Case Report

Mimickers in Spine: Migrated Cages Causing Radiculopathy

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Keywords

Fusion cage · Posterior migration · Revision · Spine · Transforaminal lumbar interbody fusion

Abstract

The procedure of interbody fusion has become an established treatment for many spine disorders. This arthrodesis can be achieved by hardware (fusion cage) through many approaches. Initially, posterior lumbar interbody fusion was popularized but had some serious neurological complications related to insertion as well as the migration of the cage. Gradually, transforaminal lumbar interbody fusion (TLIF) was introduced, which proved safer as it involves minimal cord handling, and also migration, if any, remains asymptomatic. We had two patients who were operated for interbody fusion using TLIF technique with subsequent posterior migration of the banana-shaped fusion cage 4–6 month after the index surgery. Both patients presented with radiculopathy mimicking a prolapsed intervertebral disc. These were evaluated and operated with the removal of the migrated cages and revision with bigger-size cages with adequate bone grafting. At the 1-year follow-up, both had remission of symptoms, and radiographs showed no subsequent migration. TLIF procedure is an established procedure to achieve arthrodesis in varying spine disorders with promising result. However, there are only a few reports describing cage migration after the procedure and these have been asymptomatic. Revision surgery is contemplated in the setting of neurological compression or instability. A bigger fusion cage in a compressive mode with adequate bone grafting is used to achieve arthrodesis. The principles of interbody fusion must be followed, and utmost precautions must be taken to prevent this unfortunate complication.

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Introduction

The procedure of interbody fusion has become an established treatment for conditions like degenerative disc disease, spondylolisthesis, and lumbar stenosis with instability. This arthrodesis can be achieved by hardware (fusion cage) through posterior approach. Initially described by Cloward [1] in 1945, posterior lumbar interbody fusion (PLIF) was subsequently modified by Steffee and Sitkowski [2] and since then has been practiced as a routine spinal procedure. Gradually it is now giving way to the safer technique of transforaminal lumbar interbody fusion (TLIF), which involves minimal cord handling [3]. TLIF is reported to have comparative clinical and radiological outcome with PLIF and associated with hardware migration as well [4, 5]. Fortunately, the tract being more lateral, there is a very low risk for cord compression, seldom requiring an emergent revision as compared to PLIF procedure.

Here we present two cases of TLIF with posterior migration of cage producing neurological features requiring a redo procedure with subsequent revision with bigger cage at our tertiary health care centre.

Case 1

A 47-year-old female presented to the outpatient department complaining of chronic low back pain for 5 years, bilateral leg pain with more pain in the left side, and neurogenic claudication with claudication distance less than 100 m for least 2 years. On examination, there was no neurological deficit. Dynamic X-ray did not show any listhesis or instability. However, magnetic resonance imaging (MRI) revealed L3–L4, L4–L5 spinal canal stenosis with dark desiccated discs and flavum hypertrophy with canal diameters at the aforesaid level of 7 mm and 9 mm, respectively (Fig. 1a). An uneventful L3–L4, L4–L5 decompression and TLIF using banana-shaped titanium fusion cages (22 mm × 9 mm and 22 mm × 8 mm, GESCO, India) and bilateral pedicle screw fixation (GESCO, India) was done (Fig. 1b). The cage was inserted from the left side at both levels after packing the fusion cage with the locally harvested bone graft from the facet joint, lamina, and spinous process. The remaining bone graft was packed into the disc space prior to the insertion of the fusion cage. Postoperative course was uneventful, and the patient was mobilized on postoperative day 2. On evaluation after 2 weeks from the day of surgery, the visual analog score improved from 7 to 2 for low back pain, 9 to 0 for leg pain, and 8 to 0 for numbness. She was on regular follow-up but at 4 months post-surgery, she had a domestic fall and was referred to the emergency department with low back pain with severe radiating pain to the left lower limb. Her straight leg raising on the left was 60 degree, and she had weakness of EHL with motor power grade 4/5. Plane radiograph showed migration of cage posteriorly at L4–5 level (Fig. 1c). Computed tomography and MRI scan showed a posterior migrated fusion cage encroaching the L5 neural foramina on left side (Fig. 1d). Revision surgery was performed with the same left side approach with removal of cage at L4–5 level and insertion of larger fusion cage (GESCO, India, length = 25 mm, height = 11 mm) packed with allograft (Fig. 1e). The patient had an expectant recovery and intraoperative cultures from cage and bone graft tissue were negative. At 1 year, she is doing well without any fresh complaints.

Case 2

A 50-year-old female operated elsewhere for grade II spondylolisthesis with TLIF at L4–5 level was asymptomatic for 6 months when she had gradual onset of tingling sensation and numbness in the left lower limb. Her examination revealed decreased sensation in right L5 dermatome and severe radiating pain with reduced straight leg raising. Her X-ray and MRI images were consistent with cage slippage with encroachment of the right sided L5 neural foramina (Fig. 2a, b). There were no signs of infection clinically. Her records and postoperative X-ray immediately after the surgery showed a well-placed banana cage and screws (10 × 22 mm, Gesco, India) (Fig. 2c). She was counseled for a second surgery and the cage was removed and a bullet cage of one size bigger (11 × 25 mm, MJ, India) with autogenous bone graft harvested from posterior iliac crest was placed (Fig. 2d). Postoperatively, she had remission of symptoms and was happy until the last follow-up 12 months after the second surgery.

Discussion

Lumbar interbody fusion has emerged as amicable solution to many aged patients of spinal disorders like spondylolisthesis, degenerative scoliosis, spinal stenosis, and instability. Besides providing anterior column support in patients undergoing posterior instrumentation, it also provides an increased surface area for fusion, leading to enhanced fusion rates over posterolateral fusion [6]. TLIF has become more widely accepted to the classical PLIF as it is easy to perform, is very safe, and has little effect on spinal stability. Many surgeons have reported 90–100% fusion rate after the TLIF procedure using cage and bilateral pedicle screw instrumentation in the scientific journals [7, 8]. However, sometimes it is associated with complications like nerve root injury, dura mater injury, pedicle screw malposition, cage malpositioning, and even migration [9].

Cage migration has been classified as posterior, anterior, or sagittal migration, but posterior migration is the most serious of these because of its possibility to compress the neural tissue [9]. Although both PLIF and TLIF procedures have reported the posterior migration of hardware, the slippage after PLIF procedure is relatively risky as it directly compresses the neural tissue, producing intractable pain and motor deficit necessitating emergency revision surgery [5, 10], whereas posterior migration of fusion cage in post-TLIF procedure is mostly asymptomatic and may not need any further intervention. Aoki et al. [4] revised only one of the three patients of TLIF with posterior migrated hardware.

Zhao et al. [9] reviewed the factors related to cage migration and had some interesting findings. They found that rectangular-shaped and small cages migrated more frequently than did kidney-shaped and large cages [9]. They also observed a higher incidence in double segment fusion and patients with linear adjacent endplates. Grant et al. [11] in their mechanical studies have found that migration rate occurred more frequent in central regions than in posterolateral regions and cages without grafts in them had a significantly higher migration rate than did those with grafts. Among the materials used, PEEK cages had more incidence of migration than carbon fibres or titanium [12]. Similarly, Abbushi and colleagues [13] have done a biomechanical study by creating a grid system with 16 rectangles on the end plate and concluded that anterolateral, anteromedial, and mediolateral regions had no migration compared to others, confirming central regions were weaker than periphery. Maximum probability of cage migration is in media-medial position [13]. Although the posterolateral endplate was stronger than the posteromedial one, the need for facetectomy for cage placement led to

higher migration in these than the latter. Another important finding in their study was that open box cages had less migration than closed boxes. Cage migration is more common in conditions where the adjacent endplates were of linear type when compared with concave or convex type of endplate [9].

It has been reported in the literature that unilateral pedicle screw fixation has equivalent clinical and radiological outcomes as compared to bilateral pedicle screw fixation to achieve fusion and also involves less invasive procedure [8, 14–16]. Unilateral pedicle screw fixation results in weaker biomechanics construct after TLIF procedure and it provides reduced primary stability during lateral bending, flexion, and extension of spine. Aoki et al. [4] considered that cage migration occurs more commonly in patients treated by unilateral fixation than in those treated by bilateral fixation.

Despite its rare occurrence, the consequences of cage retropulsion are disabling to the patient, and revision surgery is technically challenging with epidural fibrosis and scarring from prior surgical intervention. Hence, some surgeons have even retrieved the cages with a lateral, anterior, and even transdural approach [16–18]. All these have significant risk of iatrogenic complications.

As a higher number of surgeons with varying skills keep performing this procedure, it is best to stick to principles of TLIF to reduce if not avoid this unexpected complication.

Conclusion

Posterior interbody fusion procedure is an established procedure to achieve arthrodesis in varying spine disorders. At present, TLIF is the preferred technique performed with promising result. Posterior migration of fusion cage following TLIF procedure is a rare finding and may need revision surgery if features of nerve compression or instability present. A bigger fusion cage can be used in a compression mode by the pedicle screw rod complex to achieve arthrodesis. Filling the cage with bone graft and adequate packing of bone graft into the disc space prior to insertion of cage is recommended. Adequate care should be taken to avoid any destruction to the posterior wall of the vertebral body to reduce the chance of migration.

Statement of Ethics

Consent was taken from both patients at the time of surgery. Subjects have given their written informed consent to publish their case (including publication of images). The study protocols have been approved by the institute's committee on human research. Animal experiments conform to institutional standards.

Disclosure Statement

The authors have no conflicts of interest to declare.

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Fig. 1. **a** Radiograph showing L3–4, L 4–5 TLIF with banana cage in situ after index surgery. **b** Radiograph showing posterior migration of L4–5 fusion cage in lateral view and rotation in anteroposterior view. **c** MRI showing encroachment of left L5 neural foramina and absence of collection or vertebral body edema. **d** Radiograph images showing L3–4, L4–5 TLIF with a revised bigger cage at L4–5 level.

Fig. 2. **a** Radiograph showing L4–5 TLIF with well-placed fusion cage. **b** Radiograph showing posterior migration of L4–5 cage. **c** MRI scan image showing posterior migration of L4–5 cage. **d** Radiograph showing L4–5 TLIF revised with a bigger cage at L4–5 level. **e** Computed tomography scan (sagittal) showing compression at posterior vertebral body.