CASO CLÍNICO

Posterior Migration of Titanium trabecular cages: Revision Spinal Surgery

Guerrero Mena, Javier

Médico residente. Servicio de Cirugía ortopédica y traumatología. Hospital universitario Valme

javier338@hotmail.es

Rev. S. And. Traum. y Ort., 2026; 43 (1/2): 89-94 *Recepción: 20/04/2025. Aceptación: 14/10/2025*

Abstract

Interbody fusion cages are commonly used in lumbar degenerative disease surgery to enhance spinal stability and fusion rates. However, complications such as cage migration, though rare, can lead to neurological deficits and require revision surgery.

We present the case of a 67-year-old male who developed posterior cage migration months after L1-L5 arthrodesis.

We further discuss preventive measures, key precautions, and surgical techniques that may assist other surgeons in managing this complication.

Palabras clave: *Revision surgery, Posterior migration, titanium trabecular cage, TILF, Complication*

Introduction

The use of interbody fusion cages has been widely used in the surgical treatment of lumbar degenerative diseases (LDDs).[1-4] This tool offers many advantages, primarily improving spinal stability and fusion rates. This is particularly relevant for achieving successful lumbar arthrodesis.[5-6] Further, utilization of fusion cages results in stabilization of the anterior column and restoration of foraminal and disc space height[7-8] and preventing spinal deformity.[9] The common complications of interbody fusion cages include nerve root injury, screw extraction, adjacent segment disease, and the change of fusion cage position.[10-11] Among these complications, the cage displacement is relatively rare, and may lead to progressive spinal deformity, compression of the nerve roots and dura mater, non-fusion[12], or revision operation.[13-14]

Cage migration is usually diagnosed as movement of the cage that exceeds 3mm or extends beyond the wall of the vertebral

body.[15-16] Cage migration can be further classified as posterior (backward into the vertebral canal), anterior (forward into the retroperitoneum), or lateral according to the direction in which the cage migrates.

Case presentation

A 67-year-old patient reported clinical worsening in one of the postoperative check-ups. He suffered pain in the lower back and on the right leg with associated paresthesia and weakness. The radiated pain was present from the gluteal area, lateral aspect of the thigh and anterolateral aspect of the right leg. No bladder and bowel dysfunction was noted.

The patient had undergone a lumbar L1-L5 arthrodesis months ago at our center (Imagen 1). It was necessary to reoperate days later to reposition the right L5 screw. This surgery took place without incident. Although no compression was applied to the L4-L5 segment where the TILF was placed. The patient was symptom-free for a few months after the index surgery. A review showed posterior migration of the intersomatic cage (flush with posterior wall of vertebral) without producing clinical changes in the patient. At that time, a semi-rigid lumbar belt, rest and follow-up monitoring of the case were prescribed.

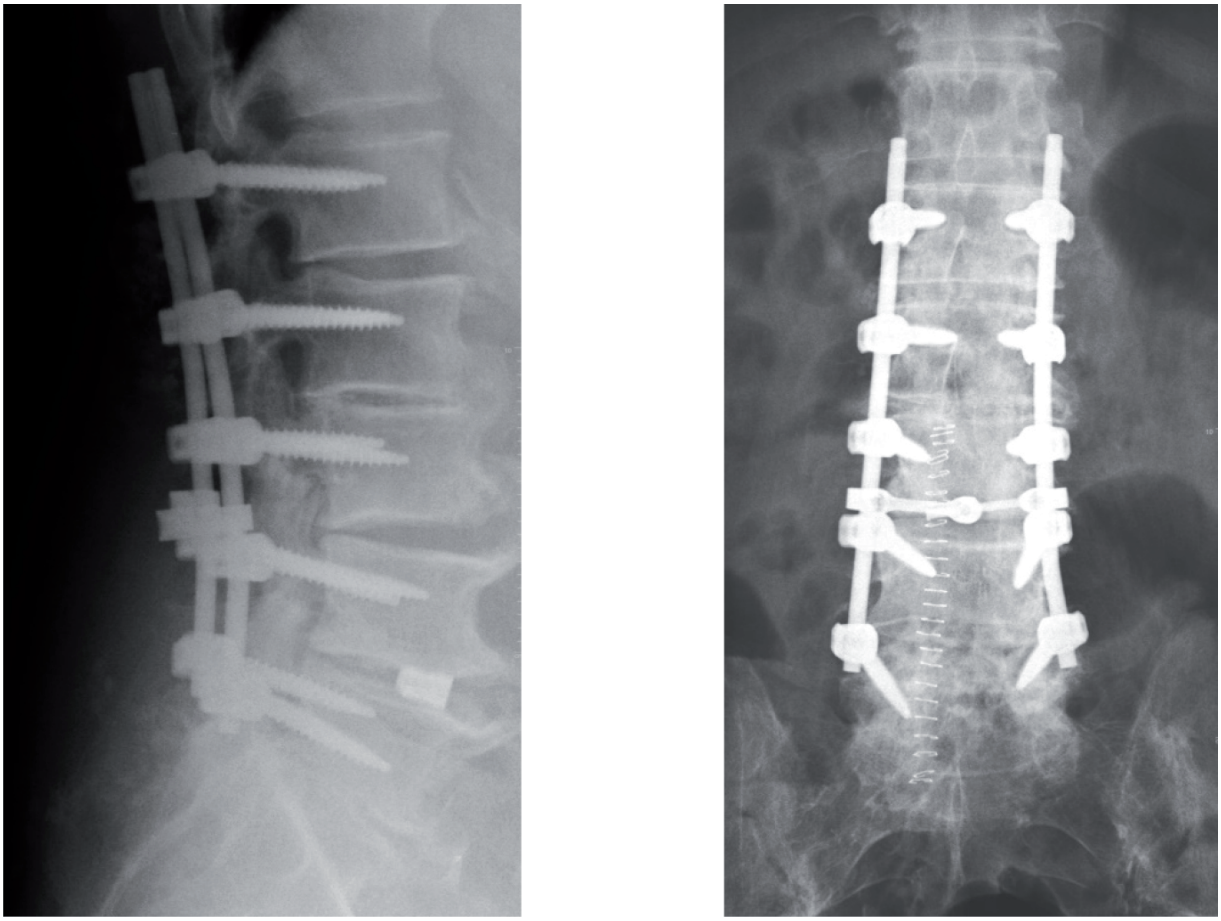

Imagen 1. Primary X-Rays after primary surgery.

On examination, Radicular signs (Lasegue and Bragard) were positive for the patient's right leg. The lower limb power of L4 and L5 is MRC grade 3. Loss of sensation in the L5 dermatome of right foot. The control radiograph showed a posterior migration of the interbody cage at the L4-L5 disc with the surrounding area of osteolysis.

An MRI was performed, which showed the posterocentral stenosis dependent on the migrated cage, also confirmed in TC Scan (Imagen 2). The cage was in contact with the right L5 root and the dural sac. Revision surgery was performed to remove the interbody cage, and explore the dura and exiting nerve.

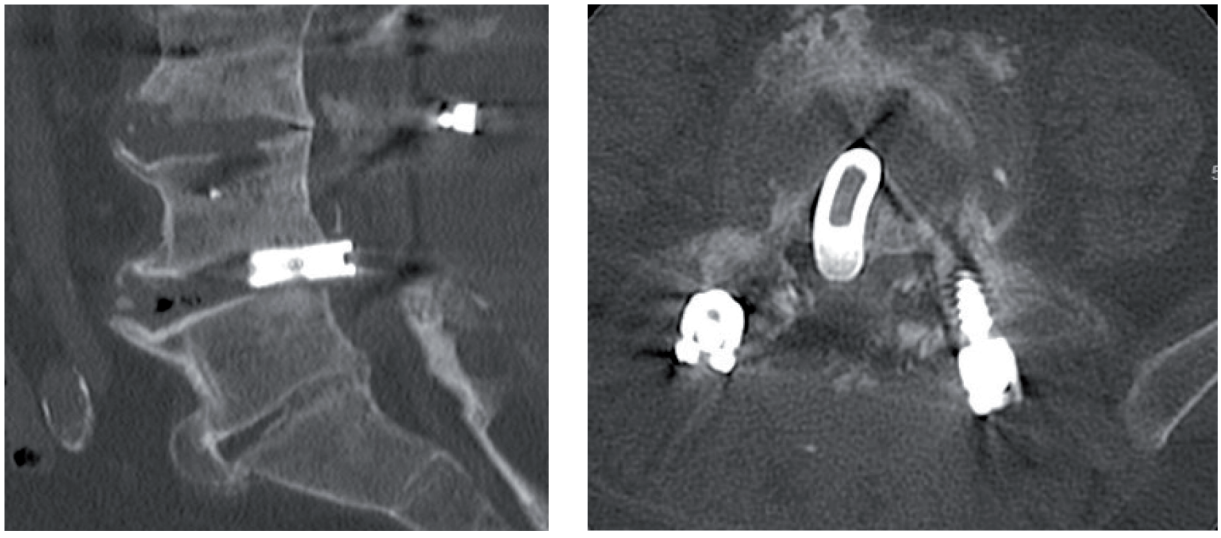

Imagen 2. Migrate cage confirmed in TC Scan.

Surgical Technique

Under general anesthesia, the patient was placed in a prone position on a spinal table. A posterior lumbar approach was performed on the operated area at the L4-L5 level. Scar tissue was noted as soon as we approached the instrumentation. We extend the window of laminectomy in the right L4 hemilamina and right facetectomy to allow an approach to the disc space. A careful dissection of the fibrotic tissue around the neural canal was performed, rejecting the scar tissue medially until reaching the intervertebral disc and the posterior aspect of the cage.

The Titanium trabecular cage was well integrated with the surrounding bone and has fibrous in-growth with the surrounding soft tissue. With the help of chisels we managed to detach the intersomatic cage from the vertebral plates. With the help of intraoperative fluoroscopy and using a foramen explorer, we successfully hooked and extracted the protruding cage without causing damage to the neurological structures during the process that was protected with a nerve root retractor (Imagen 3).

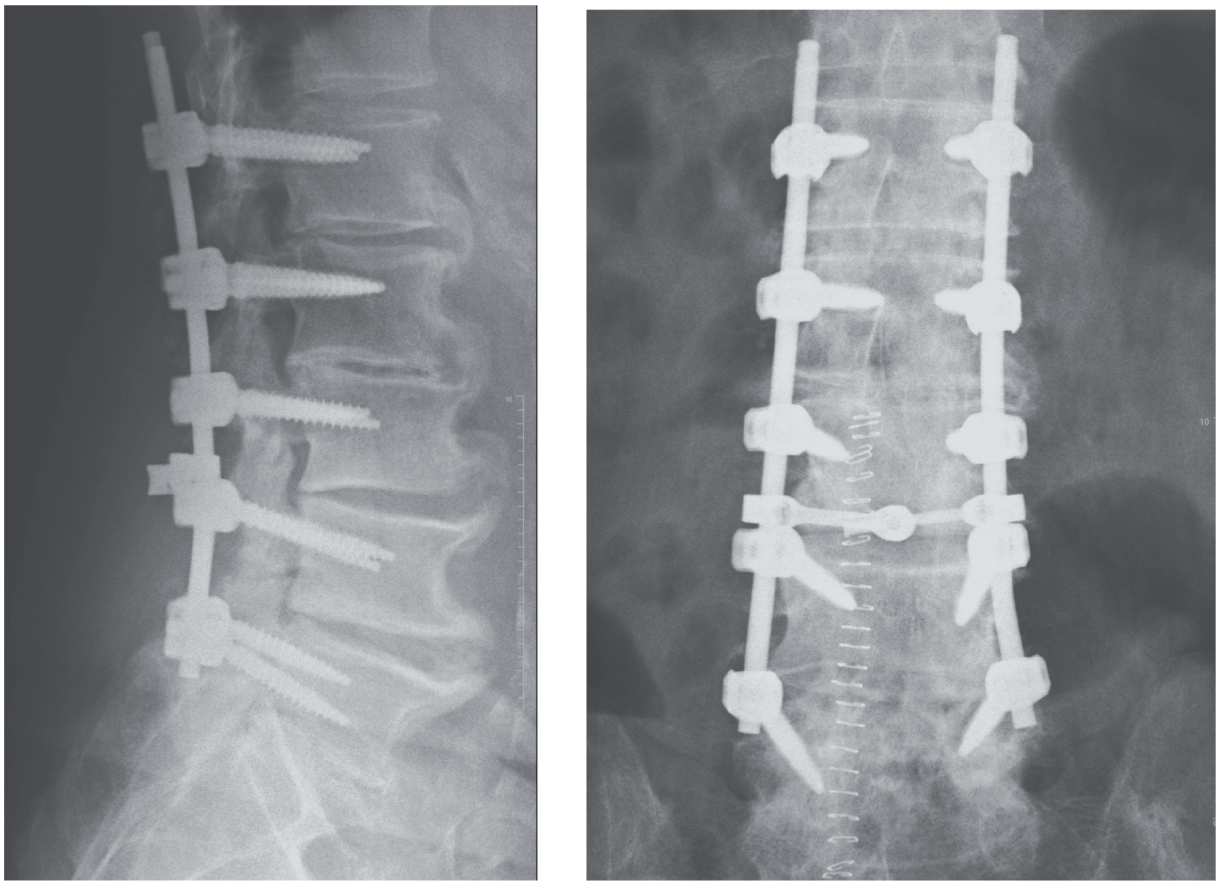

Imagen 3. X-rays after revision surgery.

Discussion

The interbody cage spinal fusion technique is demanding and carries a risk of complications such as damage to the dural sac and roots. It therefore requires a refined surgical technique.

Three types of interbody cage migrations have been categorized based on the clinical scenario. When pseudoarthrosis is the primary cause and the only symptom is low back pain (type 1), removal of the migrated cage may not be required. In contrast, type 2 migrations necessitate the removal of the displaced cage, with a same-side TLIF approach being the recommended procedure. However, the most difficult case is type 3, which results in cauda equina syndrome and usually requires cage removal from an anterior approach[17].

Most studies have described cage migration in the posterior direction[18, 19]. The incidence of cage migration is reportedly 2.5–6.3%[13,20,21,22]

The pattern of cage migration or retropulsion can be narrowed down to an average of 1–4 months postoperatively[14, 20].

In the case of this patient, after reviewing the control X-ray and CT images, the initial placement of the cage appears to be correct and even piece of bone autograf were incorporated after placement of the cage to facilitate arthrodesis of the level.

In this specific case, the need for revision surgery of the instrumentation and modification of the compression forces in the segment where the intersomatic cage was placed seems to have had an impact on its stability. Likewise, the fact that the patient's lumbosacral mobility was not restricted during the first weeks of the postoperative period could have facilitated the displacement of the box from its original position.

At the time of the extraction of the box, a partial integration of the box on both vertebral pads where it was located was observed.

Previous studies have emphasized the importance of maintaining the integrity of the bony endplate to prevent the cage subsidence or migration[12,23]. Park et al[24] reported that if endplate injury occurs during interbody fusion surgery, the intervertebral space lacks sufficient strength to support the stability of the cage. So in this type of surgery an essential step is the thorough removal of disc material and the cartilaginous layers of the endplates, as this is crucial for proper insertion and positioning of the interbody cage.

Posteriorly located cages were shown to be a significant risk factor for posterior cage migration in univariate and multivariate analyses[20]. The authors found no significant difference in flexion-extension range of motion (ROM) between anterior cage placement and posterior cage placement constructs[25]. To minimize the risk of posterior cage migration, we should avoid placing the cage with its center located posterior to the disc center. The technique of disc preparation plays an important role in avoiding posterior cage migration. Before cage insertion, the trial implant should reach adequate depth after disc preparation and bone graft packing. It is always necessary to monitor cage position during surgery by fluorescent imaging.

Hu et al in his study show posterior cage migration was found in discs with significantly increased preoperative disc height. They recommend using cages with heights equal to or larger than preoperative disc heights.

Regarding the geometric aspect, kidney-shaped cages had higher posterior cage migration incidence than bullet-shaped cages, even though this difference was not statistically significant[20].

On the other hand, others studies have shown that the use of a bullet-shaped cage is a possible risk factor for cage migration[14,15,16].

Another aspect to highlight is the length of the instrumentation and the location of the interbody cage within the construct. Posterior cage migration occurred mostly at the end level of the fusion[20]. As gravity transmits vertically, there is large cantiléver bending torque applied at the end levels, being able to increase the incidence of failure.

Hu et al[20] also emphasized that more caution is required for multilevel fusions, and additional effort should be put into end level stability.

In our case the box was housed in the last instrumented level within an L1-L5 instrumentation. Right in the area of greatest risk.

We also believe that it is equally important the compression of the pedicle screws and rod construct could further prevent any cage retropulsion.

Jin et al[26] showed that age was a significant risk factor for cage migration because patients of advanced age developed more migration, especially those older than 70 years. They presume that older patients have more highly unstable segments.

Surgeons undertaking the removal of revision cages should be prepared to manage potential dural leaks and perform dural repairs due to epidural fibrosis. Utilizing a small osteotome can help loosen the implant. The cutting direction should target the anterior disc space to minimize soft tissue injury. To break the bone-implant interface, the implant can be tamped further into the disc space without directly cutting the interface, reducing the risk of endplate fractures.

Further studies are needed to better understand the factors that cause this complication as well as the tools to treat them.

Conclusions

Cage migration, though rare, can result in significant complications requiring revision surgery. Proper surgical techniques, including endplate preservation and precise cage positioning, are key to preventing this issue. Early detection and timely intervention are crucial to ensure favorable patient outcomes

We find the normal limitations of a clinical case. More in-depth studies will be necessary.

References

Ren C, Qin R, Sun P, Wang P. Effectiveness and safety of unilateral pedicle screw fixation in transforaminal lumbar interbody fusion (TLIF): a systematic review and meta-analysis. Arch Orthop Trauma Surg. 2017;137(4):441–450. https://doi.org/10.1007/s00402-017-2641-y.

Greggi T, Martikos K, Faldini C, et al. Comparing TLIF to single cage PLIF for degenerative spondylolisthesis. Eur Spine J. 2018;27(4):961. https://doi.org/10.1007/s00586-018-5531-2.

Leonova ON, Cherepanov EA, Krutko AV. MIS-TLIF versus O-TLIF for single-level degenerative stenosis: study protocol for randomised controlled trial. BMJ Open. 2021;11(3). https://doi.org/10.1136/bmjopen-2020-041134.

Trouillier H, Birkenmaier C, Rauch A, Weiler C, Kauschke T, Refior HJ. Posterior lumbar interbody fusion (PLIF) with cages and local bone graft in the treatment of spinal stenosis. Acta Orthop Belg. 2006;72(4):460–466.

Lauber S, Schulte T, Liljenqvist U et al (2006) Clinical and radiological 2–4 year results of transforaminal lumbar interbody fusion in degenerative and isthmic spondylolisthesis grades 1 and 2. Spine 31:1693–1698

Zdeblick T, Phillips F (2003) Interbody cage devices. Spine 28:52–57

McAfee P, DeVine J, Chaput C et al (2005) The indications for interbody fusion cages in the treatment of spondylolisthesis: analysis of 120 cases. Spine 30(6):S60–S65

Uzi E, Dabby D, Tolessa E et al (2001) Early retropulsion of titanium-threaded cages after posterior lumbar interbody fusion: a report of two cases. Spine 26:1073–1075

Liu K, Chang H, Wang L, Wang C, Chen T, Meng X. Risk factors for cage retropulsión after lumbar interbody fusion: systematic review and meta-analysis. World Neurosurg. 2019;132:273–281. https://doi.org/10.1016/j.wneu.2019.09.019.

Epstein NE. Lower complication and reoperation rates for laminectomy rather tan MI TLIF/other fusions for degenerative lumbar disease/spondylolisthesis: a review. Surg Neurol Int. 2018;9:55. https://doi.org/10.4103/sni.sni_26_18.

Xu YC, Yao H, Wang QY, Hou G, Zhao HQ. Analysis of posterior lumbar interbody fusion (PLIF) in treating lumbar degenerative disease in elderly patients. Zhong Guo Gu Shang. 2015;28(11):1021–1025.

Abbushi A, Cabraja M, Thomale UW, Woiciechowsky C, Kroppenstedt SN. The influence of cage positioning and cage type on cage migration and fusion rates in patients with monosegmental posterior lumbar interbody fusion and posterior fixation. Eur Spine J. 2009;18(11):1621–1628. https://doi.org/10.1007/s00586-009-1036-3.

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 patients. Spine (Phila Pa 1976). 2009;34(1):E54–8.

Aoki Y, Yamagata M, Nakajima F, et al. Examining risk factors for posterior migration of fusion cages following transforaminal lumbar interbody fusion: a possible limitation of unilateral pedicle screw fixation. J Neurosurg Spine. 2010;13(3):381–7.

Zhao FD, Yang W, Shan Z, et al. Cage migration after transforaminal lumbar interbody fusion and factors related to it. Orthop Surg. 2012;4(4):227–32.

Kimura H, Shikata J, Odate S, et al. Risk factors for cage retropulsion after posterior lumbar interbody fusion: analysis of 1070 cases. Spine (Phila Pa 1976) 2012; 37: 1164.

Tanaka et al. Revision for cage migration after transforaminal/posterior lumbar interbody fusion: how to perform revision surgery? BMC Surgery (2022) 22:172

Corniola, MV., Jagersberg, M., Stienen, M. N. & Gautschi, O. P. Complete cage migration/subsidence into the adjacent vertebral body after posterior lumbar interbody fusion. J. Clin. Neurosci. 22, 597–598.

Lee, J. G., Lee, S. M., Kim, S. W. & Shin, H. Repeated migration of a fusion cage after posterior lumbar interbody fusion. Korean J. Spine 10, 25–27.

Hu et al. Cage positioning as a risk factor for posterior cage migration following transforaminal lumbar interbody fusion – an analysis of 953 cases. BMC Musculoskeletal Disorders (2019) 20:260

Pan, F. M. et al. Risk factors for cage retropulsion after lumbar interbody fusion surgery: Series of cases and literature review. Int. J. Surg. 30, 56–62.

Li H, Wang H, Zhu Y, Ding W, Wang Q. Incidence and risk factors of posterior cage migration following decompression and instrumented fusión for degenerative lumbar disorders. Medicine. 2017;96(33): e7804.

Kuslich SD, Ulstrom CL, Griffith SL, Ahern JW, Dowdle JD. The Bagby and Kuslich method of lumbar interbody fusion. History, techniques, and 2-year follow-up results of a United States prospective, multicenter trial. Spine (Phila Pa 1976). 1998;23(11):1267–1278.

Park MK, Kim KT, Bang WS, et al. Risk factors for cage migration and cage retropulsion following transforaminal lumbar interbody fusion. Spine J. 2019;19(3): 437–447.

Tallarico RA, Lavelle WF, Bianco AJ, Taormina JL, Ordway NR. Positional effects of transforaminal interbody spacer placement at the L5–S1 intervertebral disc space: a biomechanical study. Spine J. 2014;14(12):3018–24.

Jin, L., Chen, Z., Jiang, C., Cao, Y., Feng, Z., & Jiang, X. (2019). Cage migration after unilateral instrumented transforaminal lumbar interbody fusion and associated risk factors: A modified measurement method. Journal of International Medical Research, 48(2), 1–10.

Yang Hou, Haoyang Shi, Hongyang Shi, Tianyi Zhao, Jiangang Shi, Guodong Shi. A meta-analysis of risk factors for cage migration after lumbar fusion surgery. World Neurosurgery: X 18 (2023)