Ipsilateral Pedicle Screw Fixation And Contralateral Translaminar Facet Screw Placement In Conjunction With TLIF: Technical Note

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Citation

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Abstract

Transforaminal lumbar interbody fusion (TLIF) has become a widely used method of surgical treatment for a variety of lumbar spinal conditions. Bilateral transpedicular instrumentation is routinely used in conjunction with an interbody cage to provide additional stability. In this technical note, we introduce a hybrid fixation employing pedicle screw construct on the side of TLIF and contralateral translaminar facet screw placement. We also compared the results of hybrid instrumentation with bilateral pedicle screw construct in 40 patients who underwent one or two level TLIF. Sixteen patients were in hybrid fixation group, and 24 in bilateral pedicle screw group. The outcome was evaluated at 6-32 months follow-up. The parameters included radiographic outcome based on evidence of solid union and the clinical outcome was determined by the improvement in Oswestry Disability Index. All patients had radiographic evidence of satisfactory posterolateral fusion at 6 months.None of the patients had any hardware problems at six months. Four patients had transient neuropraxia and no other major complications occurred.

Mean preoperative Oswestry Disability Index score of 62 had improved to 24 at last follow up. Minor transient neuropraxia occurred in 4 patients. The average cost of implant including cage and hardware was $9,563 for the hybrid group, and $13,094 for bilateral pedicle screw group. In conclusion, hybrid screwing system minimizes contralateral dissection, eliminates the risk of screw abutment on the adjacent facet joint, and significantly decreases the cost of implants. This hybrid form of fixation is an attractive alternative to standard bilateral pedicle screw fixation.

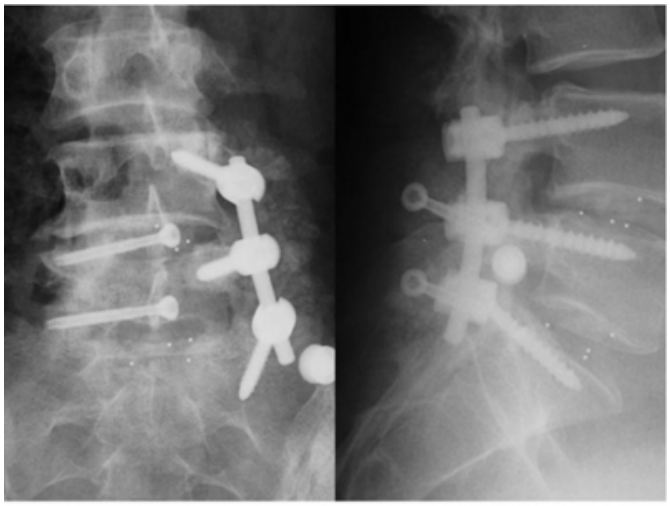
INTRODUCTION

Transforaminal lumbar interbody fusion (TLIF) has become a well established method of surgical treatment for lumbar spinal disorders such as spondylolisthesis and discogenic back pain. [2,6,7,11]Bilateral pedicular posterior spinal screw fixation is usually preferred in conjuction with transforaminal interbody cage and graft placement. [8,10]More recently, translaminar facet screws have also been utilized, mostly bilaterally, as a supplement to anterior lumbar interbody fusion. [1,3,4,9]It has been reported that biomechanically the translaminar facet screw fixation may provide stability comparable to that of a pedicle screw system. [1] During a TLIF procedure for discogenic back pain, contralateral facet and lamina are usually kept intact. Thus, it is technically possible to insert a translaminar facet screw instead of a pedice screw- rod construct on the side contralateral to TLIF. However, the role of such a hybrid fixation has not been well evaluated.

The purpose of this study is to compare the efficacy of a hybrid instrumentation incorporating ipsilateral pedicle screw fixation and contralateral translaminar screw placement with bilateral pedicle screw construct in patients who underwent one or two level TLIF.

Figure 1

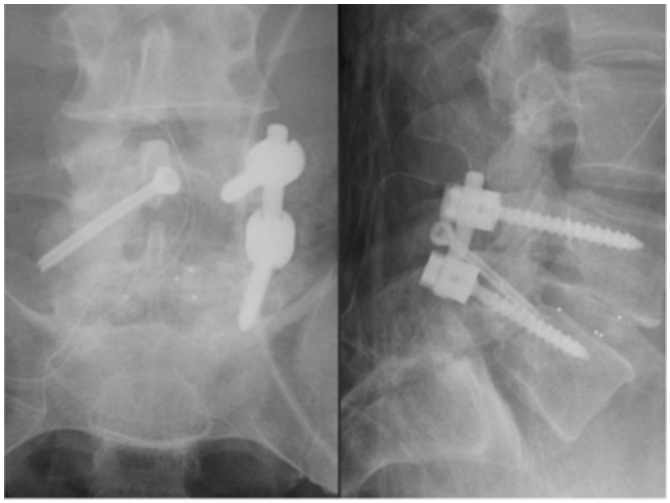
Figure 1: Radiograph after two level lumbar fusion using this hybrid technique from L4 to S1. At the left side, pedicle screw rod system is used for fixation. Two translaminar facet screw fixation is conducted at L4/5 and L5/S facet joints at the right side.



AP view Lateral view

Figure 2

Figure 2: Radiograph after one level lumbar fusion using this hybrid technique at L4/5. At the left side, pedicle screw rod system is used for fixation. A translaminar facet screw fixation is conducted at L4/5 facet joints at the right side.



AP view Lateral view

METHODS

PATIENTS

A retrospective review of charts and radiographs of all patients who underwent one or two level TLIF over a three year period was conducted. A total of 40 patients (24 females and 16 males) who underwent TLIF were included. In 18 patients, L5-S1 segment was fused and L4-5 in 13. Other nine patients had both segments (L4-S1) fused. Six patients had isthmic grade 1 or 2 spondylolisthesis and remaining patients had discogenic back pain. Among them, 24 underwent bilateral pedicle screw fixation in conjunction with TLIF, and remaining 16 underwent hybrid type fixation with translaminar facet and pedicle screw. All procedures were performed by a single surgeon (AB). Implants used were manufactured by Depuy Spine (Raynham, NJ) and included Monarch and MOSS SI pedicle screw systems as well as Brantigan and Leopard reinforced carbon fiber cages.

TECHNICAL NOTE

TLIF and ipsilateral fixation : After a midline skin incision was made, unilteral paraspinal dissection was performed on the side of TLIF, and corresponding laminae, facet joint, and transverse processes were exposed. Initially pedicle holes were created in a standard fashion using a gearshift. A total unilateral facetectomy and hemilaminotomy was then performed. The nerve root and dura sac were identified and protected. Bipolar electrocautery was used to coagulate epidual veins and the dic space was identified. Pedicle screw and rod were then placed and distraction was achieved. Distraction prior to bipolar electrocauterization was avoided to minimize epidural bleeding. A thorough discectomy was then performed and iliac autograft and local laminaetomy bone was place within the disc space folowed by insertion of a cage via a transforaminal approach. Compression was achieved across the pedicle screws and the set screws were tightened. The remaining bone graft was placed posterolaterally.

Contralateral fixation: In the bilateral pedicle fixation group, contralateral pedicle screw and rod system was utilized in a routine standard manner. In the hybrid group, minimal dissection of the lamina was performed to provide the desired trajectory. Through a small stab incision on the side of the TLIF, a drill hole was created and a translaminar screw was inserted under fluorocopic guidance.

OUTCOME MEASURES

The outcome was evaluated at 6-32 months follow-up. The parameters included radiographic outcome based on evidence of solid union, and clinical outcome was determined by the improvement in Oswestry Disability Index.

RESULTS

All patients had radiographic evidence of satisfactory

interbody fusion at 6 months. There was significant improvement in Oswestry Disability Index at last follow up. Mean preoperative score of 64 had improved to 22 at last follow up. Minor transient neuropraxia occurred in 4 patients. Neuropraxia occurred in two patients from each group. There were no instrument related complications in either group. The average cost of implant including cage and hardware was $9,563 for the hybrid group, and $13,094 for bilateral pedicle screw group.

DISCUSSION

In this report, we describe a hybrid technique of pedicle screw rod system and translaminar facet screw placement in conjunction with TLIF. Based on the clinical results obtained from this study, the hybrid technique seems to be comparable to bilateral pedicle screw system. Fuison Fusion rates and clinical outcome also appear similar between the two groups. The complication rate wass also similar between the two groups in this study.

A hybrid techniques such as decribed here offers several advantages. First and foremost, the cost of a facet screw is substantilly lower than a pedicle screw-rod construct. A facet screw such as Discovery typically ocsts about $ 200 versus pedicle screws and rods, which cost around $1,000 a piece. A second advantage of facet screw insertion is that the risk of screw abutment on contralateral facet joint is eliminated. There is CT evidence of encroachment of normal facet joint by pedicle screws in as many as 30% patients. [12]Another advantage of this procedure is minimal dissection of the contralateral paravertebral muscles with potentially lower blood loss and lesser morbidity. So-called “posterior fusion disease” has been reported as a complication related to wide exposure required for pedicle screw fixation. [5] This is considered to be results of muscle stripping and denervation, and it may lead to back fatigue, bursitis or other complication. Minimally invasive techniques of pedicle screw insertion may also decrease the posterior fusion disease but such techniques are expensive, and the risk of damage to adjacent facet joint persists.

In conclusion, contralateral translaminar facet screw insertion and ipsliateral pedicle screw construct is an effective adjunct to TLI F. It is safe and easy to perform, is less expensive, and may have potentially lower instrumentation related complications such as abutment of facet joint with pedicle screws. This technique is suitable in patients with intact laminae. Patients with discogenic back pain, but is not applicable when a complete laminectomy is done such as in patients with isthmic spondylolisthesis.

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References

1. Beaubien BP, Mehbod AA, Kallemeier PM, Lew WD, Buttermann GR, Transfeldt EE, Wood KB. Posterior augmentation of an anterior lumbar interbody fusion: minimally invasive fixation versus pedicle screws in vitro. Spine. 2004; 29(19): E406-12.
2. Figueiredo N, Martins JW, Arruda AA, Serra AR, Figueiredo MA, Diniz RC, Cavicchioli AA. TLIF--transforaminal lumbar interbody fusion. Arq Neuropsiquiatr. 2004;62(3B):815-20.
3. Humke T, Grob D, Dvorak J, Messikommer A. Translaminar screw fixation of the lumbar and lumbosacral spine. A 5-year follow-up. Spine. 1998; 23: 1180-4.
4. Kandziora F, Schleicher P, Scholz M, Pflugmacher R, Eindorf T, Haas NP, Pavlov PW. Biomechanical testing of the lumbar facet interference screw. Spine. 2005; 30(2):E34-9.
5. Lonstein JE, Denis F, Perra JH, Pinto MR, Smith MD, Winter RB. Complications associated with pedicle screws. J Bone Joint Surg Am. 1999; 81(11):1519-28.
6. Lowe TG, Tahernia AD, O'Brien MF, Smith DA. Unilateral transforaminal posterior lumbar interbody fusion (TLIF): indications, technique, and 2-year results. J Spinal Disord Tech. 2002; 15(1):31-8.
7. Moskowitz A. Transforaminal lumbar interbody fusion. Orthop Clin North Am. 2002; 33(2):359-66.
8. Oxland TR, Lund T. Biomechanics of stand-alone cages and cages in combination with posterior fixation: a literature review. Eur Spine J. 2000; 9 Suppl 1:S95-101.
9. Phillips FM, Cunningham B, Carandang G, Ghanayem AJ, Voronov L, Havey RM, Patwardhan AG. Effect of supplemental translaminar facet screw fixation on the stability of stand-alone anterior lumbar interbody fusion cages under physiologic compressive preloads. Spine. 2004; 29(16):1731-6.
10. Rechtine GR, Sutterlin CE, Wood GW, Boyd RJ, Mansfield FL. The efficacy of pedicle screw/plate fixation on lumbar/lumbosacral autogenous bone graft fusion in adult patients with degenerative spondylolisthesis. J Spinal Disord. 1996; 9(5):382-91.
11. Salehi SA, Tawk R, Ganju A, LaMarca F, Liu JC, Ondra SL. Transforaminal lumbar interbody fusion: surgical technique and results in 24 patients. Neurosurgery. 2004; 54(2):368-74
12. Shah RR, Mohammed S, Saifuddin A, Taylor BA. Radiologic evaluation of adjacent superior segment facet joint violation following transpedicular instrumentation of the lumbar spine. Spine. 2003; 28(3):272-5.

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