Research Article

Transforaminal Interbody Fusion For Post Discectomy Pain Syndrome; Rational, Surgical Techniques and Clinical Outcome

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Abstract

Introduction: Post-discectomy Pain Syndrome (PDPS) is defined as persistent pain following lumbar discectomy, Either local back pain, radicular pain or both, Following lumbar disc surgery. ٢٥٪ of discectomy patients undergo additional surgery in the following ١٠ years, ١١-١٥٪ of patients have disabling lower-back pain after an operation for radicular symptoms. Surgical Management of Post-discectomy Pain Syndrome (PDPS) with Transforaminal Lumbar Interbody Fusion (TLIF) is evolving technique gaining a lot of popularity. it has the advantages of cleaning of the epidural fibrotic tissue, treating the recurrent disc herniation and spondylodiscitis by excising the remaining disc tissue providing stable fusion for facet joint arthrosis, erosive osteocondritis, and instability, restoring disc height and sagittal balance, avoiding possible complications of anterior approaches. **material and methods:** A total of ٣٣ patients were included in this study, all of them has back dominant pain following lumar disc surgery.The male to female ratio is ٣ to ١, age ranges from ٢٧ to ٦٤ years with mean age of ٤٣.٢. All patients had no response to ٦ weeks conservative treatment. MRI, ٣D CT scan, lumbar dynamic X-rays, Visual Analog Scale (VAS), Oswestry Disability Index (ODI) were obtained. **Results:** The mean interval between index surgery and TLIF surgery was ٩(٣.٥-٣٤) months. The mean follow-up was ١٤.٢(٣-٢٢) months, Preoperative mean VAS ٨.١(٧-٩). Mean postoperative VAS ٢.٤(١-٤), Final follow-up VAS ١.٨ (٠-٤). Preoperative mean ODI ٤٨٪ (٣٢-٦٤٪), Postoperative mean ODI ٢٦.٤٪ (٥-٤٠٪). Final follow-up ODI ٢٤.٢٪ (٠-٣٦٪). The incidence of complication in this study ١٢٪ a total of four patients develpoed transit complication following surgery, two patents developed superfacial wound infection, one developed cerbro spinal fluid leak, one developed deep venous thrombosis, all were treated consevatively. **Conclusion:** Postdiscectomy pain syndrome is a complex modality with different underlying conditions, proper patient selection, accurate diagnosis of underlying mechanisms and minimal invasive procedures are of extreme importance in order to avoid unnecessary surgical procedures, Transforaminal interbody fusion with posterior pedicle screw fixation and fusion is found as a highly effective procedure for the relief of posdiscectomy pain that is resistant to conservative treatment options.

Key Words: Post Discectomy**,** Clinical Outcome and disc surgery.

Intoduction

Post-discectomy Pain Syndrome(PDPS) is defined as persistent pain following lumbar discectomy, Recurrent lumbar disc herniation (RLDH) is a major cause of surgical failure, the incidence of which is reported from ٥ to ١١٪, with an increased incidence as the follow-up period is extended ,about ٢٥٪ of discectomy patients undergo additional surgery in the following ١٠ years, ١١-١٥٪ of patients have disabling lower-back pain after an operation for radicular symptoms

The optimal technique for treating RLDH is controversial. Some authors believe that repeat discectomy is the treatment of choice, with similar clinical results compared to the primary procedure[٣,١٢], but approach-related complications can be considerable. Scar tissue makes a repeated discectomy more difficult, increasing the

risk of dural tear or nerve injury[١١,١٤]. Some spine surgeons believe that fusion is necessary for treating disc reherniation. As repeated discectomy for either ipsilateral or contralateral recurrence requires the removal of more disc material and posterior elements, such as lamina or facet joint, further invasion at the same surgical level can increase the risk of segmental instability[٣,١١]. Therefore, the use of fusion to treat or prevent segmental instability after repeated discectomy appears to be a reasonable choice in cases of recurrent disc herniation.

Several authors reported the results of posterolateral fusion (PLF) for RLDH [٩], but there are few reports on RLDH treated with the transforaminal lumber interbody fusion (TLIF) technique. TLIF affords the opportunity to achieve stable three-column fixation with anterior support, simultaneous anterior and posterior fusion, and inherent stability through a single posterior surgical approach and unilateral placement of interbody cages. The purpose of this study is to evaluate the efficacy Rational, Surgical techniques and Clinical outcome of the TLIF technique for patients with RLDH.

Materials and methods

Between April ٢٠١١ and June ٢٠١٣, ٣٣ patients admitted to department of neurosurgery, menofyea university hospital underwent reoperation by the authors following primary lumbar discectomy. There were ٢٥ men and ٨ women, the male to female ratio is ٣ to ١, age ranges from ٢٧ to ٦٤ years with mean age of (٤٣.٢ years) a total of ٣٣ patients were included in this study, all of them has either back dominant pain, radicular pain or both following lumar disc surgery.

Indication for surgery

The inclusion criteria for this study were patients who were suffering from intractable chronic low back pain and/ or radicular symptoms that had failed conservative treatment for at least ٦ months: (١) at least ٦ months of pain relief after primary disc surgery, (٢) the presence of recurrent radicular pain unresponsive to conservative treatment, leading to a repeat operation and (٣) recurrent disc herniation at the same level as previous discectomy, either the ipsilateral or the contralateral side.eighteen patients had one lumbar disc operation before admittance to hospital, nighn had two and six had three operations. The primary procedures included discectomy with laminotomy in seven patients, discectomy with unilateral hemilaminectomy in ١٢ and discectomy with bilateral laminectomy (total laminectomy) in ١٤. The time from the primary surgery to that of recurrence averaged ٧.٢ years (range ١.٥–٢٣ years).

The levels of recurrent disc herniation were ١٩ cases at L٤–٥ (twelve ipsilateral and seven contralateral), ١٢ at L٥–S١ (٨ ipsilateral and four contralateral) and two at L٣–٤ (ipsilateral).

Radiological evaluation

All patients had MRI lumbosacral spine with and without contrast, lumbar dynamic X-rays pre operative, CT scan lumbosacral spine, and CT scan lumbosacral spine ,lumbar dynamic X-rays post operative, at ٣ months, ٦ month, ١٢ month during follow up to check for fusion and stability of the construct

Radiographic and clinical evaluation

Criteria for a successful fusion were the lack of motion on flexion/extension X-rays and, anterior bridging bone and the lack of lucencies /or contiguous bone through the cage using a thin-cut sagittal CT scan.

Nonunion was defined as a cage subsidence and screw or rod breakage in combination with lytic zones around the screws or cages. Lack of bony bridging in front of the cage
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Surgical techniques

paramedilne mucle approach was utilized in all patients, dissection was extended just lateral to the facet joints through a midline posterior skin approach. The epidural scar tissue in the area of the previous laminectomy was left intact. Pedicle screw sites were prepared in the usual fashion. On the symptomatic side, the pars interarticularis was removed and a hemifacetectomy performed on the superior and inferior facets at the level of the spinal

segment to be fused to provide access to the intervertebral disc. The traversing nerve root is protected by sliding a retractor along the upper surface of the pedicle of the inferior vertebra. The exiting nerve root hugs the inferomedial surface of the pedicle and can be directly visualised throughout the procedure. A nearly complete discectomy is performed using disc shavers, curettes and rongeurs. End-plate decortication was performed. Intervertebral disc space spreaders were then sequentially inserted and rotated to restore the normal disc space height. Once the disc space is distracted, the anterior two-thirds of the disc space is packed with cancellous bone from the laminectomy bone or iliac crest autograft. after inserting a trial cage A lateral fluoroscopic image is obtained to confirm proper size A single PEEK cage packed with laminectomy bone is inserted posterolaterally and oriented anterome-dially. A lateral fluoroscopic image is obtained to confirm proper positioning of the cage. Then, connecting rods are placed and compression is applied across the instrumentation to restore segmental lordosis and are locked in place.

Functional outcome measurement

Surgery outcomes were assessed based on the recovery rate and were classified using a four-grade scale: excellent, improvement of over ٩٠٪; good, ٧٥٪ to ٨٩٪ improvement; fair, ٥٠٪ to ٧٤٪ improve-ment; and poor, below ٤٩٪ improvement The visual analogue pain intensity scale (VAS) was recorded for all patients pre-operatively, post-operatively, and at follow-up. The mean follow-up was ١٩ months (range ٨–٢٠ months).

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Statistical methods

Statistical analysis was carried out with Microsoft Excel '٩٧ (Redmond, WA, USA) and SPSS (version ١٠), applying the Wilcoxon test and the Mann-Whitney U-test with a significance level of ٥٪ (p<٠.٠٥

Results

The mean interval between index surgery and TLIF surgery was ٩(٣, ٥-٣٤) months. The mean follow-up was ١٤, ٢(٣-٢٢) months, Preoperative mean VAS ٨.١(٧-٩). Mean postoperative VAS ٢.٤(١-٤), Final follow-up VAS ١.٨(٠-٤). Preoperative mean ODI ٤٨٪ (٣٢-٦٤٪), Postoperative mean ODI ٢٦.٤٪ (٥-٤٠٪) Final follow-up ODI ٢٤.٢٪ (٠-٣٦٪) .

The incidence of complication in this study ١٢٪ a total of four patients develpoed transit complication following surgery ,two patents developed superfacial wound infection, one developed cerbro spinal fluid leak, one developed deep venous throm-bosis, all were treated consevatively

Conclusion

Postdiscectomy pain syndrome is a complex modality with different underlying conditions, proper patient selection, accurate diagnosis of underlying mecha-nisms and minimal invasive procedures are of extreme importance in order to avoid unnecessary surgical procedures.

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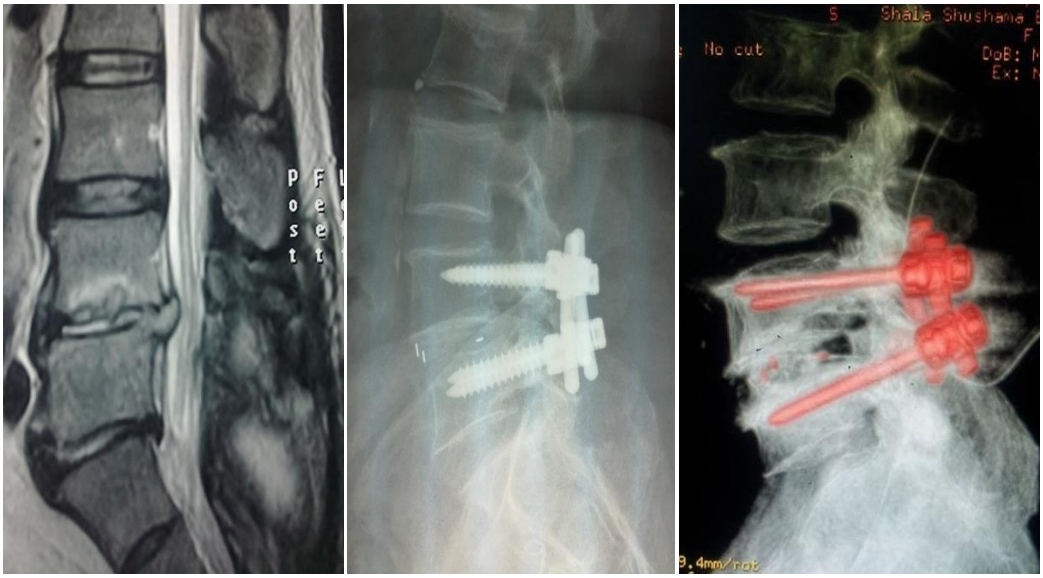
Transforaminal interbody fusion with posterior pedicle screw fixation and fusion is found as a highly effective procedure for the relief of posdiscectomy pain that is resistant to conservative treatment options.



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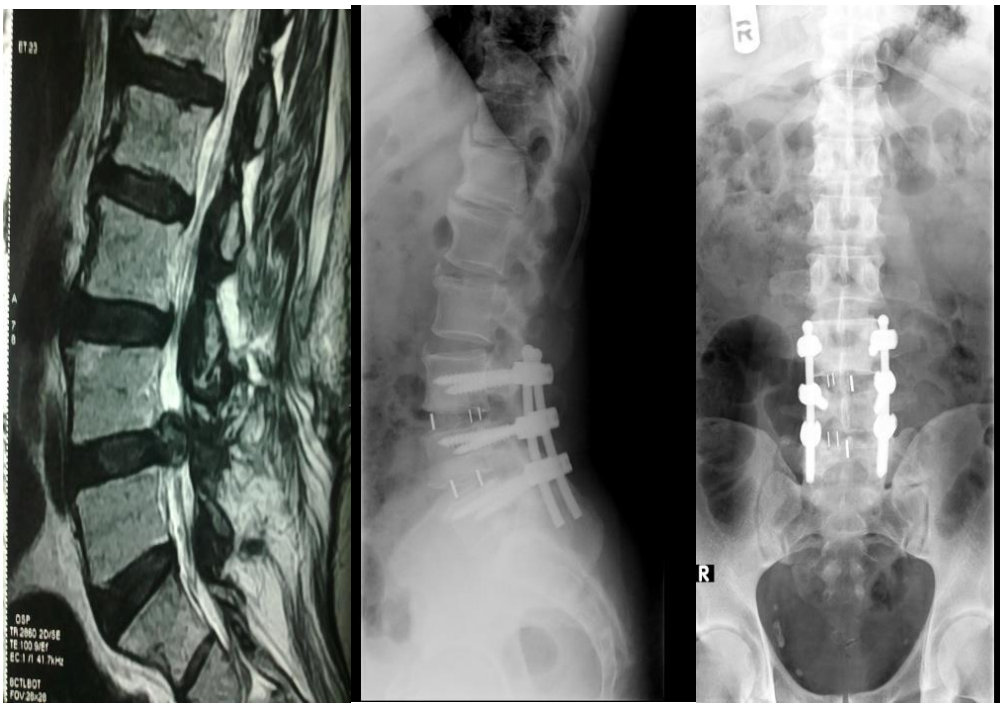
Sagittal T٢ MRI showing recurrent L٤l٥ disc
Plain x ray lat. View showing the implant in place
Saggital ٣D reconstruction showing implant in place



Sagittal T٢ MRI showing recurrent L٤l٥ disc and L٣-٤ stenosis
Plain x ray lat. View showing the implant in place
Plain x ray A-P view showing the cages and the construct at L٣-٤/L٤-٥ levels

Discussion

The optimal surgical approach for recurrent disc herniation remains a subject of controversy. Discectomy with fusion has several theoretical advantages. Specifically, interbody fusion reduces or eliminates segmental motion, immobilises the spine, reduces mechanical stresses across the degenerated disc space[١] and may reduce additional herniation at the affected disc space[١٥]. Lehmann and LaRocca[٩] treated ٣٦ patients following previous lumbar surgery by spinal canal exploration and spinal fusion. Solid fusion correlated

closely with satisfactory outcomes, and the patients in the fusion group tended to have better outcomes than those with disc excision alone Revision spinal surgery is more challenging than primary surgery, owing to the indistinct anatomical planes and perineural scarring. Ebeling et al.,[٤] reported a complication rate of ١٣٪ after repeated discectomy, and dural tears and infections were the most common problems.

However, TLIF provides an approach through facetectomy to enter unscarred virgin tissue. Therefore, the surgeon can approach the target site safely without demanding dissection of the fibrotic scar tissues, and excessive retraction of scarred nerve root and dura, the potential risk of dural tear and nerve injury may also be decreased. Only two (٤.٧٪) cases experienced dural tear during surgery in our series, which is lower than the previous reports[٨, ٩].

Postoperative degenerative changes after the conventional discectomy can arise with time. Gradual disc space subsidence and impingement of the superior facet could result in foraminal stenosis.

Because the foraminal portion can be exposed in the course of the TLIF approach, adequate foraminal decompression can be easily accomplished. Satisfactory outcomes were obtained from our study. None of the patients had a poor result, although three patients had transient neurological deficits, which were completely resolved within ٣ months. These are comparable with the rates of satisfactory clinical results reported by others[٢, ٣,١٢, ١٥].

We used a single cage inserted diagonally from the symptomatic side. A more lateral entry point compared with posterior lumbar interbody fusion (PLIF) is selected, which can reduce dura and nerve root retraction and minimise the risk of neurological injury. Zhao et al.,[١٦]

demonstrated that, as only unilateral facetectomy is required for the insertion of a single cage, the stiffness of the construction is significantly superior to the standalone two-cage analogue. Because the cage we used has ٣ or ٨ degrees of lordosis, TLIF enables the reconstruction of the anterior column and restores lumbar lordosis.

Bone grafting of the available surface area of the disc space is important for fusion success. Before cage insertion, the prepared laminectomy bone or iliac crest autograft was grafted into the prepared disc space and in the cage. Because we used only one cage, there was more space for the bone graft than when two cages were inserted. We believe that the bone outside the cage has greater fusion potential than the bone inside the cage.

The placement of additional bone grafts around the single cage may enhance the fusion rate; there were no pseudarthroses in our series.

The peri-operative complication rate lies within the rates described in the current literature[٥, ٧,١٤,١٧,١٩] and confirms that with increasingly demanding technique, the complication rate increases but there were ٣ patients developed surgery-related complications in the TLIF group. A currently increasing number of papers reporting on TLIF results reflect that the technique is gaining in popularity,

Factors that could affect outcomes of lumbar interbody fusion are numerous[١–٤,٧–٩,١٨]. In patients suffering from chronic low back pain related to a post-discectomy syndrome, a good clinical and functional outcome after lumbar interbody fusion is dependant on achiving adequte decompression of the neural strcture, elimination of instability and restortion of spine stiffness, In our group of patients, the success rate could be demonstrated by only three factors: radiological fusion, results of VAS, and functional recvery and working state.

Based on these clinical outcomes as well as the theoretical advantages of TLIF, we found the TLIF technique to be an effective procedure with satisfactory clinical results for the treatment of recurrent lumbar disc herniation. It can restore the stability and

lordosis of the lumbar spine, and has low complication rates.

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