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Case report

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Intradural migration of fusion cage in an isthmic listhesis patient treated with transforaminal lumbar interbody fusion (TLIF): A case report

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Abstract

Lumbar listhesis, is defined as a disorder that causes a vertebral body to slip over the one below it. Several surgical decompression and augmented fusion techniques are available for treatment. Transforaminal lumbar interbody fusion (TLIF) is a commonly used surgical technique for degenerative lumbar spondylolisthesis in cases in which conservative care fails to achieve satisfactory spinal fusion. Although TLIF is widely accepted because it is easy to perform and is very safe, cage migration is an important complication, and posterior migration is a serious one. Cage migration can be classified as posterior, anterior, or sagittal forms according to migration direction. An increasing number of the surgeons have encountered cage migration; however, consensus on its cause is lacking. In this report, a case of intradural cage migration with left leg pain is presented, and this complication is discussed in light of related studies.

Keywords: Listhesis, Cage migration, Risk factors, Transforaminal lumbar interbody fusion, TLIF, Complication

Introduction

Listhesis is defined as a disorder in which one vertebral body slips over the one below it [1]. Lumbar listhesis often results in both low back and leg pain related to spinal stenosis [2]. Indications for its surgical treatment include persistent or recurrent back pain and/or leg pain, progressive neurological deficits, and neurogenic claudication [3]. Several surgical techniques for decompression and augmented fusion can be performed, each of which has its own merits and limitations [4]. Both Posterior lumbar and transforaminal lumbar interbody fusion (TLIF) are two commonly used surgical techniques for treating degenerative lumbar spondylolisthesis in cases in which conservative care fails to achieve spinal fusion [5]. TLIF is widely accepted because it is easy to perform and very safe**.** However, cage migration is an important complication as posterior migration, in particular, is quite serious since it can cause compression of the nerve root or dura mater and intensify a patient’s neurological symptoms. Cage migration can be classified as posterior, anterior, or sagittal according to its direction [6]. An increasing number of surgeons have encountered cage migration; however, no consensus regarding this complication exists. In this study, a case of an intradural migrated cage with left leg pain is presented, and this complication in light of the literature is discussed.

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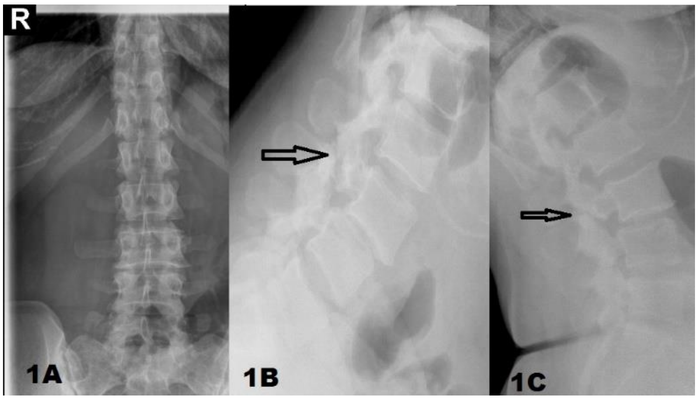
Case presentation

A 36-year-old female patient had a 5-year history of bilateral leg and back pain and neurogenic claudication. Medical and physical treatments were unsuccessfully performed for five years. She presented to our neurosurgical polyclinic as an outpatient and underwent a neurological examination, standing flexion and extension X-rays (Figure 1A–C), and lumbar magnetic resonance imaging. According to the Meyerding classification, Grade 1 isthmic listhesis, bilateral foraminal stenosis, and subligamentous disc herniation were observed between the third and fourth lumbar levels. The patient was given the diagnosis, and surgery was recommended after which an informed consent was obtained. During surgery, a conventional midline incision was made, and a total laminectomy, bilateral inferior facetectomy, and bilateral discectomy were then performed. Before the TLIF was performed, polyaxial screw fixation was performed at the third and fourth bilateral lumbar pedicles after which the disc space was expanded due to pedicle screw distraction. Thereafter, bilateral discectomy was repeated, and a 6-mm TLIF filled with patient bone was applied in the disc space. After TLIF application, pedicle screw compression was performed. Four days later, the patient was discharged with no complaints.

Figure 1: Pre-operative anterior-posterior X-ray view (1A), pre-operative flexion (1B) and extension (1C) X-ray views show Grade 1 isthmic listhesis and foraminal stenosis



One month later, the patient returned for a follow-up with no complaints. Three months later, a lumbar X-ray (Figure 2A, B) revealed slight posterior TLIF migration; however, it was decided to continue following up. At six months post-surgery, she returned to the hospital complaining of back pain, and another lumbar X-ray (Figure 3A, B) revealed further posterior TLIF migration. A second surgery was recommended, but the patient declined in favor of continuing to follow only. Nine months later (at 16 months post-surgery), the patient returned to the hospital complaining of left leg pain. A lumbar X-ray (Figure 4A, B) and computed tomography (CT) revealed that the TLIF migration had progressed further (Figure 5A, B). Revision surgery was recommended for which the patient provided informed consent. It was initially thought that the TLIF was in the left foramina, butit could not be seen in that location. Thereafter, the dissection was expanded toward the ventral lumbar dura, and it was seen that the TLIF had migrated into the posterior lumbar dura (Figure 6). An attempt was made to withdraw the TLIF, but resistance was encountered in its anterior portion. After pedicle screw distraction, and the TLIF was withdrawn easily. The ventral and posterior dura (Figure 7) were then closed. The screw fixation system was re-established, a closed suction drain system was placed, and the anatomical layers were closed. On the first post-operative day, she had no complaints and walked without assistance. On the fifth post-operative day, the patient was discharged with no complaints or complications.

Figure 2: Three-month follow up anterior-posterior (2A) and lateral (2B) X-ray views showed slight posterior transforaminal lumbar interbody fusion (TLIF) migration.

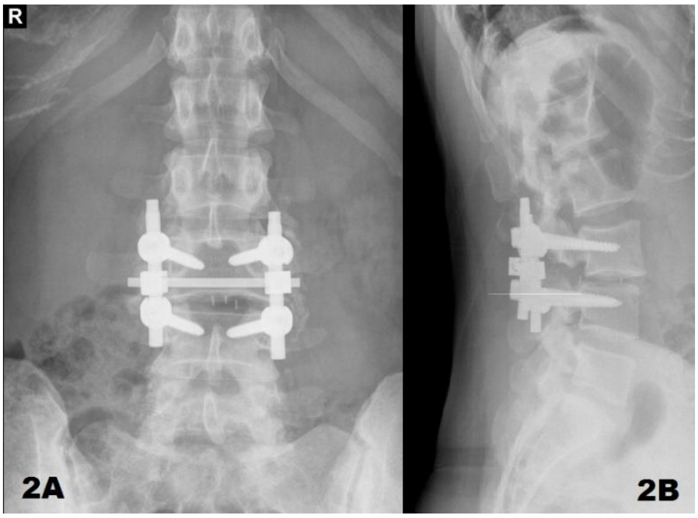


Figure 3: Six-month follow up anterior-posterior (3A) and lateral (3B) X-ray views showed further posterior TLIF migration.

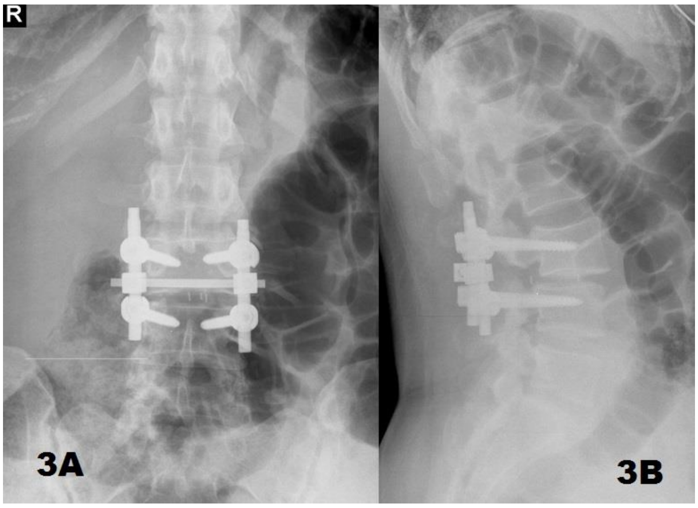


Figure 4: Sixteen-month follow up anterior-posterior (4A) and lateral (4B) X-ray views showed progressed further TLIF migration

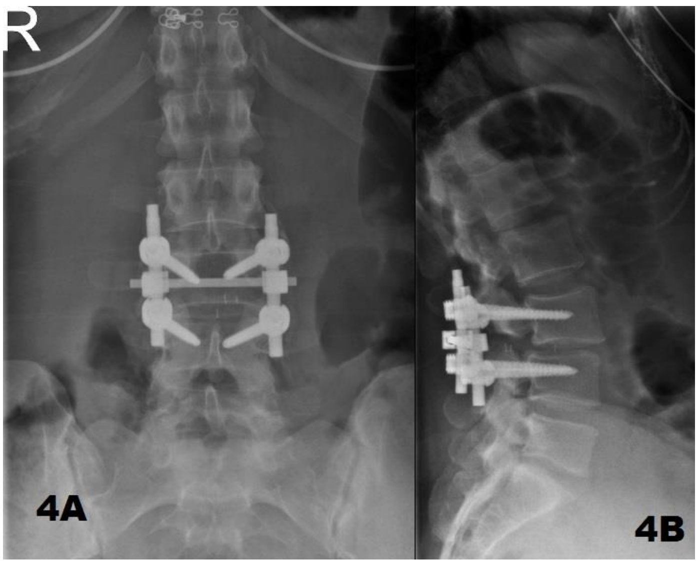


Figure 5: Sixteen-month follow-up saggital (5A) and coronal (5B) computed tomography (CT) sections showed progressed further TLIF migration and bilateral L3 and L4 screw loosening.

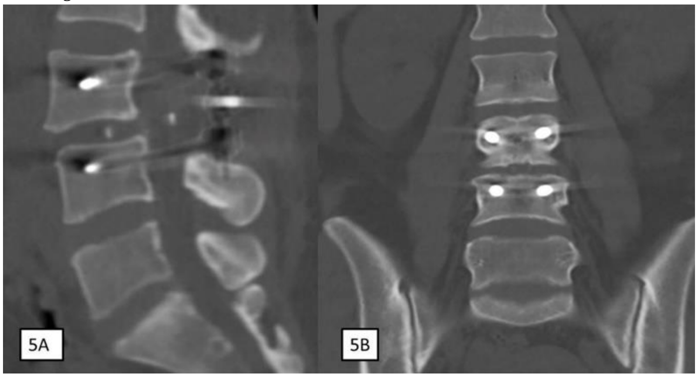


Figure 6: Intradural cage migration

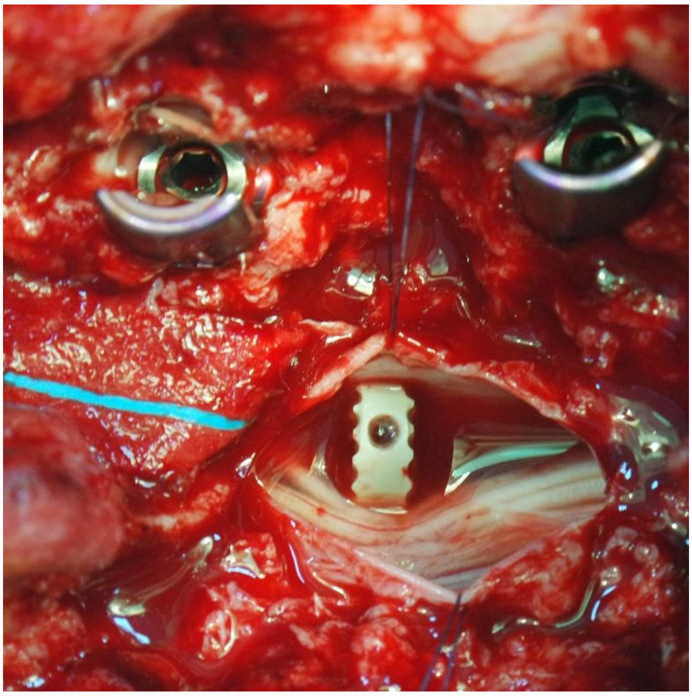
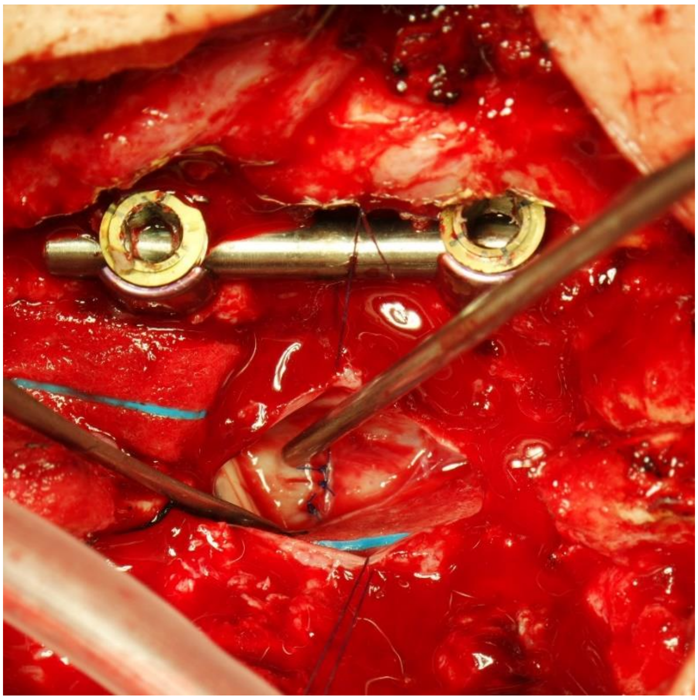


Figure 7: Closed ventral dura after withdrawing the TLIF



Discussion

The popularity of TLIF has increased over the past decade because fusion rates after TLIF application and bilateral pedicle screw instrumentation are reportedly 90%–100% [7, 8]. Different surgical approaches have been developed for TLIF placement. One such approach is an open technique that has been performed thanks to posterior decompression and simultaneous interbody fusion, while another involves minimally invasive TLIF placement. Both techniques have advantages and disadvantages. TLIF placement using the traditional method requires a posterior midline approach in addition to retraction of the thecal sac and nerve roots. Therefore, all complications encountered during TLIF placement are related to this approach. In the literature, many different studies have reported the possible complications of the open surgical technique [5, 7, 9]. TLIF cage migration is a post-surgical complication that may occur in the posterior, lateral, or anterior direction [6]. Although cage migration may be asymptomatic in some cases, posterior migration may be the most important because its symptoms may appear soon after surgery.

Many possible factors related to TLIF migration, such as excessive endplate abrasion, TLIF size and type, endplate type (concave–concave or linear–linear), the presence of the scoliotic curvature, greater posterior disc height, and TLIF performed without or unilateral instrumentation have been identified [6, 10, 11]. In the light of our case and those in the related literature, many reasons for TLIF migration can be suggested. However, some reasons related to our case, such as excessive endplate abrasion, greater posterior disc height, linear–linear endplate type, scoliotic curvature, and TLIF performed without instrumentation, can be separated from the others. Our patient had the necessary endplate abrasion, a concave–concave endplate, no scoliotic curvature, and TLIF was performed with instrumentation. Therefore, cage type, size, and surgical technique may have been factors in our case. In the literature, rectangular-shaped and small cages have been reported to migrate more frequently than kidney-shaped and large cages [6]. In our case, although a kidney shaped TLIF was used, another important factor in the emergence of this complication might be the size of the TLIF. At first, a 6 mm TLIF was freely tried before expanding the distance with the screw system; however, it did not stretch the distance. Therefore, it was thought that TLIF above these dimensions would cause endplate abrasion. For this reason, it was felt that a 6 mm TLIF would be sufficient. To suggest a self-criticism in this situation, although the entrance of TLIF was narrower than 6 mm, the concave–concave surface of the intervertebral disc could also have allowed the application of larger sizes of TLIF than the actual applied one since the middle part of the intervertebral disc was higher.

In this surgical technique title, bilateral or unilateral inferior facetectomy, inadequate discectomy or failure load, and flexibility may be factors for the failure. In the literature, spinal biomechanical studies have shown that the interface between the endplate and the fusion cage is subject to extreme pressure [12, 13]. Therefore, excessive pressure, such as that exerted by pedicle screw compression, may be a factor contributing to endplate fracture or fragility. In this way, intervertebral disc space may be expanded post-operatively, which can facilitate

TLIF migration. Another factor is screw malposition, which can cause inadequate loading and lead to an increase in the risk of TLIF migration. Our case demonstrated neither excessive loading nor screw malposition and inadequate discectomy. The inferior facetectomy may have been a factor for TLIF migration in our case. In the literature, Aoki et al. reported that a unilateral facetectomy could cause TLIF migration because the pedicle could have been mechanically injured prior to pedicle screw fixation during the TLIF procedure. This resection could have caused mechanical injury to the pedicle on the same side [10]. However, a bilateral inferior facetectomy was performed in our case because of the patient's reported bilateral radicular pain due to midline disc herniation and facet instability. This state can be a secondary factor contributing to mechanical injury of the pedicles. Because of the technical implementation of TLIF, the disk space needed to be widened and then compressed. These distraction and compression movements may have caused enlargement of the screw-inserted pedicle of the vertebral segment whose cortex integrity was disrupted by inferior facetectomy. In our case, the finding that supports our view is loosening appearances around the screws in the bilateral L3 pedicles occurred as viewed on the coronal sections of the CT scan. This screw loosening may have decreased the compression force on TLIF, facilitating pseudo-union in the disc space and then removal of the TLIF.

Conclusion

Intradural TLIF migration can occur, and surgeons must remain alert to its possibility. The posterior dural approach can be used to withdraw TLIF and reduce the risk of caudal fiber injury. In addition, many reasons for TLIF migration exist. Bilateral inferior facetectomy can be a factor, but how it affects TLIF migration must be investigated in future mechanical studies.

References

1. Ishimoto Y, Yoshimura N, Muraki S, Yamada H, Nagata K, Hashizume H, et al. Association of lumbar spondylolisthesis with low back pain and symptomatic lumbar spinal stenosis in a population-based cohort: the Wayakama spine study. Spine (Phila Pa 1976). 2017;42(11):E666–71. doi: 10.1097/BRS.0000000000001960.
2. Liu J, Deng H, Long X, Chen X, Xu R, Liu Z. A comparative study of perioperative complications between transforaminal versus posterior lumbar interbody fusion in degenerative lumbar spondylolisthesis. Eur Spine J. 2016;25(5):1575–80. doi: 10.1007/s00586-015-4086-8.
3. Kayanama M, Hashimoto T, Shigenobu K, Oha F, Ishida T, Yamane S. Non-fusion surgery for degenerative spondylolisthesis using artificial ligament stabilization: surgery indication and clinical results. Spine. 2005;30:588–92. doi: 10.1097/01.brs.0000154766.74637.5e.
4. Fan G, Wu X, Yu S, Sun Q, Guan X, Zhang H, et al. Clinical outcomes of posterior lumbar interbody fusion versus minimally invasive transforaminal lumbar interbody fusion in three-level degenerative lumbar stenosis. Biomed Res Int. 2016;2016:9540298. doi: 10.1155/2016/9540298.
5. Chrastil J, Patel AA. Complications associated with posterior and transforaminal lumbar interbody fusion. J Am Acad Orthop Surg. 2012;20(5):283–91. doi: 10.5435/JAAOS-20-05-283.
6. Zhao FD, Yang W, Shan Z, Wang J, Chen HX, Hong ZH, et al. Cage migration after transforaminal lumbar interbody fusion and factors related to it. Orthop Surg. 2012;4(4):227–32. doi: 10.1111/os.12004.
7. Wong AP, Smith ZA, Nixon AT, Lawton CD, Dahdaleh NS, Wong RH, et al. Intraoperative and perioperative complications in minimally invasive transforaminal lumbar interbody fusion: a review of 513 patients. J Neurosurgy Spine. 2015;22(5):487–95. doi: 10.3171/2014.10.SPINE14129.
8. Aoki Y, Yamagata M, Nakajima F, Ikeda Y, Takahashi K. Posterior migration of fusion cages in degenerative lumbar disease treated with transforaminal lumbar interbody fusion: a report of three cases. Spine (Phila Pa 1976). 2009;34(1):E54–8. doi: 10.1097/BRS.0b013e3181918aae.
9. Hey HW, Hee HT. Open and minimally invasive transforaminal interbody fusion: comparison of intermediate results and complications. Asian Spine J. 2015;9(2):185–93. doi: 10.4184/asj.2015.9.2.185.
10. Aoki Y, Yamagata M, Nakajima F, Ikeda Y, Shimizu K, Yoshihara M, et al. Examining risk factors of posterior migration of fusion cages following transforaminal lumbar interbody fusion: a possible limitation unilateral pedicle screw fixation. J Neurosurg Spine. 2013;13:381–7. doi: 10.3171/2010.3.SPINE09590.
11. Smith AJ, Arginteanu M, Moore F, Steinberger A, Camins M. Increased incidence of cage migration and nonunion in instrumented transforaminal lumbar interbody fusion with bioabsorbable cages. J Neurosurg Spine. 2010;13:388–93. doi: 10.3171/2010.3.SPINE09587.
12. Grant JP, Oxland TR, Dvorak MF. Mapping the structural properties of the lumbosacral vertebral endplates. Spine. 2001;26:271–3. doi: 10.1097/00007632-200104150-00012.
13. Labrom RD, Tan JS, Reilly CW, Tredwell SJ, Fisher CG, Oxland TR. The effect of interbody cage positioning on lumbosacral vertebral endplate failure in compression. Spine (Phila Pa 1976). 2005;30(19):E556–61. doi: 10.1097/01.brs.0000181053.38677.c2.

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