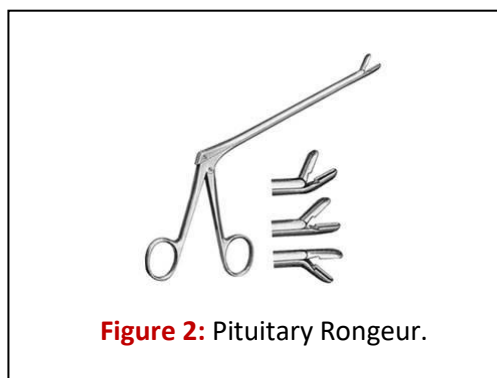


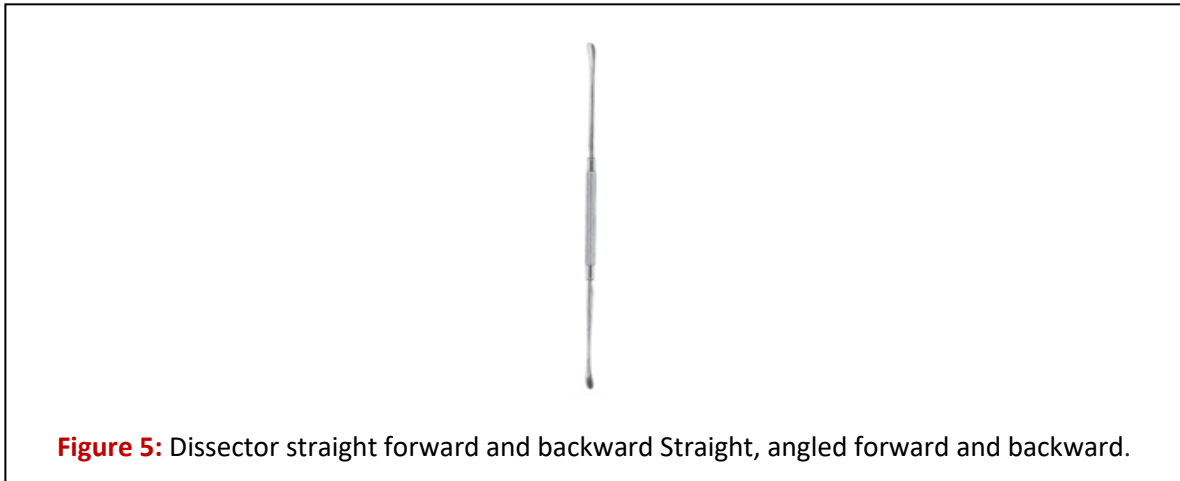
Atlas of Spine Surgery
Winter, Lonstein, Denis, Smith
WB Saunders 1995

Figure1: Lumbar discectomy without seeing through a small incision. Published with permission of Atlas of spine surgery [2].

In the anatomical study, it was determined that the distance between the anterior wall of the disc and the iliac vessels was usually less than 5 mm [4]. For this reason, the rule that surgical instruments should enter a maximum of 2.5 cm from the incision in the PLL has been defined [5,6]. During the discectomy maneuvers, it is checked that this rule is followed at any time, and passing into the retroperitoneal (Prevertebral) area is avoided [5]. Generally, discectomy is terminated by encountering intact disc tissue at a depth of far less than 2.5 cm. Loose, semi-free nucleus pulposus and annulus fibrosus fragments that may later herniate and present in the

intervertebral disc are released and removed as much as possible [5]. While maneuvering the pituitary rongeur (punch) (Figure 2), curette (Figure 3), nerve hook (Figure 4) or dissector (Figure 5) in an area of 2.5 cm during discectomy, great vessel, ureter or bowel injury may occur. can cause mortality and morbidity. Despite observing the 2.5 cm rule, Vascular and visceral injury may occur in the presence of adhesions in the intervertebral disc to the surrounding tissues [6] or in the presence of fissures in chronic disc degeneration [7] While Lumbar discectomy without seeing, often the surgeon is unaware of the vascular/visceral injury. It can also occur in highly experienced surgeons [8]. So legally this case was published in 1997 by Thomson V Lochert. Violation of ALL/AAF and the development of vascular or intra-abdominal organ injury in lumbar disc surgery are not spontaneously/naturally neglected. It was declared that for this type of event, “res ipsa loquitur” (tort) and the operating field theory could not be ruled. In order to argue that this event is negligence, it is necessary to prove that the surgeon violated the standard treatment principles or neglected the technique [8,9].





Vascular injury in lumbar disc surgery; Sudden blood loss such as laceration and life-threatening; It may present as a pseudoaneurysm or Arteriovenous Fistula (AVF) in the late period or even after years of silence. Pseudoaneurysm may present with hypovolemic shock as a result of sudden perforation, AVF systemic or regional vascular overload findings [10,11]. In this study, the case of left iliac artery injury and silent pseudoaneurysm that developed during L4-5 right microdiscectomy will be analyzed in terms of neurosurgical technique, and a literature review will be made in terms of its contribution to surgical technique. The treatment of vascular injury will not be discussed in this study.

Inamasu J [12] concluded that with a better understanding of the mechanism of how and when this injury occurs, its frequency can be reduced, and mortality and morbidity can be reduced with effective management.

Material and Method

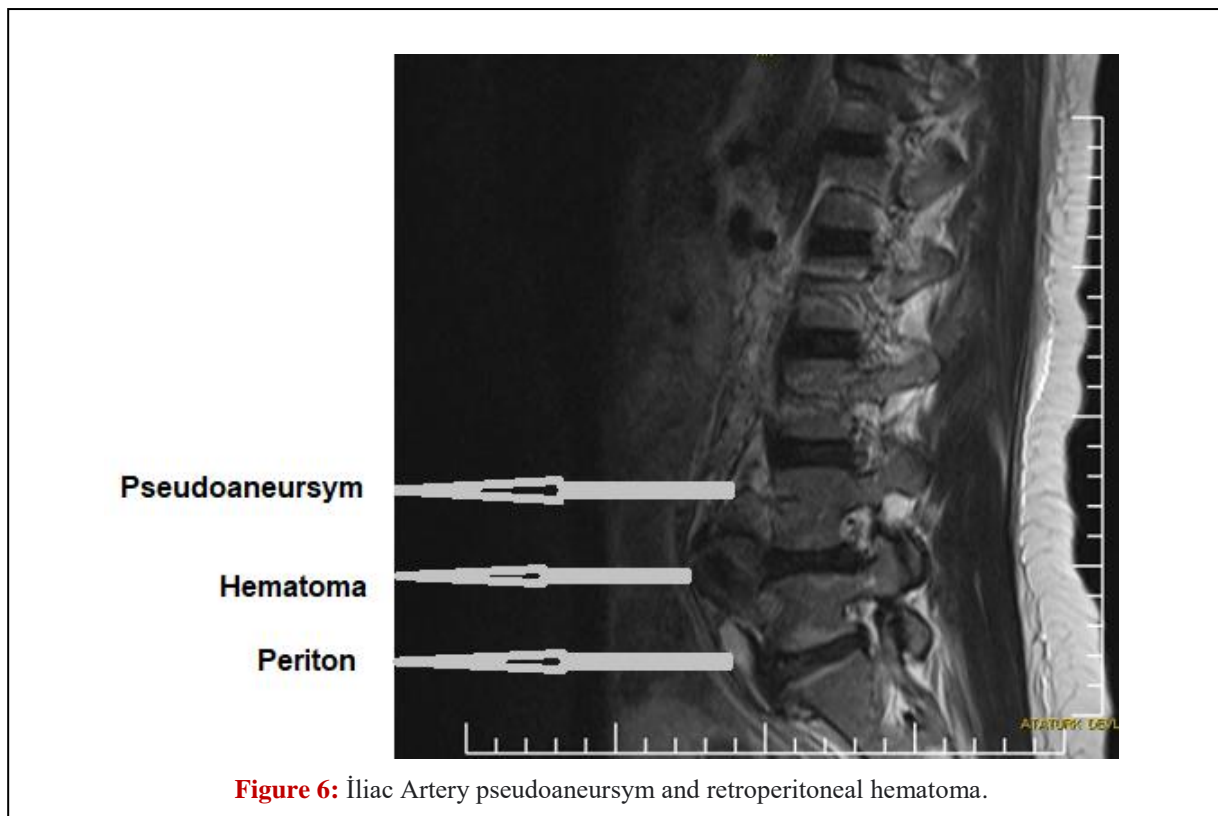
During the lumbar microdiscectomy operation, the patient was followed closely in terms of vascular injury due to risky surgical manipulation. Vascular injury was detected and CVC consultation and operation was organized. “How can the complication of vascular injury in lumbar discectomy be prevented?” literature was searched with the approach. Vascular injury types in lumbar discectomy were classified by analyzing publications that included sharing of surgical experience. The treatment of vascular injury will not be discussed in this study.

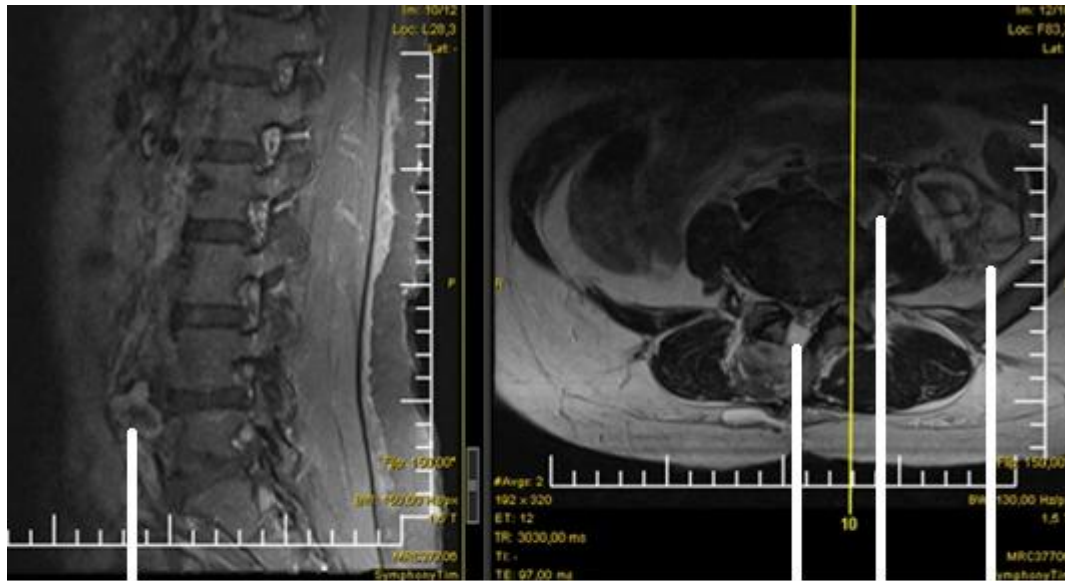
Case Presentation

During L4-5 right lumbar microdiscectomy operation, after removing extruded and degenerated disc parts with punch (pituitary rongeur) in a 38-year-old female patient with low back and right leg pain that did not respond to medical treatment for 3 years, I encountered a space with loose tissue clumps in the disc distance. I perceived them as disc parts that need to be removed so that there is no recurrence of hernia. When I realized that the tissue, I held with the pituitary rongeur was harder than the disc and moved slightly when pulled, I tried to perceive this different structure by staying still, I felt vibration at the tip of the pituitary rongeur. “I suspected I might have punched a large vein. On the other hand, I looked at the size of the pituitary rongeur outside the disc distance, and I guessed that the punch had entered 4-5 cm from the incision in the PLL. While it should not be more than 2.5 cm to the disc distance with Punch, I exceeded this limit. I thought I might be biting a vein with the punch. Without moving the pituitary rongeur, I loosened the tip, opened it slowly and pulled back slightly, then removed it completely. There was no bleeding from a distance, there was no change in blood pressure, I

ended the operation. Due to my risky use of surgical instruments, I decided to follow the patient closely. The patient woke up well postoperatively, his vital signs and neurological examination were normal when I saw him in the ward. He was happy that his leg pain was gone, but I noticed that his skin color was slightly pale. Control Hb: 7.5 gr/dl was detected. Preop Hb was 12 g/dl. There was a loss of 4.5 g/dl. There was no abnormal bleeding during the operation. This was a suspicious decrease in Hb, but after 2 UPS administration, Hb was detected as 10.5 g/dl and remained stable thereafter. I discharged the patient on the 3rd postoperative day after his general condition was good. When the patient came to the control on the 10th day, he complained of pain in the left groin and in front of the left thigh, which started after the operation and lasted from time to time, and was relieved by taking painkillers. I requested blood and urinalysis and Lumbar MRI with contrast. I found high leukocytes in the urine and consulted with the infectious diseases doctor. I asked the patient to inform her by phone whether the pain would continue or not. Infectious diseases doctor started antibiotherapy for urinary infection and requested urinary USG. One week later, the patient reported that his complaints decreased with the treatment, but she had occasional left groin and left lower quadrant abdominal pain, which resolved in a short time. I decided to wait for MRI and USG.

On the 28th postoperative day, the patient called by phone and informed that the USG result was obtained and sent the report to me. Abdominal USG of the patient, "retroperitoneal abscess?" was reported as. I immediately thought of a major artery injury and asked her to come to the hospital. When I saw the patient at the hospital, she said that he was doing quite well, that he was no longer in pain. I've also seen a contrast-enhanced Lumbar MRI taken in the hospital system and reported as "normal postoperative changes". However, when I examined the image, it was seen that the L4-5 level was in the prevertebral area, the sacular lesion of heterogeneous intensity and the peritoneum were pushed due to this (Figure 6).





Pseudoaneurysm on the iliac artery

Laminectomy Pseudoaneurysm on the iliac artery and hematoma

Figure 7: Postoperative Day 28 L4-5 right discectomy and left iliac artery pseudoaneurysm and retroperitoneal hematoma.

I consulted the cardiovascular surgeon with the preliminary diagnosis of left iliac artery injury. Contrast-enhanced Thorax and Abdominal CT Angiography requested. A 12 mm pseudoaneurysm was detected in the left common iliac artery and a 7x3 cm hematoma was detected adjacent to the psoas (**Figure 7**). On the same day, the patient was operated by a cardiovascular surgeon, the hematoma was evacuated, and ilio-iliac bypass was performed with a PTFE synthetic graft. Postop abdominal CT angiography showed normal flow (**Figure 8 and 9**). The patient's left abdominal and groin pains disappeared and he was discharged on the 4th day. During the operation, we saw the pseudoaneurysm in the excised iliac artery segment, when we incised the pseudoaneurysm sac, we saw the injury area about 4 mm in diameter. The dilated and thinned artery wall from this injury area formed the pseudoaneurysm sac.

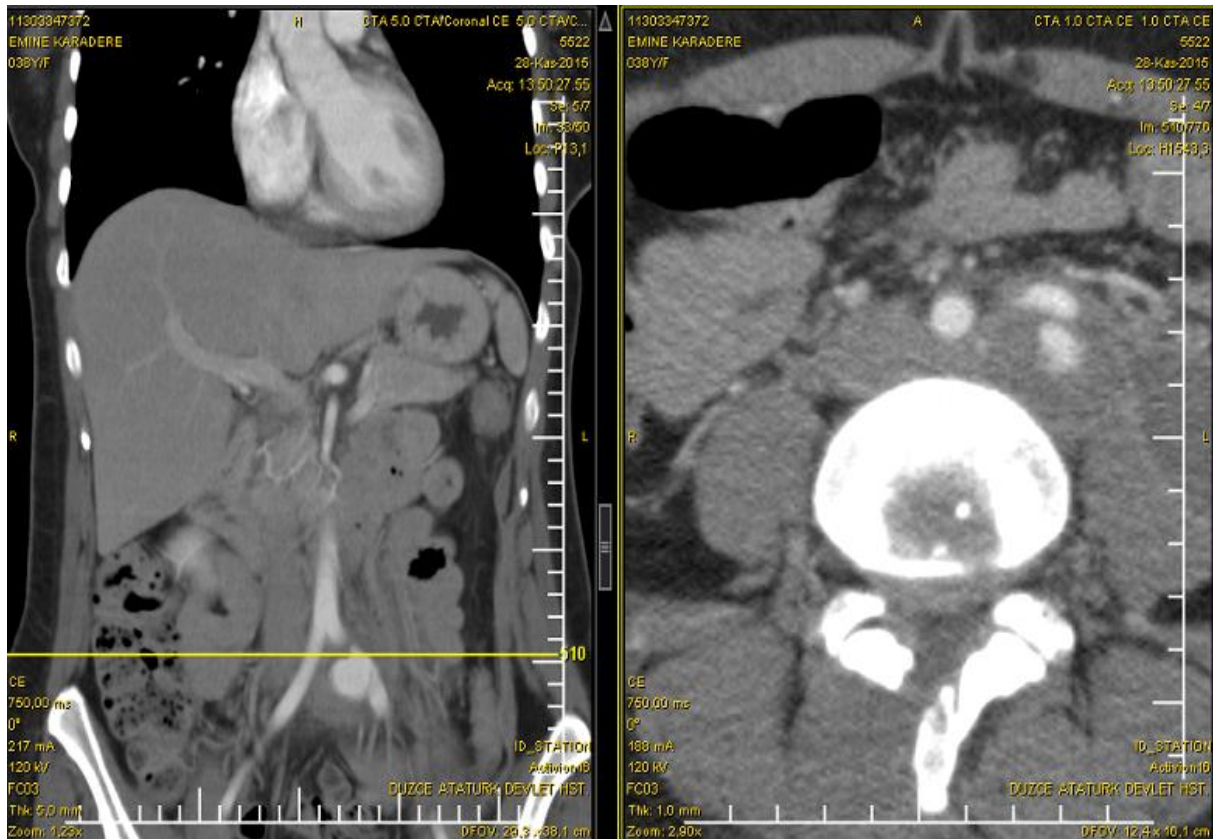
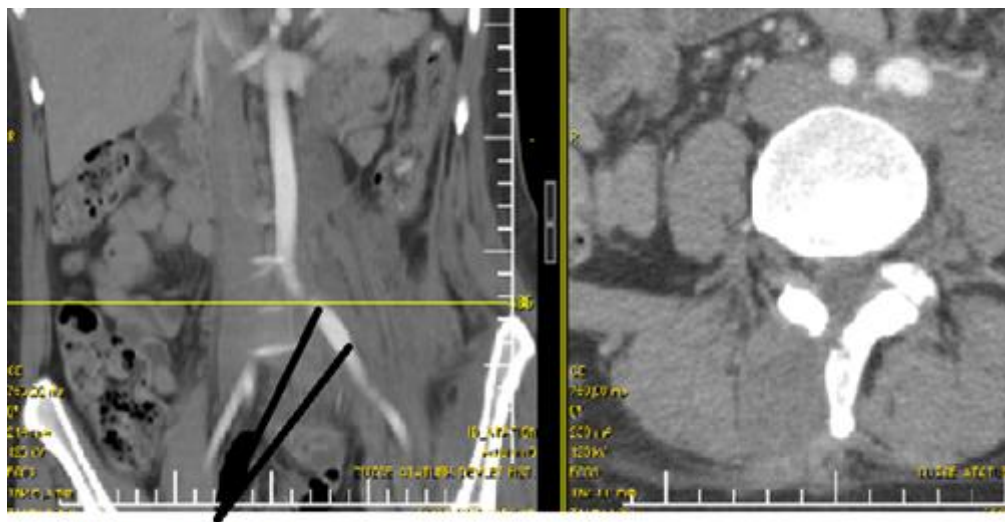


Figure 8: Abdominal CT angiography L4-5 level right laminectomy left iliac artery pseudoaneurysm.

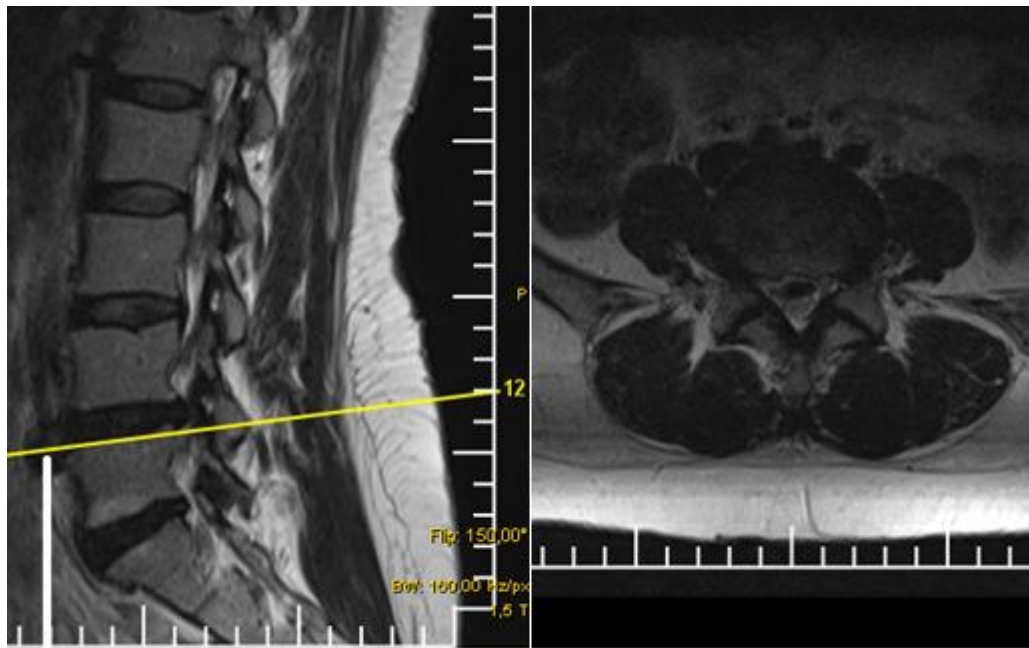


iliioiliac by pass with synthetic graft

Figure 9: Postop abdominal CT angiography Iliioiliac bypass with synthetic graft was performed by the cardiovascular surgeon.

Conclusions: I concluded that the left iliac artery was the tissue that I grasped with the pituitary rongeur during the operation and was slightly mobilized by pulling, which was stiff and vibrating compared to the disc. (There was a non-full-thickness injury). As a result of grabbing and releasing the left iliac artery with a punch, a 4 mm

diameter incomplete-thickness injury had occurred, causing bleeding in the form of leakage and pseudoaneurysm in the process. The hematoma caused findings that mimicked urinary infection by compression of the ureter, and the findings were diluted and relieved as the hematoma resorbed. Leukocyturia masked the picture. The small pseudoaneurysm was asymptomatic. Abdominal USG or lumbar MRI could have provided an earlier diagnosis when I detected a lower hemoglobin level than expected postoperatively. When I retrospectively reviewed the preop lumbar MRI, I found an anteriorly extruded disc herniation in the L4-5 intervertebral disc (**Figure 10**). Therefore, the anterior annulus was torn and the ALL was thin or torn. Therefore, I went deeper into the prevertebral area without encountering resistance and unnoticed.



Anterior herniation at L4-5 disc level

Figure 10: Preoperative MR imaging L4-5 shows anterior longitudinal ligament defect and anterior herniation. It was concluded that this situation should be considered as a predisposing factor for vascular injury.

Discussion

The frequency of vascular injury during lumbar discectomy has been reported in a wide range, ranging from 1/1000 to 1.6/10,000(10) (0.1%-0.016%) [11]. These rates do not include those with recurrent surgeries, concomitant spinal stenosis, additional pathology such as spondylolisthesis, and those who have undergone more than 2 levels of discectomy [11]. However, it has been reported that the risk is higher in these cases [1,5,6,8]. Inamasu et al. [12] In 2006; He found that the frequency of this complication has not changed for more than 50 years. In the joint declaration of neurosurgery and spinal surgery professional organizations (SBNS (the Society of British Neurosurgeons) and BASS (British Association of Spine Surgeons)) sent to the members in 2017, in United Kingdom. They reported the frequency of vascular injury in lumbar discectomy as 1 in 4000 (13,14). So, 2.5/10,000 (0.025%). Thus, it can be concluded that the frequency of vascular injury in lumbar discectomy has not changed for more than 75 years since 1945. In addition, many researchers have reported their predictions that it is much more common than reported [5,12,15,16]. It is surprising that the frequency of vascular injury has not

decreased despite the opportunities provided by the microscope, with the introduction of MRI and CTI in this long period of time, providing the opportunity to evaluate the disc and adjacent structures preoperatively. It is observed that case reports and clinical studies from the fields of neurosurgery and orthopedics performing lumbar discectomy operations are very few, and even these studies do not discuss the surgical technique, they focus on the management of complications [17,18]. In parallel with this determination, Fruhwirth J [19]. In their study, which they shared from the field of cardiovascular surgery, it was determined that only a few isolated cases have been reported for this unusual rare complication following disc surgery, and that there is no data on this subject. De Saussure RL reported that one or two cases were reported 75 years ago from the field of neurosurgery, which is much more than was thought and estimated that it was not reported [5]. It was found that the subject of vascular injury during lumbar discectomy was not included in books like publications. It was determined that there were 4 lines in 455 pages in the Spinal Surgery Manual [20], 2 lines in the 1781 pages in the Neurosurgery Handbook [21], and 10 lines in the 424 pages in the Spinal Surgery Atlas [2]. On the other hand, it is observed that publications from the fields of anesthesia and reanimation, radiology, and emergency medicine, especially cardiovascular surgery, naturally concentrate on the treatment and effective management of vascular injury [1,18,19]. In this study, it was determined that vascular and visceral injury avoidance techniques during lumbar discectomy were transferred almost entirely within the master-apprentice relationship, were not discussed in the publications, were not explained in the books, and were not included in the training program. It was concluded that the lack of development of techniques to avoid this complication is an important shortcoming.

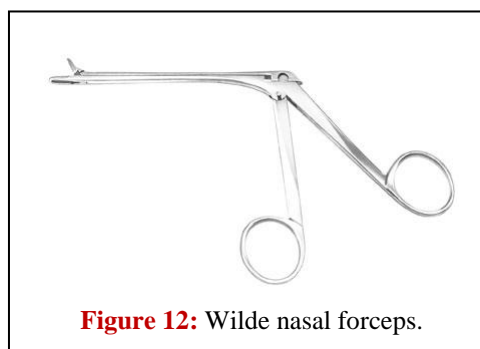
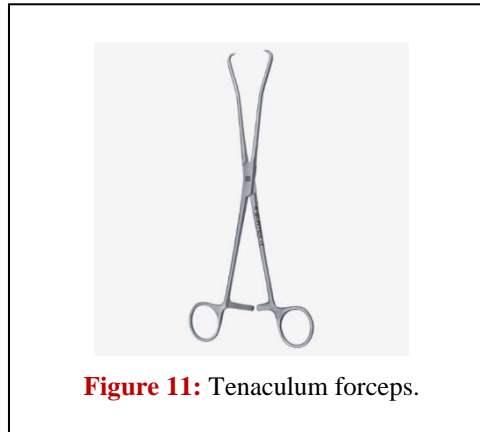
To discuss the surgical technique, going back to the beginning; The articles were reviewed chronologically for their contribution to surgical technique:

In 1948, Holscher EC stated, “In a case where you are trying hard to prevent vascular injury, it is an accident.” he was saying [22]. “When palpating the anterior annulus fibrosus with a closed-ended pituitary ronger, unexpectedly, the surgical instrument slipped in very easily, and artery and vein injury occurred,” he said [22]. In 1952, Cloward R.B. A discogram was performed for the patient who had sustained low back pain for 1 year after the trauma and whose myelography was negative (no disc herniation was detected). He detected anteriorly extruded disc herniation and tear of anterior annulus fibrosus in L5-S1. Using the vertebral spreader he developed during the surgery, he visualized and emptied the entire disc, and he found that the anterior longitudinal ligament was thinned and loosened, but not torn. He concluded that anterior disc herniation may be much more common than previously thought, and may even be more common than posterior herniation. He also cited studies that reached the same conclusions. He stated that discectomy would not yield any results in these patients and recommended radical discectomy and fusion with autogenous graft [23].

In 1953, when Leavens ME and Bradford FK L4-5 lifted a large extruded disc piece with the pituitary rongeur with the right approach, they found that the disc piece escaped from the tear in the posterior ligament with little pressure towards the intervertebral space, and went further in the distance. In this case, they thought that the extruded part went to the defect in the anterior annulus fibrosus, and they gave an opaque material without applying internal pressure, performed a limited discectomy around the posterior annular defect, and detected that the opaque material was visible in the retroperitoneal area when they took an X-ray. Thus, they found that the anterior annulus fibrosus and anterior longitudinal ligament were previously torn [24].

In 1959, De Saussure RL reported 106 cases of vascular injury occurred during lumbar disc surgery, as a result of the questionnaire data answered by 3000 physicians (neurosurgeons and orthopedists) in the USA. De

Saussure said that he believes this is not true, although the survey often concluded that this complication develops during limited discectomy, emphasizing that "vascular injury occurs every time the greatest effort is made to remove the nucleus pulposus and annulus fibrosus." He stated that he believed that the disc distance can only be scraped from beginning to end with the greatest possible precaution, and suggested using tenaculum forceps (Figure 6) to remove loose parts, because he emphasized that non-loose parts cannot be loosened with this tool. He reported that he believed that vascular injury could be avoided by using only pituitary forceps (Figure 2) and tenaculum forceps and using the curette with minimal use (Figure 3) in removing loose parts. As a result of the survey, he reported that vascular injury occurred mostly when using pituitary rongeur [5].



De Saussure RL conducted this survey at the request of the Harvey Cushing Society, and its results were announced during the 1959 symposium. De Saussure RL added to his article the two presentations from this symposium: Semmes E, while removing the herniated disc part, it is necessary to remove the disc parts that may herniate or extrude after a while, this is completely and safely with a curette; reported that it could be done by creating a space between the bony surfaces of the vertebrae and leaving a horseshoe-shaped annulus [5,16]. He emphasized that when working with the curette, it should be used systematically with the bowl of the curette facing the bony surface of the vertebra to avoid possible anterior or lateral annular tear. He reported that disc fragments still partially attached to the annulus can be removed by loosening the curette in this way and using a Wilde (Figure 12) or blunt tenaculum forceps (Figure 11). Semmes E emphasized that it should not be a rongeur type instrument, as it can grab and bite the veins when the surgical instrument goes towards the ALL. He reported that this was the case in almost all reported injuries. He reported that the only case in their series was when the anterior disc fragment was removed with a sharp (toothed) pituitary rongeur [5]. Bradford F. K. reported that it is a habit to be constantly aware of the depth of the surgical instrument in the intervertebral disc,

and he can advise everyone to do so. It should be noted that if the surgical instrument passes through the AAF/ALL many times, there is no bad result if the biting movement is not performed, and if the surgical instrument freely penetrates more than 2.5-3 cm from the posterior annulus, absolutely no biting or manipulation should be done. reported. Anterior annular tear; He stated that in some specimens it was not performed with surgical instruments but was pre-existing, so he never made radical maneuvers within the disc. In this case, he reported that we may not realize that we are in the prevertebral area, feeling as if we are removing a disc from a part of the anterior annulus fibrosus by passing very easily to the prevertebral area with a surgical instrument [5]. In 1962, Taylor H. If there is damage to the anterior wall of the disc annulus due to disc degeneration, this situation; He reported that the aorta, inferior vena cava and common iliac vessels may be responsible for the injury, in this case, there is a bottomless disc cavity and a discectomy limited with rongeur forceps should be performed. He reported that if surgeons trusted the annulus, they could capture and tear one or two large vessels instead of widening the margins of the disc they drained, and in many cases, this was the case [25]. In 1968, Holscher EC reported that 25 years after the case reported in 1943, the Surgeon expressed astonishment that "The disc distance has no bottom". He suggested avoiding depth checking with the instrument [26]. In 1969, Birkeland IW stated that the Pituitary rongeur should be used with extreme caution. When it enters the disc distance of the pituitary rongeur; He emphasized that his jaw should be opened immediately before moving forward, and that it is more difficult for the rongeur with an open jaw to move towards the ALL, compared to a device with a closed jaw. He stated that "the case of the pituitary rongeur slipping towards the ALL during disc evacuation is encountered without vascular injury and this is not uncommon [27]. Shevlin WA in 1973 [28] While performing the L4-5 discectomy, he noticed that the flat pituitary rongeur had suddenly shifted to an unexpected depth. He immediately retracted the pituitary rongeur without making any gripping operations. He suspected that the anterior longitudinal ligament was torn, and when he filled the disc space with saline, he saw that it emptied immediately, and he repeated the same procedure three times, and got the same result 10 min. Then, sudden hypotension and tachycardia developed. Despite rapid vascular repair, the patient died. He reported that when in doubt, it can be easily determined whether the AAF/ALL is torn or not with this test. In 1995, Bolesta MJ [6] He reported that when the dura, roots and posterior longitudinal ligament are adhered to, although he has not undergone surgery, this adhesion should also be expected between AAF/ALL and vascular structures. He attributed this to chronic inflammation. In patients whose complaints persist for a long time, due to chronic inflammation; Adhesions formed in both disc anterior and disc posterior; Described as Peridiscal Fibrosis. In the presence of these adhesions, He emphasized that even though surgical instruments do not penetrate more than 2.5 cm into the disc during discectomy, vascular injury may occur, semi-free parts should not be pulled with a rongeur, and recommended limited discectomy [6]. In 1998, Goodkin R. In his series of 21 cases compiled from forensic medicine documents, he presented the death or disability resulting from this complication and the conditions under which the lawsuits resulted in reconciliation or criminal convictions [8], and he made the pressure of this subject on surgeons felt deeply. Canale DJ suggested simply performing the depth sounding maneuver at the beginning of the surgery with the jaw-closed pituitary rongeur. He reported that the refocusable microscope allows this, and if the instrument suddenly dives 1 cm or deeper, it is an indication that the retroperitoneal space has been passed. He emphasized that with this maneuver, it can be understood that the anterior annulus and ALL are defective [29]. In his reply, Goodkin R [30], reported that Smith and Estidge suggested the same thing in 1964, but in 1968, he suggested that the case presented by Holsher EC in 1948

occurred while drilling depth with a closed-jaw rongeur, and suggested avoiding depth drilling with the instrument. Goodkin R. [30] reported that despite the focusable operating microscope, the surgeon should consider that when a disc is removed in the anterior region of the disc, this is not a guarantee that a new vascular injury will not occur.

Analyzing the commonality and differences between lumbar discectomy cases of vascular injury in lumbar discectomy published so far in this study, it was concluded that vascular injury mainly occurs in two ways:

- 1- Bottomless pit type direct vascular injury
- 2- Indirect type vascular injury due to adhesions

Bottomless pit type direct vascular injury: For the first time, Taylor H made the analogy of a bottomless pit (for the intervertebral disc) in 1962 [25]. For the second time, Holscher EC reported that the surgeon made this analogy [26]. While Shewlin WA was performing a discectomy, she noticed that the straight pituitary rongeur had suddenly slipped (pulled!) to an unexpected depth, and immediately pulled the instrument back without holding anything. During the operation, hypotension developed. The patient was operated immediately, iliac artery transection and iliac vein injury were detected [28]. It was concluded that this case can be classified as a Bottomless pit type direct vascular injury. In the case presented by Yalvaç B and Balak N, it was found that the disc space was empty, no resistance was encountered at the bottom of the disc space, and the pituitary rongeur could go deeper than usual [31]. It was concluded that this case can also be classified as a bottomless pit type direct injury. In the anteriorly extruded L5-S1 hernia diagnosed by discography as described above by Cloward RB [23], if he had tried to perform discectomy with a small incision instead of completely emptying the disc by using a spreader and directly seeing it, he would have passed through the torn annulus and thin, loose ALL into the prevertebral space and passed into the bottomless well. It was concluded that this type of vascular injury may cause. While Birkeland IW [27] stated that it is not uncommon for Pituitary Rongeur to slip (pull in!) Towards the ALL during disc evacuation, even without vascular injury, it was concluded that They defined bottomless pit type disc degeneration.

Yip SL [32] While 4-5 left discectomy was performed in the patient with L4-5 left disc hernia, ligamentum flavum hypertrophy, disc degeneration and narrow canal, anterior shift of the pituitary rongeur went forward. The surgeon reported this suspicious manipulation to the anaesthesiologist. There was no bleeding at the operating site. After 5 minutes, the blood pressure dropped rapidly, laceration was detected in the aortic bifurcation. In this case, it was concluded that ALL was defective due to chronic disc degeneration and a bottomless pit type vascular injury occurred with surgical instrument slippage. In our case, it was concluded that a bottomless pit type direct vascular injury developed. The pituitary rongeur had gone deeper than 1 cm without being noticed, and had come across the common iliac artery, assuming it was between the disc clusters. To feel the bottomless pit disc degeneration without seeing it, Canale DJ definition of "If the instrument goes 1 cm or more deep suddenly, this indicates that it has passed into the retroperitoneal space" [29] should be considered as a well-defined finding that helps the surgeon. It was concluded in this study. The bottomless pit type direct vascular injury can be avoided with the rule of not penetrating the disc distance more than 2.5 cm with the instrument (limited discectomy). It was discussed and practiced to mark the instruments with a 2.5 cm mark, but then Semmes RE for curette [16], De Saussure RL for pituitary rongeur [5], they did not recommend marking instruments as may create a false sense of security and different values may be required for different vertebral

sizes [5,16]. In this study, it was concluded that it is important to "make a habit of constantly being aware of the depth of the surgical instrument in the intervertebral disc" as suggested by Dr. Bradford FK [5]. The clinical significance of anterior disc herniation has not been defined because it does not cause any significant complaints. However, it was concluded that it should be considered as a predisposing factor since it is an indication of anterior annular tear and bottomless pit type vascular injury may be encountered in lumbar disc surgeries. Preoperative evaluation of anterior disc herniation on MRI was recommended. In our case, anterior extruded disc herniation was retrospectively detected after vascular injury. Jinkins found 29.2% anterior disc herniation in their study in which they evaluated 250 consecutive Lumbar MRIs. It is observed that the probability of rupture of the anterior annulus and ALL is quite high. Earlier, Cloward RB, based on his own observations, reported that anterior disc herniation is very common and may even be more common than posterior disc herniation [23].

Indirect type vascular injury due to adhesions: It was defined as Peridiscal Fibrosis by Bolesta MJ for the first time [6]. In the case reported by Bolesta MJ, bilateral discectomy was performed for L5-S1 central disc herniation, which has been resistant to treatment for 4.5 years. Due to the sudden hypotension detected during the operation, which was uneventful, the cardiovascular surgeon operated the patient quickly and emptied the hematoma. He found dense scar tissue at the L5-S1 level between all vessels and the PLL, and a 12 mm laceration in the left common iliac vein. He was unable to repair the vessel wall without performing a release dissection because of the dense scar tissue. He attributed this to the retroperitoneal surgery that the patient had undergone. In this study, the case of Bolesta MJ was evaluated as a typical example of Indirect Vascular Injury due to Adhesion. It was concluded that when the semi-free disc part was pulled during the discectomy, the ALL and the vessels attached to the ALL from the other side were pulled indirectly, resulting in indirect vascular injury by tearing from the adhesions. Moreover, in order to make a 12 mm vein tear from top to bottom with a pituitary rongeur, it is necessary to bite off 3 times and bite again from above or below. Since the height of the intervertebral disc is 5-7 mm, it was concluded that this vascular injury is impossible to be caused by direct grasping and biting, and it can be caused by indirect vascular injury due to adhesions. Case 3 of Birkeland IW [27] had radicular pain in the lower back and right leg for 5 years. Despite the diagnosis of L4-5 right disc herniation on examination, myelography was negative. When discectomy is performed for L4-5 bulging in the surgery, it is observed that the nerve root is adhered to circumference, although it is the first surgery. On the 6th day after the operation, pain begins in the right inguinal region. Murmur is heard on auscultation in the bilateral inguinal region and between the xiphoid and umbilicus, and a trill is obtained in the right lower quadrant of the abdomen with palpation. Pain and swelling develop in the right leg. An 8 mm AVF is detected between the right iliac artery and vein, and a large pseudoaneurysm is detected in the right iliac artery. The iliac artery and vein are found to be adherent to each other. It is observed that this case had peridiscal fibrosis, which was described by Bolesta MJ as adhesions both anteriorly and posteriorly to the disc. There should be a point-like rupture in the artery and vein that causes leakage in the form of bleeding so that it does not immediately give symptoms and a fistula can develop between the two vessels. It was concluded that this could not be due to tool bite, but indirect injury could occur as a result of chain rupture as a result of pulling on adherent structures, and this case could be classified as Indirect Vascular Injury Due to Adhesion. In Case 4 of Birkeland IW, a fistula is detected between the common iliac artery and vein after the second surgery for L5-S1 recurrent hernia. The Patient had recurrent wound debridement's and a 9-month drainage history due to infection after the first operation [27]. In this case, it was concluded that peridiscal fibrosis occurred due to repetitive surgery and long-term infection, and because

the iliac artery and vein were attached to both the ALL and each other, due to the pulling of the adhesions, bleeding in the form of leakage, and fistula formation between the artery and vein could occur. It was concluded that this case can also be classified as Indirect Vascular Injury due to Adhesion. In Case 1 of Birkeland IW, L5-S1 right extruded disc herniation findings and negative findings at this level in myelography, and an abnormality in L2-3 left side were detected. Although bulging was seen in L5-S1 and limited discectomy was performed during the surgery, there was a large amount of bleeding. In the laparotomy performed due to early postoperative abdominal pain, laceration at the beginning of the superior rectal vein and a small tear in the opposite L5-S1 ALL were detected [27]. It is seen that the case does not have an extruded hernia, but has sciatica. It was concluded that pressure on the root is likely due to adhesions and can be evaluated as peridiscal fibrosis. It was concluded that this case could also be classified as an indirect vascular injury due to adhesion. The case presented by Mouhinto M has a history of oophorectomy due to Ovarian Ca, chemotherapy and an operation for L4-5-disc herniation 2 years ago. After L5-S1 right discectomy, Hb decreases from 14 to 7.3 after 12 hours, and orthostotic hypotension is detected. CT angiography is performed. Right iliac artery and vein dissection, AVF and pseudoaneurysm are detected. Discectomy is performed by a very experienced surgeon in 60 minutes. There is no sign of any bleeding. In this study, it was concluded that due to the ovary being a retroperitoneal organ, retroperitoneal adhesions occurred after oophorectomy, chain rupture occurred during retraction, and this case could be classified as Adhesion type Indirect vascular injury. In Birkeland's 2nd Case, a myelography-confirmed L4-5 left extruded disc herniation and simultaneous prostate nodule are detected. He is operated for lumbar disc herniation 2 weeks after carcinoma is detected in biopsy and prostatectomy is performed. All of a sudden, there is a large amount of bright bleeding from the operating field. Bleeding can be controlled. A laparotomy is performed when hypotension and a mass in the lower left abdomen are detected postoperatively. A 2lt hematoma is drained and a notched tear is detected in the left iliac artery at the L4-5 distance [27]. In this study; For these reasons, notched laceration, in which adhesion is not expected in 2 weeks due to prostate operation, is also suggestive of direct vascular injury; It was concluded that the probability of direct vascular injury is higher, but the data are not sufficient to classify this case. It was concluded that 6 of the 21 cases compiled by Goodkin R from medicolegal documents [8] were bottomless pit type direct vascular injury and 3 were Indirect Vascular Injury Due to Adhesion. The data of 12 cases could not be evaluated because of insufficient data. In this study, when the cases of indirect vascular injury due to adhesions were examined, it was concluded that AVF generally occurred. It was concluded that simultaneous rupture of both artery and vein can be explained by indirect tearing from adhesions by pulling. It was concluded that if the tears caused by the withdrawal from the adhesions are large, it should be considered that laceration may also develop. Bolesta M [6] reported that indirect vascular injury due to adhesion; the rule that the instrument should not enter more than 2.5 cm in distance is not valid. The partially attached disc parts should not be pulled, and the disc parts can be removed by pressing against the endplate with a curette and releasing [16]. It was concluded that if low back pain symptom is prominent and peridiscal fibrosis is expected, performing visual total discectomy and fusion surgery as suggested by Cloward RB is effective in avoiding vascular injury due to adhesions and relieving complaints. In this study, it was concluded that further studies are needed on the diagnosis of peridiscal fibrosis and the management of these patients

Pseudoaneurysm: It is a late complication of lumbar disc surgery [1,12]. Papadoulas S [1] He reported that 3 of the 99 cases identified in the literature were pseudoaneurysms. Bleeding times of pseudoaneurysm cases;

reported as postop 5th day, postoperative 2nd year and postoperative 2.5 year. They interpreted the rate of pseudoaneurysm as very low, possibly concluding that the frequency was higher [1]. Inamasu [12] concluded that patients who developed pseudoaneurysm experienced bleeding after discharge, so it is impossible to determine the true frequency. Fruhwirth F, [19] reported that the pseudoaneurysm was detected after remaining silent for 2 years after lumbar discectomy, after eroding the vertebral corpus, neurologic symptoms and abdominal distension developed in their case. Luan JY found bone erosion in L4 and L5 and left iliac artery pseudoaneurysm in a patient they investigated with complaints of right hip and leg pain and numbness. They reported that the patient had a history of lumbar discectomy 18 and 13 years ago, and iliac artery pseudoaneurysm developed as a silent complication of these surgeries.

Important intervention on vascular injury complication in Lumbar Discectomy: The presidents of SBNS (The Society of British Neurosurgeons) and BASS (British Association of Spine Surgeons) in a joint letter they wrote and sent to their members in 2017, stated that it is necessary to conduct regular training programs that create continuous awareness for this risk, which reveals the importance of the risk of large vessel injury in the anterior spine. It was emphasized that the differential diagnosis and management of sudden hypotension developing during and after lumbar discectomy should be clearly included in this training program. It was stated that the necessity of regular training programs is valid for all physicians working in the evaluation and management of spinal surgery patients. According to this declaration, it is recommended that every surgeon should complete the training program on this subject at certain intervals and that the awareness of this injury should be constantly renewed. Branches of specialization associations were given the task of arranging these training programs [13,14]. It was concluded that it is important that this declaration is embraced and developed by the national associations of neurosurgery and spinal surgery all over the world. It was concluded that it is important to discuss the subject and to share knowledge and experience.

Conclusion

In the case presented in this study, common iliac artery pseudoaneurysm was detected after further examination due to suspicious manipulation after Lumbar microdiscectomy operation, and its treatment was administered. In all cases where vascular and organ injury is suspected, when there is a decrease in HB more than 3mg/dl or more than expected in maneuvers that the surgeon suspects; It was concluded that, even if the patient has no symptoms, early diagnosis can be made by first asking for abdominal USG and lumbar MRI, if necessary, contrast-enhanced abdominal CT angiography. Vascular injuries in lumbar disc surgery are classified into two types according to the mechanism of occurrence, as bottomless pit type direct and indirect vascular injury due to adhesion.

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