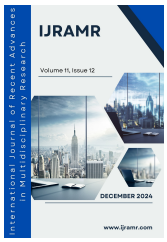
ISSN : 2350-0743

International Journal of Recent Advances in Multidisciplinary Research

Vol. 11, Issue 12, pp. 10561-10568, December, 2024



RESEARCH ARTICLE

ASSESSMENT OF FUSION RATE WITH TRANSFORAMINAL LUMBAR INTERBODY FUSION IN DEGENERATIVE LUMBAR SPINE DISEASES

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ARTICLE INFO

Article History

Received 20th September, 2024
Received in revised form
16th October, 2024
Accepted 27th November, 2024
Published online 29th December, 2024

Keywords:

Fusion Rate, Transforaminal Lumbar Interbody Fusion, Degenerative Lumbar Spine, Back Pain.

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ABSTRACT

Background*:* It is theoretically presumed that TLIF will provide the same advantages as circumferential fusion, but with a higher level of safety than other inter body fusion methods, as it does not involve direct traction on the spine. TLIF technology preserves the interspinal ligament and supraspinal ligament in terms of spinal integrity. Goal and objectives: We aimed to evaluate the clinical outcomes, complications, and advantages of transforaminal lumbar inter body fusion in degenerative lumbar spine diseases. ***Subjects and methods:*** The orthopedic department of Menoufia University Hospital conducted a study between November 2018 and December 2020 on 30 patients who were experiencing persistent low back discomfort as a consequence of degenerative lumbar spine disorders.. The patients underwent transforaminal lumbar interbody fusion with a PEEK Banana cage and pedicle screw fixation, with a minimum follow-up of 9 months. ***Result****:* All of the patients under investigation had a severe Oswestry disability index (ODI) at the preoperative stage (100%). On the initial postoperative day, they are all incapable of being evaluated at a 100% level. The majority of the patients who were examined had experienced a moderate ODI, in addition. The Oswestry disability index (ODI) demonstrated a significant linear improvement in the patients under investigation, with the most considerable improvement occurring within the first three months following the operation. In summary, TLIF generates favorable clinical and radiological outcomes in the management of lumbar instability after a one-year follow-up period. Dural rupture and operational complications are substantially diminished by the TLIF technique. TLIF has the potential to reduce the duration of the operation and the volume of blood loss.

Citation: Elsayed Morsi. 2024. "Assessment of fusion rate with transforaminal lumbar interbody fusion in degenerative lumbar spine diseases", *International Journal of Recent Advances in Multidisciplinary Research,* 11, (12), 10561-10568.

INTRODUCTION

Affecting 70-85% of the population at some point in their lives, low back pain is the most prevalent cause of disability in individuals of both sexes. We are unlikely to encounter an individual who has not experienced back discomfort. A condition is classified as chronic when it persists for a period exceeding three months (1). There are a multitude of pathologies that result in chronic low back discomfort. This group of pathologies may be congenital, traumatic, degenerative, or neoplastic (2). Suffering and constraint Symptomatic lumbar degenerative disease is characterised by the predominant symptoms of walking. The symptoms listed above are the consequence of abnormal compression or movement of neural structures and their vessels. This is a manifestation of the individual's distinctive circumstances, including spinal canal narrowing, degenerative disc disease, herniated discs, and any degenerative impairment of the posterior arch, such as spondylolisthesis and arthropathy (3).

Chronic low back pain caused by lumbar degenerative disease continues to be a contentious issue, as there are numerous treatment options available. Traditional and conventional treatment methods include nonsurgical interventions, including spinal injections, analgesia, and physiotherapy (2). The failure of the nonsurgical treatment necessitated the evaluation of alternative options, including spinal fusion. In order to access the diseased motion segment, this procedure may be performed through the anterior, lateral, or posterior aspect of the lumber spine (4). The surgical procedure known as lumbar fusion surgery involves the union of two or more vertebral bodies to eliminate pathologic segmental motion, thereby alleviating the associated symptoms. In lumber fusion, there are two types: posterolateral fusion, which involves the fusion of transverse processes and the lateral aspect of the facet joint, and interbody fusion, which involves the fusion of vertebral bodies (5). In the treatment of degenerative lumbar conditions, transforaminal lumbar interbody fusion is becoming increasingly common.

The unilateral posterior approach facilitates anterior column stabilisation and 3600 fusion, despite the fact that the morbidity associated with posterior and anterior lumbar interbody fusion is reduced (6). The purpose of this thesis was to assess the clinical and radiological outcomes of transforaminal lumbar interbody fusion in the management of degenerative lumbar diseases. The primary focus was on the advantages, complications, and outcomes of this procedure, in light of the ongoing debate in the literature regarding its effectiveness (7).

PATIENTS AND METHODS

This study included 30 patients who were diagnosed with degenerative lumbar spine maladies and were experiencing chronic low back pain. From November 2018 to December 2020, these patients were treated in the orthopaedic department of Menoufia University Hospital through transforaminal lumbar interbody fusion with a PEEK Banana cage, which was supplemented by pedicle screw fixation. The follow-up period was required to be a minimum of nine months.

Ethical consideration: Prior to the commencement of the research, each patient executed a written informed consent that delineated the objectives of the investigationSuccessful approval of the study protocol was granted by the Ethical Scientific Committee of Menoufia University Hospital.

Inclusion criteria: Spondylolisthesis: documented progression or symptomatic slip refractory to conservative treatment, lumbar spine pseudoarthrosis in both sexes, aged 20 years or older, recurrent lumbar disc herniation with significant mechanical back pain, post-discectomy collapse with secondary radiculopathy, and degenerative disc disease resulting in discogenic low back pain.

Exclusion criteria: Local infections (spondylodiscitis), historical spinal tumours or tuberculosis-associated spinal congenital deformities, and medically unsuitable patients for surgery or anaesthesia.

All patients were subjected to the following

Complete history taking: including Personal history, age, sex, onset story, age, sex, onset of pain, preoperative duration of complaint, etc.

Complete clinical examination: including the Oswestry Back Pain Scoring System and the visual analogue pain scale (VAS), as well as inspection, palpation, range of motion, neurological examination, and back pain scoring.

Radiological assessment including: *Plain X ray:* Static views include oblique, lateral, and anteroposterior views. Dynamic perspectives: lateral (flexion and extension) perspectives. Magnetic resonance imaging (MRI) is employed to evaluate soft tissue, particularly neural components.

Surgical technique: The patient was placed in a prone position following endotracheal anaesthesia to prevent epidural venous distention in the event of abdominal compression during pedicle screw placement. An anaesthesiologist was called upon to administer controlled hypotensive anaesthesia. The chest and iliac crest were cushioned with soft pillows, while the abdomen was left unoccupied to alleviate intra-abdominal pressure and thereby alleviate blood congestion at the surgical site. To ascertain the appropriate level and to facilitate the insertion of fasteners and cages, C-arm fluoroscopy was implemented. Prophylaxis was administered to all patients 2-hours prior to surgery using 4th generation cephalosporin. To prevent flat back syndrome and sustain lumbar lordosis following spinal fusion, surgical positioning is essential. Typically, the intended level of fusion was indicated through fluoroscopic examination following skin preparation and draping. We administered diluted adrenalin and local infiltration anaesthesia to the surgical wound. An incision was made directly in the middle of the back to expose the lumber fascia, subcutaneous tissue, and epidermis two levels above and below the affected level. The paraspinal muscles were targeted during the procedure, which involved elevating them subperiosteally and severing them from the spinous process's dorsal surface to the facet joint's lateral border on both sides. After completing the subperiosteal dissection with an electric scalpel, the paraspinous muscles were adorned with the transverse spinous process, parsinterarticularis, and facet joints. The dissection was continued until the facet joint was visible on both sides. Before decompression, pedicle screws were strategically sized and inserted under C-arm x-ray guidance to minimise blood loss and achieve distraction. The anatomical features of the pars-interarticularis, specifically the mammillary process and ancillary tubercle, were employed to ascertain the location of each screw's penetration of the bone. Similarly, the spine was exposed to the lateral border of the superior articular process and the transverse process extremities. The spongy tissue of the facet joint was surgically excised after it was exposed. A vertical line running along the side of the facet joint and a horizontal line traced through the middle of the transverse process meet at the entry point. The entrance site of the screw can be embellished using a burr or rongeurs. Before cutting a pilot hole parallel to the top endplate, mark the entrance site by penetrating the pedicle's dorsal cortex with an awl.To be considered satisfactory, medial angulation should be between 5º and 15º. The acromalous plain angle grows about 5º with each level from L1 to sacrum. A straight or curved pedicle probe was used to create a screw path through the cancelous bone of the vertebral body. The investigation ought to go forward in a regular and orderly fashion. It is a spheroid. The walls of the pedicle were investigated using a pointed probe or filler. In an effort to facilitate the selection of the pedicle screw length, which is approximately 80% of the vertebral body, the length of the pilot opening was measured. The pedicle screw was inserted, and the transverse process and lateral aspect of the facet joint were decorated and prepared for the subsequent bone graft implantation. Following this, the bone graft was affixed to the fusion matrix that had been previously prepared. The spinal processes and both laminae of the afflicted level were excised by rongeurs to alleviate the posterior aspect of the secal sac. Contralateral distraction and unilateral facetectomy. The spinal canal was accessed by performing a unilateral laminectomy and inferior facetectomy on the side of the radicular discomfort in the event of radiculopathy. In the absence of radiculopathy, the side is chosen at random. Detract the disc space and apply the rod system to the contralateral side (Figure 1).

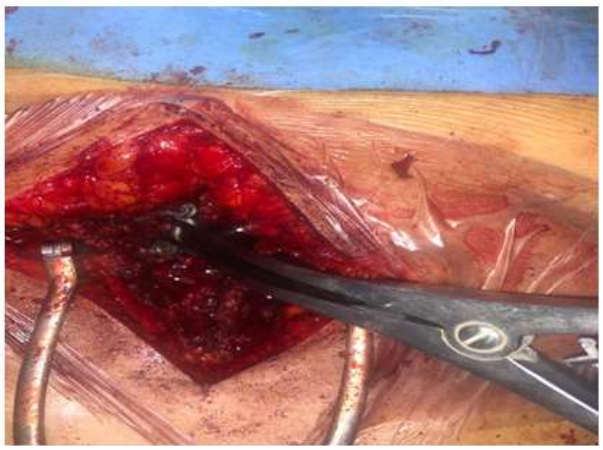

Figure 1. Intraoperative photograph showing Unilateral facetectomy and contralateral distraction

Following this, the disc was accessible using the transforaminal technique. The cranial vertebra's inferior articular process was widened using a rongeur as distraction forces were applied to the opposite side. Second, after reducing the width of the inferior articular process of the cranial vertebral body, you can use a chisel or bone cutter to carefully approach the neural foramen. The part of the ligamentum flavum that covers the capsule should be preserved. Cut the neck vertebrae at their highest point of articulation into separate pieces. The neural foramen was palpated and the pedicle of the caudal vertebral body was measured and located, and then the root of the cranial nerve was examined.

Finally, with the inferior vertebra superiorly respected, access can be gained to the longitudinal ligament, posterolateral portions of the annulus fibrosis, and the disc. Full detection of the neural foramen occurred after resection of the upper medial parts of the lower vertebral body's superior articular facet. You can easily identify the upper nerve root because it wraps around the upper vertebral body lamina and the side of the intervertebral disc. By feeling its path through the foramen magnum, one can locate the nerve root as it crosses the lateral part of the intervertebral space. You can also see the beginning of the nerve root that comes after it and the dural sac on the medial border when you look down the spinal column. Careful coagulation of epidural vessels in the neural foramen was performed after these neurological structures were identified. A total discectomy required a careful medial retractio of the cal sac by means of a unilateral approach **(See Figure 2)**

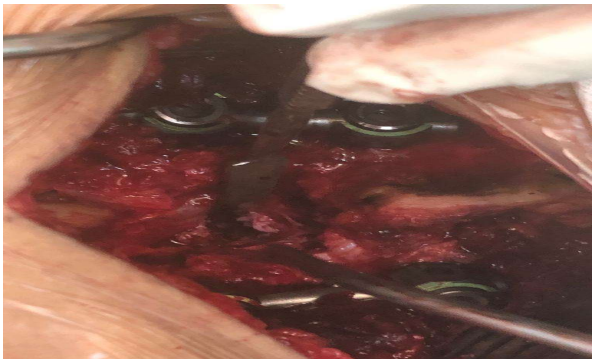

Figure 2. Intraoperative photograph showing medially retracted thecal sac for foraminectomy

This one-sided approach was used to perform a discectomy. To partially release the intervertebral disc compartment, use a variety of rongeurs. To remove the remnants of the intervertebral disc that have stuck to the top plates, you can use a curette. By removing the end plates' cartilaginous coatings with the curettes at the same time, the osseous structure of the plates could be preserved.

End Plate Preparation

- Following the initial discectomy, the pedicle screws on the opposing side were progressively distracted.
- In order to establish a flat end plate surface, the osteotome was employed to eliminate the posterior lateral border of the concave bone. This was required as a result of the unique concave shape of the upper segments of the lumbar vertebral bodies.
- By marginally resecting the dorsal margins of the end plates, a parallel plane between the contiguous vertebral bodies could be established. An introduction to the structural suture is provided in this post. A uniform aperture could be achieved by resecting the dorsal margins of the vertebral body.
- Gently curette the remaining cartilaginous components of the end plates.
- By removing the front one-third or quarter of the corresponding end plates, a permanent osseous fusion can be accomplished. The vertebral body's cancellous bone structure was revealed during bone resection using angular chisels. The only part of the body that can be surgically removed is the front 1/3 or 1/4. The delicate preservation of the residual portion of the osseous end plate is necessary to make room for the sustaining structural transplant. The anterior longitudinal ligament must remain unharmed throughout the chiselling process to avoid vascular injury. (Figure 3)

Figure 3. Intraoperative photograph showing initial discectomy with gradual distraction applied to the pedicle screws on the opposite site that help in end plate preparation

Trial spacers were inserted in intervertebral space prior to final placement of graft material. Standard implant sized for TLIF was typically between 8 and 12mm in height and between 26 and 32mm in length.

Local autologous graft placed anterior to and packed with in the interbody device.Through the utilisation of trial cages, the suitable dimensions and position of the enclosures were determined. The moralised autologous bone from resected bony elements was used to load the Definite Cage. After medial dura and nerve root retraction, a banana cage was employed to insert moralised autologous bone into the intervertebral disc space scaffold for fusion. Consequently, the enclosure was relocated to its optimal position. The final assembly and closure of the Rod-Screw System: In order to establish an optimal transplant bone interface and restore lumbar lordosis at the operated segments, the construct was compressed. Unscrewed the rod-screw system (Fig 4, 5)

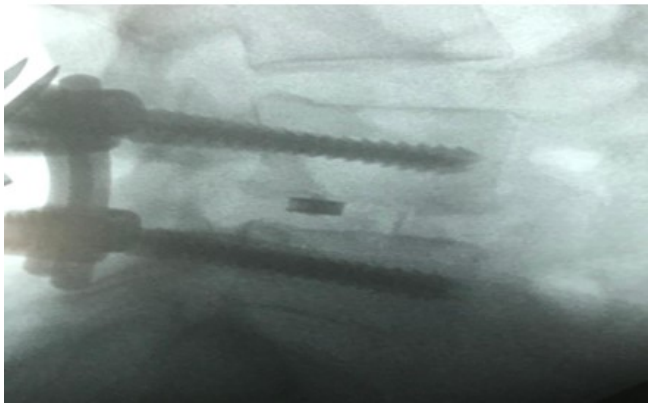

Figure 4. Intraoperative c arm lateral image showing final pedicle screws and cage end position

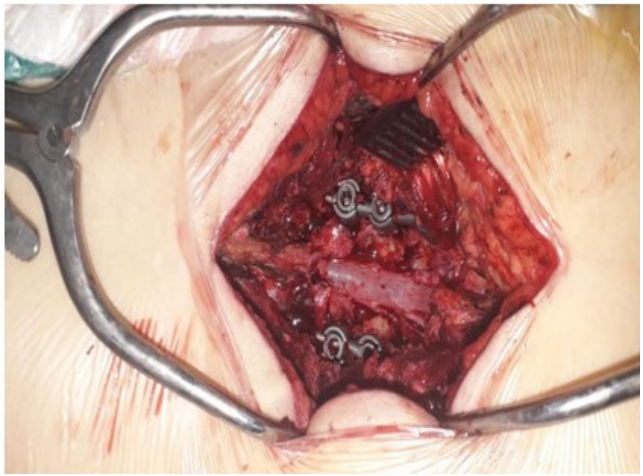

Figure 5. Intraoperative photograph showing the final assembly of Rod-Screw System.

After conducting adequate decortication on both sides, perform a posterolateral fusion with a bone transplantation over the transverse processes. The muscle closure is executed initially, followed by the subcutaneous suture, fascia suture, and epidermis closure. Drains are installed. In an endeavour to assess the rate of fusion: The disc space was not traversed by trabeculae, and there was no endplate reaction.

RESULTS

The participants' ages ranged from 38 to 60 years, with a mean of 43.53±6.78 years. Their mean weight and length were 88.43±9.07 and 165.90±8.71, respectively.

Also, mean body mass index was 31.12±5.62 kg/m^2.Regarding occupation most of the studied patients were house wife (83.30%) Table (1). This table shows that, regarding pain distribution and Neurological distribution sensory, 26.70% of the studied patients had pain along L5-S1 roots and Hyposthia along L5 -S1 roots followed by 23.30% of patients had pain along L4 roots and hyposthia along L4 roots respectively. While most of the studied patients had normal neurological distribution motor (90%) Table (2). The mean duration of operation was 136.33±28.71 min while mean blood loss of the studied patients was 503.33±182.39 while all the studied patients had no complication Table (3).

In all patients examined (100%), the preoperative Oswestry disability index (ODI) was severe. 100 percent of them are incapable of being assessed on the initial day of the postoperative period. Furthermore, the majority of the patients under investigation had experienced a modest ODI by the sixth, third, sixth, and ninth months, with increases of 80%, 83.33%, 76.67%, and 76.67%, respectively. The patients under investigation experienced a substantial linear improvement in their Oswestry disability index (ODI), with the most substantial improvement occurring within the first three months following the operation Table (4). At 1st day all of the studied patients (100%) had Pedicular screws, cage in place and had average radiological at 6th weeks and had good radiological at 3rd months. Also, at 6th and 9th months postoperatively, most of the studied patients had excellent radiological by (73.33%, and 90% respectively).

We observed growth from 'average' to 'good' and from 'good' to 'excellent' at distinct follow-up intervals (6th and 9th months) Table (5). Prior to surgery, patients were assessed for the severity of their low back pain using a percentage value based on their VAS score. Subsequently, they were evaluated at one day, six weeks, three months, six months, nine months, and one year after surgery. The mean preoperative score was 78.40±0.67, with a maximum score of 9 and a minimal score of 7. The maximal score was 2 at 1 day, 6 weeks, and 3 to 9 months postoperatively, while the minimal score was 0. The mean scores were (2.67±0.48, 1.67±0.48, 0.93±0.25, 0.467±0.51, 0.33±0.48, and 0.33±0.48, respectively). VAS score was significantly gradually improvement at different follow-up times Table (6). Adverse events happened in 3 cases, one of (3.33%) them had dural Tear then managed immediately by Suturing, other Case had mal-positioned screw which managed on 2nd day by correction of the screw position (3.33%), and other case (3.33%) had persistent numbness with sciatica that improved with time and medication. No delayed complications were found Table (7).

Case: Female patient aged 38 years with LBP with bilateral leg pain 1 year ago with pain and neurological distribution along L3-4 and L4-5 roots with left more than right side. After clinical and radiological assessment, she had diagnosed as L3-4 L4-5 canal stenosis with disc prolapse with ODI sever and VAS 8. A House wife female 39yrs, 93kg, 163cm with no medical problems, affected level: L3-4, L4-5, affected side: Bilateral sides with left side more than right side.Complain: Bilateral leg pain left side more than right side with heaviness and numbness along L3 and L4 roots. Diagnosis: L3-4 L4-5 canal stenosis with disc prolapse.

Table 1. Distribution of the studied patients regarding demographic data

	Studied patients (n=30)		95% Confidence Interval	
	Mean ± SD	Range	Lower	Upper
Age/ year	43.53±6.78	38.00- 60.00	41.17	45.83
Weight/ Kg	88.43±9.07	75.00-105.00	85.13	91.73
Length/cm	165.90±8.71	158.00-180.00	163.00	168.77
BMI (kg/m^2)	31.12±5.62	29.51-34.70	28.35	33.60
	No.	**%**	**Lower**	**Upper**
Occupation				
-House wife	25	83.30	70.0	96.7
-Manual worker	3	10.00	0.0	23.3
-Teacher	2	6.70	0.0	16.7

Table 2. Distribution of the studied patients regarding pain distribution, neurological distribution sensory and motor

	Studied patients (n=30)		95% Confidence Interval	
	No.	%	Lower	Upper
Pain distribution				
-No	3	10.00	0.0	23.3
-Along L4- L5-S1 roots longer L4 roots	3	10.00	0.0	23.3
-Along L5-S1 roots	8	26.70	10.1	43.3
-Along L4 roots	7	23.30	10.0	40.0
-Along L4-L5 roots	2	6.70	0.0	16.7
-Along L4-S1 roots	2	6.70	0.0	16.7
-Along L5 roots	5	16.70	3.4	30.0
Neurological distribution sensory				
-Normal	3	10.0	0.0	23.3
-Hyposthia along L4-L5 -S1 roots	3	10.0	0.0	23.3
-Hyposthia along L5 -S1 roots	8	26.7	10.1	43.3
-Hyposthia along L4 roots	7	23.3	10.0	40.0
-Hyposthia along L4-L5 roots	2	6.7	0.0	16.7
-Hyposthia along L4-S1 roots	2	6.7	0.0	16.7
-Hyposthia along L5 roots	5	16.7	3.4	30.0
Neurological distribution motor				
-Normal	27	90.00	76.7	100.0
-Partial foot drob	3	10.00	0.0	23.3

Table 3. Distribution of the studied patients regarding Surgical time and blood loss

	Studied patients (n=30)		95% Confidence Interval	
	Mean ± SD	Range	Lower	Upper
Duration of operation / min	136.33±28.71	100-180	127.33	146.66
Blood loss	503.33±182.39	350-800	448.33	573.33

Table 4. Distribution of the studied patients regarding clinical ODI at different follow-up times

	Oswestry disability index (ODI)					X^2	P- value
	Severe	Moderate	Mild	Minimal	Cannot be assessed		
Preoperative	30(100%)	0(0%)	0(0%)	0(0%)	0(0%)	NA	----
1st day	0(0%)	0(0%)	0(0%)	0(0%)	30(100%)	NA	----
6th weeks	0(0%)	6(20%)	24(80%)	0(0%)	0(0%)	10.8	0.001**
3rd months	0(0%)	0(0%)	25(83.33%)	5(16.67%)	0(0%)	13.33	<0.001**
6th months	0(0%)	0(0%)	23(76.67%)	7(23.33%)	0(0%)	8.533	0.003*
9th months	0(0%)	0(0%)	23(76.67%)	7(23.33%)	0(0%)	8.533	0.003*
P_1=0.230, P2=0.012*, P3=0.028*, P4=0.006*, P5=0.006*							

ODI: Oswestry disability index X^2: chi-square test ; P1: 1st day postoperatively vs. preoperative P2: 6th weeks postoperatively vs. preoperative; P3: 3rd months postoperatively vs. preoperative P4: 6thmonths postoperatively vs. preoperative; P5: 9th months postoperatively vs. preoperative

Table 5. Distribution of the studied patients regarding radiological follow-up

	Radiological follow-up				X^2	P- value
	Pedicular screws and cage in place	Average	Good	Excellent		
1st day	30(100%)	0(0%)	0(0%)	0(0%)	NA	----
6th weeks	0(0%)	30(100%)	0(0%)	0(0%)	NA	----
3rd months	0(0%)	0(0%)	30(100%)	0(0%)	NA	----
6th months	0(0%)	0(0%)	8(26.67%)	22(73.33%)	6.533	0.011
9th months	0(0%)	0(0%)	3(10%)	27(90%)	19.2	<0.001**

DISCUSSION

At present, the fusion of degenerative lumbar spondylosis is facilitated by a sophisticated surgical procedure known as transforaminal lumbar interbody fusion (TLIF). In 1998, this methodology was initially described by Harms and Jeszenszky, (8) The TLIF procedure is anticipated to offer the same benefits as circumferential fusion, while also ensuring a higher level of safety than other interbody fusion procedures, as it does not involve the application of direct

Table 6. Distribution of the studied patients regarding VAS score at different follow-up times

	VAS score		Paired t test	P value
	Range	Mean± SD		
Preoperative	7.00-9.00	8.40±0.67	-----	-------
1st day	2.00-3.00	2.67±0.48	40.008	**P1<0.001****
6th weeks	1.00-2.00	1.67±0.48	46.986	**P2<0.001****
3rd months	0.00-1.00	0.93±0.25	60.015	**P3<0.001****
6th months	0.00-1.00	0.467±0.51	62.839	**P4<0.001****
9th months	0.00-1.00	0.33±0.48	63.895	**P5<0.001****

Time course of visual analogue score (VAS at postoperative 1st day to 9 months) compared to preoperative expressed as Mean± SD and tested by paired t- test. * *P* value <0.001 denotes statistical highly significance between studied patients. P1: 1st day postoperatively vs. preoperative P2: 6th weeks postoperatively vs. preoperative; P3: 3rd months postoperatively vs. preoperative P4: 6thmonths postoperatively vs. preoperative P5: 9th months postoperatively vs. preoperative

Table 7. Distribution of the studied patients regarding postoperative complications and management

Complications	No.	%	Management
Delayed complications	0	0.0	-----
Dural Tear	1	3.33	Suturing
Mal-positioned screw	1	3.33	Correction of the screw position
Persistent numbness with statica	1	3.33	Improved with time and medication

traction to the spine. Because it preserves the interspinal and supraspinal ligaments, the TLIF technique is capable of stabilising the spine. In theory, TLIF has the capacity to attain a high degree of dependability in its effectiveness. Despite that, Høy *et al.* (9) Evidence suggests that TLIF does not improve patients' functional prognosis compared to instrumented posterolateral fusion (PLF). Patients suffering from chronic low back pain due to degenerative lumbar spine diseases were included in this investigation, which included 30 levels of the spine. The patients underwent transforaminal lumbar interbody fusion procedures at Menoufia University Hospital's orthopaedic department. These procedures included the use of a PEEK cage and pedicle screw fixation. The average age, weight, length, and body mass index of the patients studied were 43.53±6.78 years, 88.43±9.07 kg, 165.90±8.71m, and 31.12±5.62 kg/m2, respectively, according to the study. The majority of the patients who were examined were mothers (83.30%). As previously stated by Jalalpour *et al*., (10) There were a total of 135 patients (74 men and 61 females) included in the study; their average age was 44.5 years.

Suitable for individuals between the ages of twenty-five and sixty-five. One group underwent instrumented posterolateral fusion (PLF), while the other underwent transforaminal lumbar interbody fusion (TLIF). The average age of the patients in the TLIF cohort was 44 years, and their ages ranged from 25 to 62. With ages ranging from 27 to 65, the PLF cohort had an average age of 45. The percentage of men in the TLIF cohort was 53%, whereas in the PLF group it was 75%. In the first group, the mean weight was 79 kg, while in the second group, it was 80 kg. In the TLIF group, participants averaged 175 cm in height, whereas in the PLF group, it was 174 cm. Also, Eladawy *et al*., (11) With ages ranging from 27 to 50 years, the average age of the 20 patients who had transforaminal lumbar interbody fusion (TLIF) was determined to be 40.3±7.6 years. There were twelve male patients and eight female patients, making up 40% of the total. Regarding age, sex, occupation, and chronic health issues, no statistically significant difference was found. In terms of their affected level, 43.30 percent of the patients analysed in this study reached L4-5 or L5-S1 levels. Regardless, the left side was the most severely impacted for the patients under study.

In agreement with Kazim *et al*., (12) According to the TLF level of the studied group, twenty of the segments were degenerated as L4/L5, and five as L5/S1. Additionally, the findings were consistent with Rezk *et al*., (13) The most significantly affected level in the PLIF and TLIF groups was L4-L5, with a percentage of 54.3% and 64.6%, respectively. L5-S1 was the second most affected level, with a percentage of 37% and 29.2%, respectively. L3-L4 was the least affected level, with a percentage of 8.7% and 6.2%, respectively. This agreed with Benguluri and Kumar, (14) According to the source, the most common level of infection was L4-L5, with 55 cases, followed by L5-S1 with 31 patients. Among the patient complaints, right leg pain was mentioned by 26.70% of patients in our study, joining low back pain.An additional discovery by Mohammad *et al*., (15) that mechanical back pain was the clinical presentation in 100% of cases and limb pain was the clinical presentation in 90% of cases. While, Yan *et al*., (16) When posterior decompression is required in addition to lumbar fusion, TLIF is especially recommended for patients with low-grade spondylolisthesis, degenerative disc disorders, spinal stenosis, and unilateral or recurrent disc herniation, according to the available research. Also, in Elghany *et al*., (17) There were two cases of spondylolysis in the TLIF group, and ten cases of spondylolisthesis in the PLF group, for a total of twenty-two patients. To add insult to injury, disc degeneration was detected in 16 patients (8 in each bracket).

Patients in this study lost an average of 503.33±182.39 millilitres of blood during the operation, which lasted an average of 136.33±28.71 minutes. Within the same spectrumSeng *et al*., (18) After open TLIF surgery, patients typically stayed in the hospital for an average of 3.94 days (range 2-11, median, 3 days) after the procedure. On average, 173 minutes passed during the procedure. This agreed with that of Hackenberg *et al*., (19) An individual assessed the TLIF technique and discovered that one-level fusions took an average of 173 minutes to complete (135–220), while multiple-level fusions took an average of 238 minutes (190-255).Also, Eladawy *et al*., (11) The mean operating time in the group consisting of lamina and facet was 153 minutes (±23.6), with a maximum of 195 minutes and a minimum of 120 minutes in the TLIF procedure.

On top of that, they found out that the lamina and facet group had an average blood loss of 512.2 ml (±170.7), with a range of 200 ml to 750 ml. The average amount of blood lost by the group receiving iliac bone grafts was 812.5 ml (±85.93), ranging from 700 ml to 900 ml per minute. Liu *et al*., (20) According to the report, the TLIF group showed shorter intraoperative times and less blood loss volume compared to the PLIF group. One possible explanation is that PLIF requires both eyes to be exposed, while TLIF only requires one. That was in agree with Rezk *et al*., (13) PLIF had a significantly longer operating time and blood loss than TLIF (p=0.0004 and 0.0001, respectively). In Lan *et al*., (21) When comparing PLIF and TLIF in the meta-analysis, the former was linked to a lengthier operation and more blood loss volume. Because PLIF necessitates bilateral discectomy, interbody bone graft, and cage implantation—all of which lengthen the operation and cause blood loss—this is likely the result.

The results of this study indicated that all patients had a severe Oswestry disability index (ODI) prior to surgery. Although ODI was significantly improved too modest during the sixth week, third month, sixth month, ninth month, and first year respectively. The most significant improvement was observed within the initial three months following the operation. Like our study, Kakadiya *et al*., (22) After surgery, the average ODI dropped from 38.73 to 21.30. It was low-grade isthmic spondylolisthesis that affected most of their patients. Compared to theirs, the follow-up was pretty brief. There was a statistically significant decrease in pain scores (VAS and ODI) compared to preoperative scores at the 3-month and 6-month follow-ups. There was a drastic improvement compared to the three-month and twelve-month results. Consistent with Eladawy *et al*., (11) During the six-month follow-up in TLIF, it was noted that the ODI showed a gradual improvement. The range of scores before surgery was from 40% to 80%, with an average of 63 (±13.8). From six months to one year after the operation, there was a significant statistical difference in the scores, with a maximum of 35% and a minimum of 10%, averaging 16 (±8.3).. Moreover, Lauber *et al*., (23) In 39 patients, the TLIF technique was evaluated, and the ODI increased from 20.05±7.9 preoperatively to 10.95±10.6 after 2 years of surgery. This study demonstreated improvement in radiological follow-up after the 9th months of procedure. In agreement Lowe *et al*., (24) Radiologically, the fusion rate was 95% in their analysis, and 88% of the cases resulted in an adequate to outstanding clinical prognosis. The individual underwent TLIF surgery. The fusion rate was 90%, and 90% of instances showed an improvement in clinical symptoms. However, the TLIF group achieved fusion grade I in 61.9% of cases after one year of follow-up in the study conducted by Lee *et al*. (25) ,in contrast to 63.3% of cases in the PLIF group. When comparing the two groups, no statistically significant difference was found.

The average VAS score before surgery was 8.40±0.67, as shown in this study. Over the course of nine months, the VAS score improved significantly, reaching 0.33±0.48 in the end. In accordance with Kazim *et al*., (12) The study's findings indicated that 18 individuals (90%) experienced an improvement in their distress, while 2 individuals (10%) did not. Additionally, these findings are corroborated by Hackenberg *et al*., (19).

The TLIF technique was the sole technique evaluated, and it was determined that the preoperative pathology is a contributing factor to the VAS improvement. In the isthmic spondylolisthesis group, the VAS decreased from 7.6±2.3 to 3.4±2.4 after six months. In the degenerative disorders group, the VAS was 8.3±2.6 preoperatively and decreased to 4.4±2.216 after 6 months postoperatively. On the other hand, the study of Han *et al*., (26) At any stage, there was no statistically significant difference in VAS for pain between the PLIF group and the TLIF group. Three cases experienced adverse events in our study. One of the cases experienced a dural tear, which was promptly resolved with a dural patch. The other case had a mal-positioned fastener, which was corrected on the second day. The third case experienced persistent paralysis with statica, which ultimately resolved with medication and time. Delayed complications were not identified. This in agreement with Tsahtsarlis and Wood, (27) The postoperative complications were identified as two mal-positioned fasteners (one superior pedicle breach and one lateral pedicle breach). A pulmonary embolus was experienced by one patient upon their return home; however, there were no adverse effects. Furthermore, one patient experienced transient unilateral L5 nerve root pain, a novel neurological symptom that was linked to the decrease of a grade two spondylolisthesis. Also, Goldstein *et al*. (28) During the PLIF and TLIF procedures, the dural injury rate was 5.4%, graft malposition was 4.4%, screw malposition was 2.6%, neurologic deficit and nerve injury were 3.8%, and the reoperation ratio was 3.3%. There was a 1.8% rate of reoperation for graft malposition. Rezk *et al*. (13) also reported that dural rupture, nerve root injury, and deep wound infection occurred in 4.4%, 4.4%, and 2.2% of cases, respectively. Complication rates of 10.9% were reported in the PLIF cohort. To the contrary, the TLIF cohort experienced a complication rate of only 6.3%. In 4.2% of the cases, a superficial incision infection was present, while 2.1% were afflicted by a dural injury.

CONCLUSION

TLIF is effective in treating lumbar instability, as shown by positive clinical and radiological outcomes after a year of follow-up. The TLIF technique significantly lowers the risk of dural injury as well as operational complications. TLIF may shorten the time of surgery and lessen the amount of blood loss.

Conflict of interest No funds were received in support of this study.

Nobene Wtsin any forms have been or will be received from a commer- cialparty related directly or indirectl yto the subject of this manuscript.

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