Cage Retropulsion after Transforaminal Lumbar Interbody Fusion Surgery: Case Report

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ABSTRACT

Cage Retropulsion is an uncommon complication following transforaminal lumbar interbody fusion (TLIF) surgery. The estimated rate of cage retropulsion has reportedly been < 1% in previous studies. Risk factors for cage retropulsion after lumbar interbody fusion surgery includes patient-related factors, radiological findings, surgical procedure-related factors and postoperative factors. In the event of retropulsion, revision surgery should be performed for patients with neurologic deficits or clinically symptomatic, and conservative treatment is encouraged in patients who are asymptomatic.

Keywords: Retropulsion, Transforaminal Lumbar Interbody Fusion (TLIF), complication

Introduction

TLIF surgery is commonly used for treating degenerative lumbar diseases such as degenerative disc disease, degenerative spondylolisthesis, and degenerative lumbar scoliosis[1,2]. A fusion cage filled with auto-cancellous bone or allo-bone is generally implanted into the intervertebral space after decortication of the vertebral endplates during interbody fusion in relation to facilitating spinal interbody fusion. Interbody fusion with a cage can obtain a firm union and restores the disc height with normal sagittal and coronal alignment.

Complications associated with use of TLIF cage such as subsidence, migration, and mechanical failure have been reported by several studies in the past [3,4]. Cage retropulsion can even directly compress the dural sac or nerve root and cause neurological symptoms. To improve clinical symptoms, the protruded cage must be removed or replaced, thus requiring a revision surgery. However, a revision surgery is technically demanding because of the massive fibrosis of surrounding tissues. Furthermore, vague clinical symptoms sometimes may be concerning for spine surgeons, making it difficult to decide a revision surgery. Hence this case report purports to evaluate the risk factors for cage retropulsion, which can lead to complications that can result in narrowing of the spinal canal or foraminal stenosis, such that the revision surgery could be avoided in the future.

Case Presentation

33 years old lady from Nepal presented with low back pain for 3 months which was severe for 1 week with associated left sided radicular pain and tingling sensation. There was history of L5-S1 discectomy surgery done 2 years back (Figure 1). Due to failure of all modalities of conservative management, unilateral TLIF surgery was done at L5-S1 level this time. Post-operatively dressing was done on 3rd post operative day. Mobilization with rigid lumbo-sacral orthosis (RLSO) and physiotherapy exercises were started under the expert guidance of physiotherapist from the 1st post-operative day as pain tolerated.

She presented with severe low back pain on 9th post-operative day following unilateral TLIF surgery. There was difficulty in walking however bowel and bladder habit were normal. Plain x-ray of lumbosacral spine was done which showed cage retropulsion into the canal (Figure 2 & 3). Previous MRI showed pear shaped disc at L5-S1 level (Figure 1). However, neurology of the patient was intact.

Revision surgery was done the same day. TLIF cage (size 7 × 25 mm) could be visualized loosely attached

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at L5-S1 disc space (Figure 4) which was removed and replaced with larger size cage (size 9 × 25 mm) (Figure 5 and 6). Patient had significant relief in pain and could walk pain free from the next day. Mobilization and physiotherapy were started from the 1st post-operative day. Suture out was done on 14th post-operative day following the revision surgery. The RLSO brace was continued post-operatively till 6 weeks. Core muscle strengthening exercises were started after 6 weeks.

Postoperatively, patient was followed up on 2 weeks, 6 weeks, 3 months and 6 months of revision surgery. Low back pain has significantly reduced with Oswestry Disability Index (ODI) reducing from 84% pre-operatively to 8% on 6 months follow up following revision surgery.

Discussion

Cage migration is a rare complication following TLIF surgery. Various studies on cage retropulsion

Figure 1

Figure 2

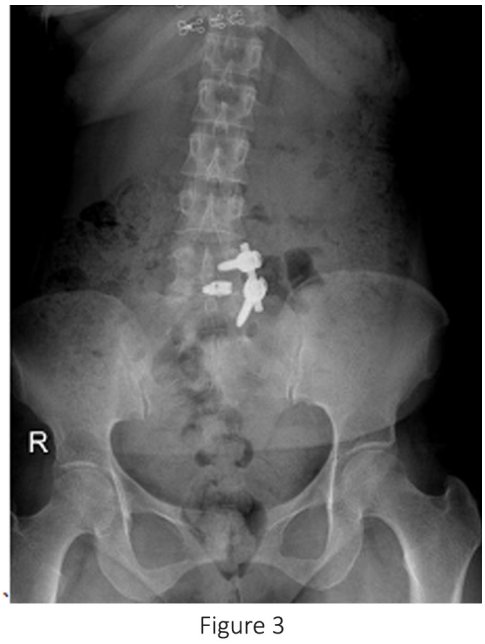

Figure 3

Figure 4

Figure 5

Figure 6

Fig 1: T2 weighted sagittal MRI of Lumbosacral(L-S) spine with disc herniation at L5-S1 level; Fig 2: X ray of L-S spine lateral view with cage retropulsion; Fig 3: X ray of L-S spine AP view with cage retropulsion; Fig 4: Intra-operative clinical picture showing cage retropulsion; Fig 5: Xray of L-S spine lateral view with TLIF cage in normal position following revision surgery; Fig 6: Xray of L-S spine AP view with TLIF cage in normal position following revision surgery

have reported the incidence ranging from 0.8% to 25%[5,6]. Several risk factors associated with cage retropulsion after interbody fusion have been described.

Kimura et al.[5] reported following risk factors for cage retropulsion: (1) pear-shaped disc space, (2) involvement of L5/S1 level, (3) wide disc space with instability, and (4) multilevel fusion surgery. To overcome the complication of cage retropulsion, they proposed the use of expandable cages. In addition, Abbushi et al[7]. reported that cage positioning and cage type influenced cage retropulsion. Aoki et al.[8] suggested that a bullet-shaped cage, higher posterior disc height, presence of scoliotic curvature, and undersized fusion cages were possible risk factors for cage retropulsion.

Multiple studies have revealed that the lack of posterior screw fixation was a main risk factor for cage retropulsion. In settings with a lack of posterior instrumentation, cage retropulsion can occur because of spinal flexion forces, which leads to mechanical failure and inter-segmental nonunion. Insufficient posterior fixation leads to residual spinal instability, possibly causing posterior screw loosening and cage retropulsion. Thus, firm posterior instrumentation is critical for preventing cage retropulsion, which can lead to mechanical spinal failures. Revision surgery for cage retropulsion is technically challenging and complicated procedure which can potentially increase postoperative pain and the probability of neurological deficits [9].

In our study, undersized fusion cage (size 7 × 25 mm) was used which could be the major contributing factor for cage retropulsion which was later replaced by larger size cage (size 9 × 25 mm) in revision surgery. Distraction was done to create space for larger size cage and compression was done following the cage insertion. Pan et al.[6] reported that the use of an undersized cage was potentially a risk factor for cage retropulsion. This mechanism might be associated with inadequate contact between the endplate and cage because the two studies mentioned above demonstrated that uneven stress generated by the cage and vertebral endplate could lead to instability. When surgeons perform endplate preparation in patients with pear-shaped discs, meticulous endplate decortications are required to avoid cage retropulsion. Furthermore, an adequate cage size with sufficient axial compression is required for firm interbody fusion.

Based on study by Kimura et. al[5], pear-shaped disc was significantly associated with a higher incidence of cage retropulsion resembling the reported case. Because a pear-shaped disc does not tend to make contact with all four corners of the cage in the sagittal plane, it may lead to instability between the endplate and cage. Hence, the pear-shaped disc could be another contributing factor for cage retropulsion in the reported case.

Duncan et al.[10] reported statistically significant higher rate of TLIF cage migration in the unilateral fixation group, as compared to the bilateral fixation group. Similar study by Burton et al.[11] performed a biomechanical analysis to compare stability of unilateral and bilateral fixation with interbody cages. Burton's study demonstrated that the construct utilizing unilateral fixation with an interbody cage showed statistically reduced stability with axial rotation. As unilateral TLIF surgery was done in our case, this could be another contributing factor for cage retropulsion. However, unilateral TLIF surgery was carried out as revision surgery considering it to be less invasive procedure with less tissue destruction and blood loss.

Conclusion

Cage Retropulsion is an uncommon complication following TLIF surgery. There are multiple risk factors for this complication, including patient factors, radiological characteristics, surgical techniques and postoperative reasons. If retropulsion does occurs, revision surgery is essential for the patients with neurological deficits or clinically symptomatic patient whereas conservative treatment and close observation is recommended for asymptomatic patients.

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