Case report

Delta Fixation for High-Grade Spondylolisthesis: An uncommon surgical technique and case report

Introduction:
High-grade spondylolisthesis is resistant to conservative management and requires surgical fixation. There are multiple options in surgery such as posterolateral fusion, posterior lumbar interbody fusion, transvertebral pedicle screw fixation, posterior trans sacral interbody fusion. But the main challenge in these procedures arises during the reduction of long-standing listhesis intraoperatively which may lead to neural damage during reduction maneuvers.

Methods:
The reported case is of a 62 yr old female presented with chronic low backache for 18 yrs with bilateral radiculopathy with bilateral positive SLR and hypoesthesia on the left L5 dermatome. Xray and MRI showed grade III spondylolisthesis at L4 over L5 with elongated pars interarticularis. The case was treated by Transdiscal fixation and posterior decompression.

Conclusion:
On follow-up, for 6 months the patient is asymptomatic with no pain on SLR though paresthesia persisted. The advantages and disadvantages of this method versus conventional methods will be discussed.

Keywords: Spondylolisthesis, delta fixation, transdiscal fixation, Spine surgery, Spine Fixation

INTRODUCTION

Symptomatic high-grade slips that are resistant to conservative treatment require surgical stabilization in spondylolisthesis. (1) The idea of in situ fusion is a fairly secure and effective method for high-grade spondylolisthesis with a balanced spine even in the cases of the unbalanced pelvis. The following are numerous surgical techniques for achieving in situ fusion in high-grade spondylolisthesis(2): posterolateral fusion with or without instrumentation, posterior interbody fusion, combined anterior and posterior procedures, and 360 ° circumferential fusion. Circumferential fusion has been found to have better outcomes, both clinically and radiologically. (3) 360 ° circumferential fusion methods are as follows: transvertebral pedicle screw fixation, posterior trans sacral interbody fusion using a cortical bone graft with pedicle screw implantation, posterior interbody cage, and pedicle screw fixation, and posterior pediculobody fixation alone or supported by superior level fusion. (4) In our case report, greater mechanical stability and fusion rate was achieved by posterior transdiscal (pediculobody) fixation supplemented by a superior level fusion by three-column stabilization along with rapidity and procedural

simplicity(5). With this procedure, compared with interbody fusion approaches, it was found that there was less intraoperative time spent, less blood loss, and less perioperative anesthetic complications, with virtually equivalent postoperative outcomes. (6)

CASE REPORT

We came across a 63-year-old female who presented with chief complaints of low backache radiating to both lower limbs for 18 years. The pain was gradual in onset, dull in nature, constant, and severe in intensity. The pain was associated with tingling in both lower limbs left more than right. The patient also gave a history of claudication with a claudication distance of 50 meters. The patient had difficulty standing for a long duration on presentation. There was a history of trauma to the back 18 years back, without the involvement of any other joint. Patient was a known case of diabetes mellitus and was on regular medications. On examination, inspection revealed an increase in lumbar lordosis and paraspinal muscle spasm was present and was confirmed on palpation. diffuse tenderness was present over the lumbar spine and a step was felt in the lower back. The straight leg raising test was positive at 50 degrees on both sides. The patient's neurology was intact in both lower limbs.

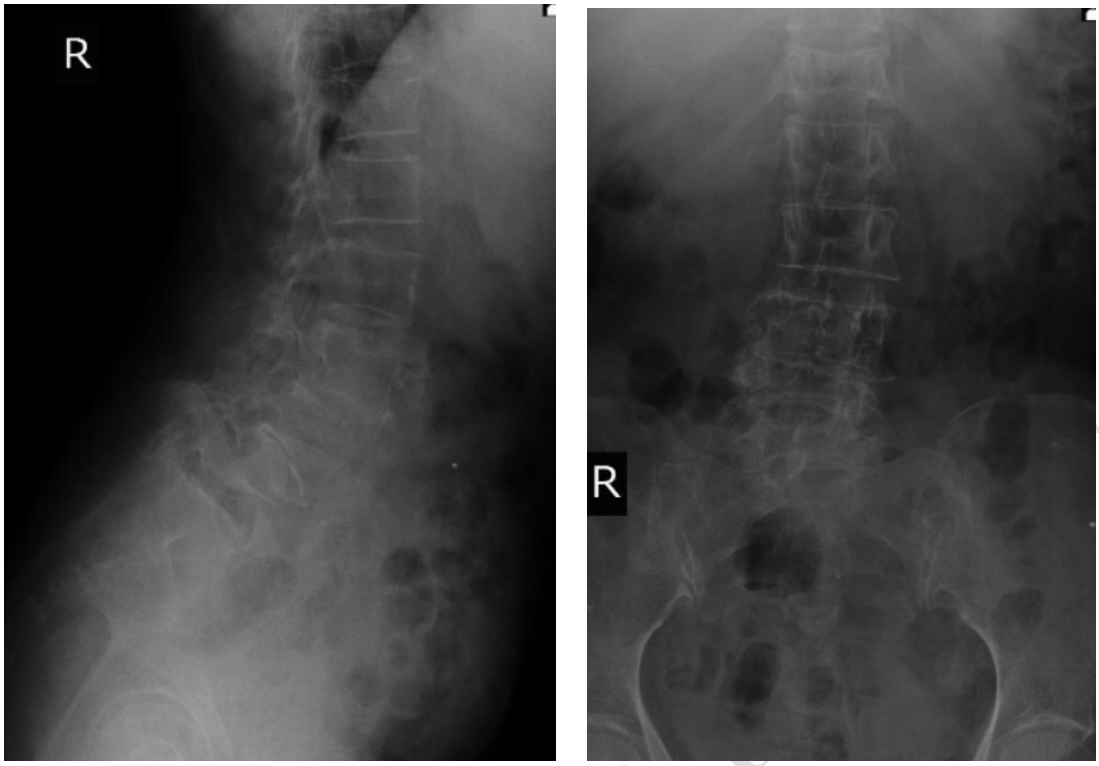

Fig 1) Pre-op Xray lumbosacral spine Antero-posterior and Lateral view

Xray lumbar spine AP and lateral view showed grade III anterolisthesis of L4 vertebrae over L5.

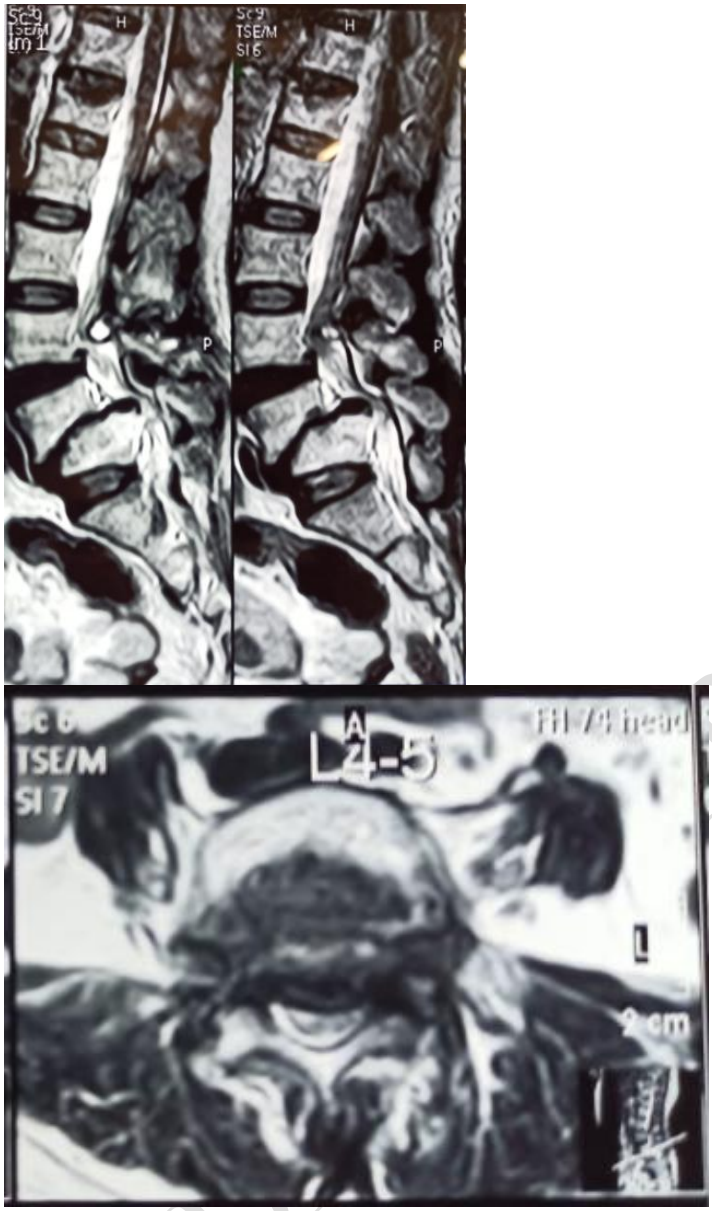

Fig 2) MRI LS Spine T2 weighted sagittal and axial images

MRI LS spine showed Grade III anterolisthesis of L4 over L5 vertebrae with diffuse disc bulge at L3L4 and L4L5.

Laboratory investigations were within normal limits. The patient was taken for surgery after obtaining preoperative physician and anesthetic fitness. The lumbar spine was exposed by a midline approach first L2L3L4L5 pedicles were identified and 2 pedicle screws were inserted from the body of L5 vertebrae to the body of L4 through intervertebral space of L4L5 while maintaining a safe distance between two cancellous screws and avoiding exiting nerve roots and transpedicular screws were inserted in L3L4L5 vertebrae respectively. Thus, overall posterior stability was achieved in delta fixation mode. Decompression was done at L3L4 and L4L5 levels and the wound was closed in layers. Patient was mobilized with a lumbar brace and walking aid on postoperative day 2.

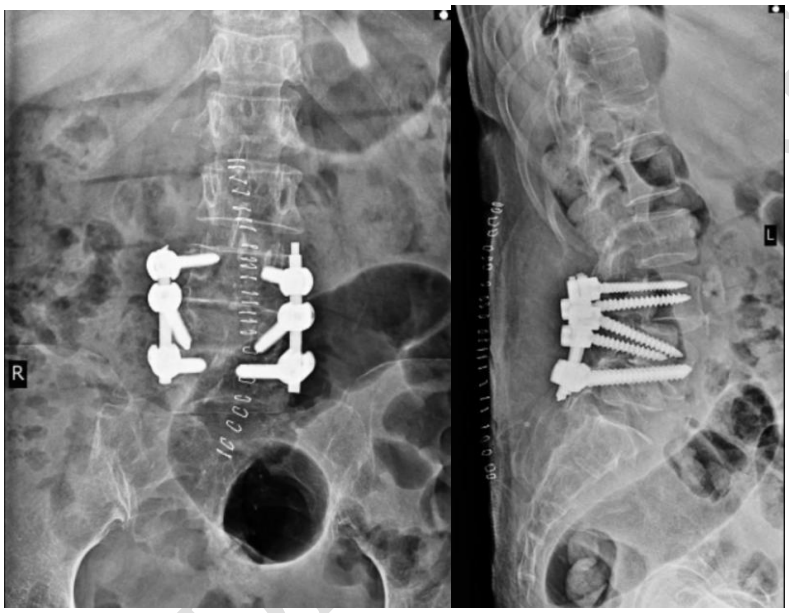

Fig 3) Postoperative X-ray of lumbosacral spine showing implant in-situ

DISCUSSION

In the case of high-grade listhesis, the primary objective is to achieve sufficient fusion with surgical decompression when symptomatic spinal stenosis is present. (7) This goal can be accomplished using various surgical approaches, each of which has its benefits and demerits. (8) Pseudoarthrosis is the most common long-term complication that can complicate the clinical image and extend the recovery time and may result in the development of new slip and implant failure. In the presence of high-grade listhesis, not much literature evidence exists to prove the efficacy of transdiscal or pediculobody fixation. (6) These screws are as powerful as traditional 360 ° circumferential techniques, with the added advantage that they are easy and fast. Furthermore, this approach greatly decreases the neurological risks associated with partial or complete reduction of listhesis thus making delta fixation a more beneficial option than in interbody fusion patients. (9)

CONCLUSION

The Delta fixation with transdiscal pedicle screws is a novel technique for long-standing high-grade spondylolisthesis. It is an easy procedure that does not require the use of any special instrumentation. Delta fixation is a better operative method for the treatment of high-grade listhesis, especially in high-risk patients as this procedure takes less time thus leading to fewer intraoperative and postoperative complications. (10)

REFRERNCE:

1. Lamberg T, Remes V, Helenius I, Schlenzka D, Seitsalo S, Poussa M. Uninstrumented in situ fusion for high-grade childhood and adolescent isthmic spondylolisthesis: long-term outcome. J Bone Joint Surg Am. 2007 Mar;89(3):512–8.

2. Pfirrmann CW, Metzdorf A, Zanetti M, Hodler J, Boos N. Magnetic resonance classification of lumbar intervertebral disc degeneration. Spine. 2001 Sep 1;26(17):1873–8.

3. Boxall D, Bradford DS, Winter RB, Moe JH. Management of severe spondylolisthesis in children and adolescents. J Bone Joint Surg Am. 1979 Jun;61(4):479–95.

4. Bartolozzi P, Sandri A, Cassini M, Ricci M. One-stage posterior decompression-stabilization and trans-sacral interbody fusion after partial reduction for severe L5-S1 spondylolisthesis. Spine. 2003 Jun 1;28(11):1135–41.

5. Lamartina C, Zavatsky JM, Petruzzi M, Specchia N. Novel concepts in the evaluation and treatment of high-dysplastic spondylolisthesis. Eur Spine J Off Publ Eur Spine Soc Eur Spinal Deform Soc Eur Sect Cerv Spine Res Soc. 2009 Jun;18 Suppl 1:133–42.

6. Weinstein JN, Lurie JD, Tosteson TD, Zhao W, Blood EA, Tosteson ANA, et al. Surgical Compared with Nonoperative Treatment for Lumbar Degenerative Spondylolisthesis. J Bone Joint Surg Am. 2009 Jun 1;91(6):1295–304.

7. Sancheti P, Hadgaonkar S, Khurjekar K, Kothari A, Singh N, Kulkarni HG, et al. Delta Fixation vs Interbody Fusion in Cases of High-grade Spondylolisthesis. J Spinal Surg. 2017 Mar;4(1):30–2.

8. Zagra A, Giudici F, Minoia L, Corriero AS, Zagra L. Long-term results of pediculo-body fixation and posterolateral fusion for lumbar spondylolisthesis. Eur Spine J. 2009 Jun;18(Suppl 1):151–5.

9. Hresko MT, Labelle H, Roussouly P, Berthonnaud E. Classification of high-grade spondylolistheses based on pelvic version and spine balance: possible rationale for reduction. Spine. 2007 Sep 15;32(20):2208–13.

10. Faciszewski T, Winter RB, Lonstein JE, Denis F, Johnson L. The surgical and medical perioperative complications of anterior spinal fusion surgery in the thoracic and lumbar spine in adults. A review of 1223 procedures. Spine. 1995 Jul 15;20(14):1592–9.