

# Result of Study Of Transforaminal Lumbar Interbody Fusion (TLIF) Surgery

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## Abstract

**Background:** Low back pain is one of the most common reported problem affecting spine. The most common causes of Low back pain are herniated discs, lumbar canal stenosis, degenerative disc disease, spondylolisthesis. Over the past few decades, new treatments and technologies are being implemented to treat spinal disorders to improve patient outcome. The Main objective of study is to access clinical and Radiological result that is obtained with Transforaminal lumbar interbody fusion as a treatment of severe back pain and degenerative disc diseases & to describe outcomes following Transforaminal lumbar interbody fusion (TLIF) surgery.

**Methods:** A Total of 15 patients who had back pain with degenerative disc disease were operated by TLIF through period from July 2017 to July 2018. Results were measured using the Visual Analogue Scale (VAS) and Oswestry Disability Index (ODI).

**Results:** Marked improvement in back pain according to VAS. Pre operative Average VAS Score was 7 and post operative average VAS score at 6 month follow up was 1.73. According to ODI score pre operative average ODI score was 66.53 and post operative 6 month ODI score was 18.53

**Conclusion:** From this study we have concluded that Transforaminal lumbar interbody fusion (TLIF) is a safe and effective method of achieving spinal fusion in patients with degenerative disc disease & low grade spondylolisthesis and thereby reduces back pain and improves patient's disability score

**Keywords:** Transforaminal lumbar interbody fusion- TLIF, Visual Analogue Scale- VAS, Oswestry Disability Index- ODI, PEEK

## Introduction:

Low back pain is one of the most common reported problem affecting spine. The most common causes of Low back pain are herniated discs, lumbar canal stenosis, degenerative disc disease, spondylolisthesis. Over the past few decades, new treatments and technologies are being implemented to treat spinal disorders to improve patient outcome.

Degenerative disease of the lumbar spine is a serious problem that causes varying degrees of disability like Lower back pain, sciatica, paraesthesia, weakness and intermittent claudication. Degeneration leads to instability, facet joint arthropathy, osteophyte formation and these leads to back pain and symptoms of neuropathy due to compression of root or spinal cord.

There are different ways to treat degenerative spinal problems and surgery to relieve pressure on root or cord and fusion of spine is one of them. The goal of fusion of the lumbar spine is to obtain a primary solid arthrodesis to alleviate back pain due to instability. There are many techniques of spinal fusion like combined anterior-posterior fusion (APF), posterior lumbar interbody fusion (PLIF), transforaminal lumbar interbody fusion (TLIF), oblique lumbar interbody fusion (OLIF) with or without cage insertion.

Harms et al., first introduced the technique of TLIF in 1982. Since then TLIF is an increasingly popular treatment for degenerative lumbar conditions. It's unilateral posterior alone approach enables anterior column stabilization and

360° fusion. Advantage of TLIF is it is all posterior approach so there is less morbidity than anterior approach. In TLIF the approach is more lateral so there is less chances of spinal cord injury.

In our study we evaluated outcome of TLIF procedures carried out in Medical College and SSG Hospital, Baroda with the help of Oswestry disability index (ODI) and VAS score. The purpose of the study was to analyze the outcome of patients who underwent spinal fusion by TLIF up to 6 months of surgery. (Fig. A)

## Materials and Methods

During the period from July 2017 to July 2018, interventional prospective study was carried out at Department of Orthopaedics, Medical College & SSG Hospital Baroda after getting ethical clearance.

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Figure A: PLIF Vs TLIF

Figure B: Posterior approach to spine

Figure C: Step for cage insertion

### Inclusion criteria

Patients with age between 20 to 70 years having chronic back pain due to vertebral disc diseases not responding to conventional conservative methods.

### Exclusion criteria

1. Patients with severe neurological deficit.
2. Patients having ODI score between 80-100.
3. Patients having multiple level disc protrusion.
4. Patients with age less than 20 years and more than 70 years.

### Operative Procedure

Anaesthesia: general anaesthesia and preoperative hypotensive anaesthesia was given for blood less operative field.

Position: Prone position is given on reton hall frame which allows the abdomen free, intravenous pressure is decreased, and blood loss is decreased as a result of collapse of the epidural venous plexus.

By this position lumbar lordosis is obliterated.

Marking: under II TV guidance level to be operated were marked.

Approach: posterior approach to the spine by Wagoner [1] (Fig. B).

- Make a longitudinal incision over the spinous processes of the appropriate vertebrae, and incise the superficial fascia, the lumbodorsal fascia, and the supraspinous ligament longitudinally, precisely over the tips of the processes.
- Dissection done and all muscles were retracted from the spinous process with

the help of Cobb's elevator.

- Affected spinal segment level to be operated is identified and confirmed under II TV image. Further dissection carried out so that pedicles were identified for pedicle screw insertion.
- Blood loss can be decreased further by using electrocautery and a suction apparatus.

STEPS: after routine exposure of the spine, surgery is divided into following steps.

1) Transpedicular screw insertion: Under I.I.T.V. guidance screws are inserted from across the pedicle anterior into the body. After deciding entry point, with the help of nibbler some bone is nibbled to fix the entry point. With the help of awl entry is made through pedicle. Awl goes by itself in direction of medulla of pedicle. Ball tip is used to check any perforation in pedicle. The pedicle screw is introduced. Two screws inserted above and two screws inserted below the affected level. Rod opposite to the side from which cage to be inserted are inserted after giving curve to rod as to align lumbar lordosis and then distraction was done with the help of distractor.

2) Laminectomy and Decompression: The dural sac and roots are decompressed by standard laminectomy. The bone removed from the resection of the spinous process and the lamina is preserved for bone grafting. The side of facetectomy was chosen according to the subject's symptoms of leg pain. On the side of radicular pain or neurological affection for a minimal

decompression is done by removing some bone and osteophytes surrounding them. Facetectomy was done towards which disc protrusion was there. Hypertrophied ligamentum flavum removed.

3) Discectomy and end plate preparation Discectomy is done at identified level. A posterolateral annulotomy is made with cruciate incision and subtotal discectomy is performed with the help of disc forceps and the hyaline cartilage of end plates is removed. Gradual rimming of the disk space is done with 7 to 12mm rimmer. Preparation of end plate is done by curettage to stimulate fusion potential. Box curette is used.

4) Interbody fusion

Size of the cage is decided by cage sizer. Before insertion of cage bone graft is inserted in disc space anteriorly through bone graft funnel and then PEEK cage or titanium BULLET cage is inserted filled with bone graft prepared from removed spinous process.

Some pieces of bone graft from spinous process inserted towards opposite facet. After that second rod is inserted and fixed. Compression is done with the help of compressor. Abgel is kept over dura. Shingling and decortication done to promote posterior fusion.

Closure is done in routine method from deep to superficial structures under negative suction drain and postoperative haemogram is obtained to decide for the replacement of blood. (Fig. C)

Post-operative protocol

- Post operatively patients were examined and post operative neurology noted.

**TABLE 1 : VAS SCORE IN PREOPERATIVE AND POST OPERATIVE PATIENTS**

Vas Score	No. of Patients(Pre Operative)	No. of Patients at Final Follow Up (Post Operative)
1	0	5(33.33%)
2	0	6(40%)
3	0	4(26.67%)
4	0	0
5	0	0
6	3(20%)	0
7	9(60%)	0
8	3(20%)	0

- IV antibiotics were given for 5 days
- Lumbo-sacral belt were given to the patients
- High sitting, bed side knee bending was allowed second post operative day.
- Patients were mobilized with walker 3 to 5 post operative day.
- Dressing done on 5th and 9th post operative day.
- Stitch removal done on 12th post operative day if dressing is clean.

**Follow up protocol**

- Patients were followed up every monthly for 6 month for clinical evaluation and complications if any.
- Every monthly ODI score and VAS score were noted.
- Every monthly x-rays were done to assess the implant status and fusion.
- At the end of 6 month final follow up done and final ODI score and final VAS score noted.
- For assessment of fusion at the end of 6 month lumbo sacral spine flexion extension X-rays were done.

**Results:**

In present study total 15 patients were operated with age ranging from 35 to 65 years with average age 50 years. 8 patients were female and 7 patients were male. 7 (47%) patients were having left sided radiculopathy, while 5(33%) were having right and 3(20%) having bilateral radiculopathy. L4-L5 level was the most common level involved in 80% patients followed by L5- S1(13.33%) and other

levels were least commonly involved (6.67%).

2 patients (13.33%) were having spondylolisthesis. In our study 1 patient (6.67%) developed early postoperative infection which resolved with parenteral antibiotics. Average duration of time for surgery in our study was 124 minutes. In present study at 6 month follow up all patients had solid fusion which was assessed using

Brantigan & Steffee fusion criteria. In our study average preoperative VAS score was 7 and average post operative VAS score at 6 month follow up was 1.73.

In our study average preoperative ODI score was 66.53 and average postoperative ODI score at 6 month follow up was 18.53.

**Discussion:**

Lumbar interbody fusion is most commonly used for degenerative disc disease, lumbar canal stenosis, disc herniation, spondylolisthesis. Since 1944, innovative implants for the disc space and supplemental instrumentation have been used to drastically improve fusion outcomes. There are mainly two approaches for interbody fusion anterior approach and posterior approach. With anterior approach there is increased morbidity related to approach. Approach related morbidity is less with posterior approach compared to anterior approach. Most commonly used methods for interbody fusion are TLIF (transforaminal lumbar interbody fusion), PLIF (posterior lumbar interbody fusion) and more recently

OLIF (oblique lumbar interbody fusion). Posterior lumbar interbody fusion (PLIF) was first attempted by Cloward [2] in 1940 and later revised by Lin [3]. Although the PLIF procedure is useful in many cases, there are complications and contraindications. To obtain unobstructed access to the disc, the surgeon must retract the dural sheath out to midline. This manipulation can lead to nerve injury or spinal cord injury. Additionally, PLIF usually is limited to L3-S1 because of the increased risk of damage to the conus medullaris and cauda equina resulting from the need for retraction above these levels [4].

The transforaminal lumbar interbody fusion (TLIF) technique was described by Harms and Jerszensky as a modification of the well-established PLIF procedure [5]. The TLIF uses a posterior approach to the spine that runs through the far lateral portion of the vertebral foramen accesses the disc space, which provides the surgeon with a fusion procedure that may reduce many of the risks and limitations associated with PLIF, yet produces similar stability in the spine. This has been shown to reduce the incidence of postoperative radiculitis [6]. TLIF usually is performed through unilateral approach preserving the interlaminar surface on the contralateral side, which can be used as a site for additional fusion. More lateral access to the disc space in the TLIF technique requires less retraction of the thecal sac and neural elements than with the PLIF technique.

In a comparative study of PLIF with TLIF Humphreys et al [7] concluded that the TLIF showed to be a good alternative to PLIF with relatively less complications, less operating time with

**TABLE 2 : ODI SCORE IN PREOPERATIVE AND POST OPERATIVE PATIENTS**

ODI score	0-20	21-40	41-60	61-80	81-100	Total
No of patient (preop)	0	0	5	10	0	15
No of patients (post op)	10	5	0	0	0	15

less blood loss during operation and hence reduced hospitalization. It reconstructs anterior column and brings back the sagittal balance in through an all posterior approach [8]. TLIF maintains the posterior soft tissues covering the dural sac. In biomechanical point of view, the interbody construct provides anterior support and the posterior soft tissues, pedicle screws and rods provide posterior tension band 20.

In present study hypotensive anaesthesia was used in all patients to provide bloodless field intraoperatively with reduced blood loss that no blood replacement were required intraoperatively or post operatively an operative time was decreased. In all cases we have used bullet cage of either titanium or PEEK (poly ethyl ether ketone) material filled with autogenous bone graft prepared from cut spinous process. The purpose of placing cages is to restore disc height and lumbar lordosis to keep ligaments in appropriate tension. It also serves as a carrier for bone graft and provides stability for fusion. Before insertion of cage bone graft is inserted anteriorly with bone graft funnel to augment anterior interbody fusion. After cage insertion shingling and decortication done in all patients with placement of additional bone graft to promote posterior fusion.

In present study total 15 patients were operated with age ranging from 35 to 65 years with average age 50 years. 8 patients were female and 7 patients were male. 7(47%) patients were having left sided

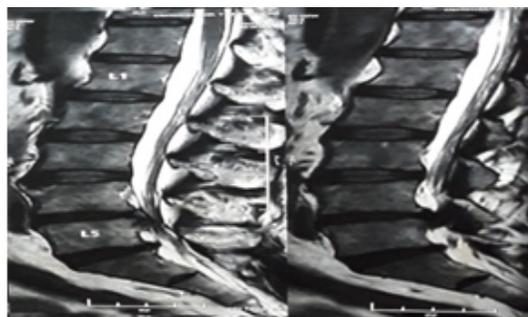
radiculopathy, while 5 (33%) were having right and 3(20%) having bilateral radiculopathy. L4-L5 level was the commonest level involved in 80% patients followed by L5-S1 (13.33%) and other levels were least commonly involved (6.67%). 2 patients (13.33%) were having spondylolisthesis. In study by Muhammad Talha et al. [9] also found that most commonly operated level was L4-L5 (61.6%) followed by L5-S1 and 17.94% patients were having spondylolisthesis. In our study 1 patient (6.67%) developed early postoperative infection which resolved with parenteral antibiotics. Average duration of time for surgery in our study was 124 minutes. In study by Hackenberg et al. [10] average duration of time was 173 minutes whereas in study by MJD Jacobsohn et al. [11] average duration of time was 170 minutes. In present study at 6 month follow up all patients had solid fusion which was assessed using Brantiga & Steffee fusion criteria. In study by Alsebaey AA et al. 57 90% patient had solid fusion using these criteria.

In our study average preoperative VAS score was 7 and average post operative VAS score at 6 month follow up was 1.73. In study by Muhammad Talha et al. [9] average preoperative VAS score was 7 which improved to 2 at 1 year follow up. In study by Perez-Curet et al. [12] mean VAS score improved from 7 to 4.2 at 1 year follow up. In study by Seng-yew Poh. [13] mean VAS score improved from 7.2 to 2.4 at 2 year follow up. In our study average preoperative ODI score was

66.53 and average postoperative ODI score at 6 month follow up was 18.53. In study by Muhammad Talha et al. [9] average ODI score improved from 76 to 36 at 1 year follow up. (Fig. D)

**Conclusion:**

From this study we have concluded that transforaminal lumbar interbody fusion(TLIF) is a safe and effective method of achieving spinal fusion in patients with degenerative disc disease & low grade spondylolisthesis and thereby reduces back pain and improves patient's disability score. Transforaminal lumbar interbody fusion(TLIF) is preferred technique in higher lumbar vertebral levels above L3 compared to posterior lumbar interbody fusion (PLIF) which is avoided above L3 level. In transforaminallumbar interbody fusion(TLIF) as the disc is approached more laterally than posterior lumbar interbody fusion (PLIF) there are less chances of neurological injury to spinal cord & nerve roots, less chances of epidural fibrosis, this results in less blood loss, less operative time & hence reduced hospitalstay.



**Figure (D 1):** MRI image suggestive of Posterior herniation Of L4-L5 intervertebral disc with posterior inferior migration Of the herniated disc material upto L5 vertebral body.



**Fig. (D 2) -** 6 months postoperative anteroposterior and lateral x-ray of the same patient.

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