

Delta Fixation vs Interbody Fusion in Cases of High-grade Spondylolisthesis

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ABSTRACT

High-grade spondylolisthesis is better dealt with surgical methods. There are various methods to achieve solid fusion and decompression in the presence of symptomatic spinal stenosis. In our case report, we have compared delta fixation with interbody fusion methods, especially in high-risk patients (American Society of Anesthesiologists grade III) with its various merits and demerits, and we have attempted to discuss it with respect to the literature available.

Keywords: Delta fixation, High-grade spondylolisthesis, Posterior transsacral interbody fusion.

How to cite this article: Kothari A, Khurjekar K, Hadgaonkar S, Singh N, Kulkarni HG, Sancheti P, Kumar N. Delta Fixation vs Interbody Fusion in Cases of High-grade Spondylolisthesis. *J Spinal Surg* 2017;4(1):30-32.

Source of support: Nil

Conflict of interest: None

INTRODUCTION

In spondylolisthesis, symptomatic high-grade slips that are resistant to conservative management require surgical stabilization.^{1,2} The concept of *in situ* fusion is a relatively safe and reliable procedure for high-grade spondylolisthesis with balanced spine even in the presence of unbalanced pelvis.³ Various surgical procedures to obtain *in situ* fusion in high-grade spondylolisthesis are as follows: Posterolateral fusion with or without instrumentation, posterior interbody fusion, combined anterior and posterior procedures, and circumferential 360° fusion. It has been found that a circumferential fusion has better results clinically and radiologically.⁴ Various circumferential fusion 360° techniques are as follows: Transvertebral pedicle screw fixation,⁵ posterior transsacral interbody fusion using a cortical bone graft with pedicle screw implantation,¹

posterior interbody cage and pedicle screw fixation,⁶ and a posterior pediculobody fixation alone or supplemented with a superior level fusion.⁷

In the present study, greater mechanical stability and fusion rate were achieved by posterior pediculobody fixation supplemented with a superior level fusion by virtue of three-column stabilization along with quickness and simplicity of the procedure. In this technique, in comparison with interbody fusion methods, it was found that by virtue of simplicity of the method, there was less intraoperative time spent, less blood loss, and fewer perioperative anesthetic complications, with almost equal postoperative results. Once we are sure with our patient selection falling within criteria of patient having slip >25%, severity index <20%,⁸ with good sagittal balance,⁹ and degenerative changes with Pfirrmann grade III to IV¹⁰ with severe disk height reduction, our results will be far better than expected, with possible three-column stabilization.

CASE REPORT

An 85-year-old female patient presented to our spine clinic with chief complaints of lower back pain radiating to both her lower limbs since 6 months. Pain was gradual in onset, constant in duration, severe in intensity, and dull in nature. Pain was associated with tingling and numbness in both lower limbs. Patient was not able to sit and stand for even small duration of time by virtue of her pain. There was no history of any significant trauma in recent past, no history of fever, or involvement of any other joint or so. Patient was hypertensive and had history of ischemic heart disease with angioplasty done in 2000; at present, she was on blood thinners.

A thorough examination of the patient revealed on inspection increased lumbar lordosis, with patient having flexion attitude at hip and knee joints. There was diffuse tenderness of lumbar spine, with significant step felt in the lower back on deep palpation of spine, and paraspinal muscle spasm was seen and appreciated on palpation. Straight leg raising test was positive at 40° on both sides, and examination of sacroiliac joints was insignificant. Patient neurology was intact in both upper and lower limbs. An X-ray of lumbar spine in anteroposterior and lateral views (Fig. 1) showed patient

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Fig. 1: Preoperative AP and Lateral views of lumbar spine



Fig. 2: Sagittal section of Lumbar spine MRI

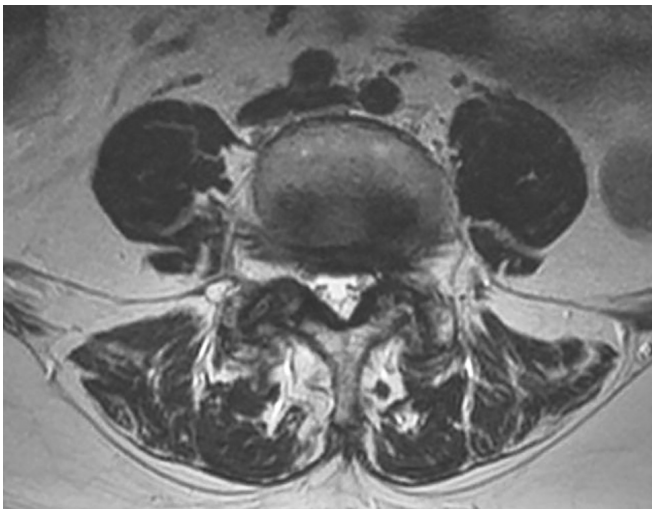


Fig. 3: Axial sections of Lumbar spine MRI

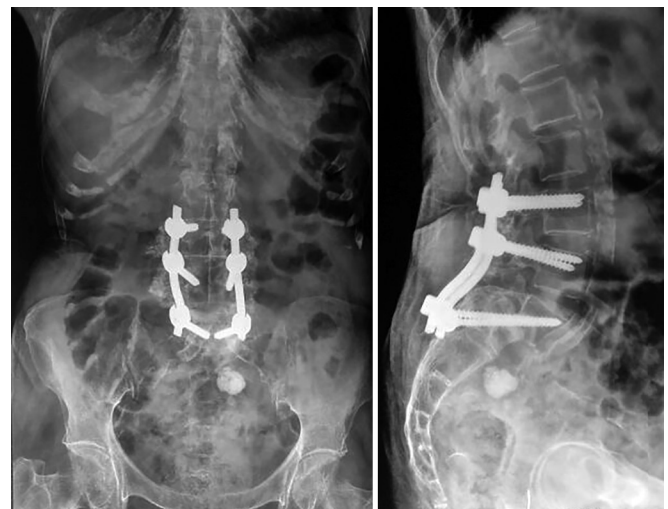


Fig. 4: Postoperative AP and Lateral views of lumbar spine

having grade III¹¹ anterolisthesis L5 over S1 vertebrae. Laboratory investigations were within normal limits. The magnetic resonance imaging of lumbar spine (Fig. 2) showed severe cord compression with lumbar canal stenosis at L3–S1 levels, with high-grade anterolisthesis grade III¹¹ of L5 over S1 (Fig. 3).

SURGICAL TECHNIQUE

Patient was taken for surgery after obtaining preoperative fitness, stopping blood thinners prophylactically for 7 days, and optimizing other blood parameters too. She was a high-risk case for surgery as well as for anesthesia (American Society of Anesthesiologists grade III)¹² for her age and presence of various comorbidities. Therefore, caution had to be exercised to be operating in minimal time and also making sure of causing less blood loss with optimal decompression and stabilization. Via a standard midline approach, posterior elements were exposed. At first, transpedicular–transdiscal–transcorporeal

screws from S1 to L5 body were put *in situ* using Grob's technique,⁷ while maintaining safe distance between two cancellous 7 mm screws and avoiding exiting nerve roots by identifying sacral foramina. The trajectory of the screws should be parallel to L4 pedicle in the lateral plane, and directing toward superior end plate of S1, through lumbosacral disk toward anterior and inferior aspects of L5 vertebral body by converging them by 30°. In addition to this, posterior instrumented stabilization is done two levels above for additional stability in delta fixation mode. Decompression was done adequately and wound was closed in layers (Fig. 4). Postoperative period went on well, and patient was mobilized with braces on 3rd postoperative day with the help of a walking aid.

DISCUSSION

In case of high-grade listhesis, the prime aim is to achieve adequate fusion¹³ with surgical decompression in presence of symptomatic spinal stenosis. This aim can be

achieved by various surgical methods, with each one of them having their merits and demerits. The commonest long-term complication being pseudoarthrosis can complicate the clinical picture and prolong recovery period and can lead to progression of slip and implant failure.¹⁴ Though a two-staged procedure has been advocated through an anterior approach with reduction of slip, in presence of high-risk patient,^{12,15} it is better to avoid it. There is adequate literature support to show the strength of lumbosacral fixation in presence of high-grade listhesis.^{16,17} These screws are as strong as classical 360° circumferential techniques with the additional advantage of them being simple and fast.¹² In addition, the neurological complications associated with partial or total reduction¹⁸ of listhesis are reduced drastically in this method. Fusion becomes a viable option in delta fixation,¹⁴ making it more advantageous than in patients with interbody fusion.

CONCLUSION

Delta fixation with transdiscal pedicle screws is a novel technique for surgical management of high-grade listhesis. It is simple and a safe procedure to perform, without use of any special instrumentation. Delta fixation is a better operative modality in treating high-grade listhesis, especially in high-risk patients, as it was for our case.

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