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Degenerative Spondylolisthesis of Lumbarized S1-S2 Vertebrae: A Case Report

Deepak Kumar Singh[1] Kshitij Sinha[1] Rakesh Kumar Singh[1] Vipin Kumar Chand[1] Arun Kumar Singh[1]

[1] Department of Neurosurgery, Dr. Ram Manohar Lohia Institute of Medical Sciences, Lucknow, Uttar Pradesh, India

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Address for correspondence Kshitij Sinha, MCh, Department of Neurosurgery, Dr. Ram Manohar Lohia Institute of Medical Sciences, Lucknow 226010, Uttar Pradesh, India (e-mail: kshitij.sinha0023@gmail.com).

Abstract

Introduction Degenerative spondylolisthesis (DS) is usually seen at lumbo-sacral region. Lumbarization of S1 is seen in less than 2% of the population and to have spondylolisthesis in this segment is even rarer. The purpose is to report a rare case of DS at S1-S2 level.

Case Report A 52-year-old male, a farmer by profession, presented to Neurosurgery outpatient department with complaint of low back ache for 4 years, which was insidious and progressive. The pain radiated to both lower limbs with more on right than left side. Radiological evaluation with anteroposterior and lateral roentgenogram of lumbo-sacral spine revealed anterolisthesis of S1-S2 (Meyerding's grade 2). Magnetic resonance imaging reported S1-S2 disk bulge with bilateral foraminal stenosis. The patient underwent S1 laminectomy along with S1-S2 discectomy with bilateral S1 and S2 pedicle screws and rod fixation with transforaminal lumbar interbody fusion.

Result Postoperative recovery was good with improvement in back pain along with power on postoperative day 1.

Conclusion The prevalence of lumbarization is less than 2% and getting spondylolisthesis in this segment is even rarer. As this is one of the first of its kind of case, further case series or longitudinal studies of such cases may help understand better the pathomechanics related to spondylolisthesis at this level.

Keywords

- S1-S2 Spondylolisthesis
- TLIF
- degenerative spondylolisthesis
- lumbarization
- sacralization

Introduction

The movement of one vertebra over another, either anterior or posterior, or nonalignment of one vertebra over another resulting in mechanical or radicular symptoms or pain is termed as spondylolisthesis.[1]

It originates from the Greek words *spondylos*, which means vertebra, and *olisthesis*, which means slippage down a slope. The term was given by Kilian in 1853.[2]

The predisposing element is a straight, stable joint that puts abnormal stress on the joint resulting in decompensation of disk and ligaments, abnormal mobility, and degeneration of the articular processes permitting forward slipping.[3,4]

The different anatomic measures that influence listhesis are pelvic incidence, sacral slope, pelvic tilt, and lumbar lordosis.[5]

The first classification was given by Newman and Stone in 1963 with modification by Wiltse et al, which included Type-VI-iatrogenic in origin.[2]

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Meyerding classification has been most commonly used.[2]
Grade percent slip:

1. 0–25
2. 26–50
3. 51–75
4. 76–100
5. >100 (spondyloptosis)

Case Report

A 52-year-old male, farmer by profession, presented to Neurosurgery outpatient department with complain of low back ache (visual analog scale (VAS): 4/10) for 4 years, which was insidious and progressive. The pain radiated to both lower limbs with more on right than left side.

The patient was admitted and detailed neurological examination was done. On examination, the power of thigh muscles was normal although movement of lower limbs were restricted due to pain. Power of tibialis anterior was ⅘, flexor hallucis longus (FHL) and flexor digitalis longus (FDL) was ⅘, and extensor hallucis longus (EHL) was ⅘ with decreased sensations in S1-S2 dermatome. The ankle jerks were absent bilaterally with normal knee jerks. Hematological investigations were within normal limit.

Radiological evaluation with anteroposterior and lateral roentgenogram of lumbo-sacral spine revealed anterolisthesis of S1-S2 (Meyerding's grade 2) with pars fracture of S1. Magnetic resonance imaging reported S1-S2 disk bulge with bilateral foraminal stenosis.

The patient underwent S1 laminectomy along with S1-S2 discectomy with bilateral S1 and S2 pedicle screws and rod fixation with transforaminal lumbar interbody fusion (TLIF).

Postoperative recovery was good with improvement in back pain (VAS: 2/10) along with increase in power of tibialis anterior to 5/5, FHL and FDL to 5/5, and EHL to 5/5 on postoperative day 1.

Discussion

Fusion of the sacrum completes by the third decade of life and is related to regional load-bearing aspects. Anatomical variations occur most commonly in the sacral region, which makes it the most variable portion of the spine.[6]

Lumbo-sacral transition junction (LSTV) was classified by Castellvi et al[7] as:

- Type I: dysplastic transverse process—unilateral (a) or bilateral (b) large triangular transverse process
- Type II: Incomplete lumbarization/sacralization
- Type III: Complete lumbarization/sacralization
- Type IV: Mixed type, that is, IIa on one side and IIIa on the other

Complete lumbarization of the S1 vertebra represents one end of the "transitional spectrum" at the LSTV with the other end being represented by absolute sacralization of the fifth lumbar vertebra with several intermediate transition states in between.

The process of sacralization depends upon the size of sacrum. If the size of sacrum is small in dimension, especially at the weight-bearing region, then the body will undergo sacralization of the last lumbar vertebra to increase its weight-bearing capacity, thus leading to the formation of six-bone sacrum.

The other end of this spectrum is the process of lumbarization in which the sacrum has increased capacity of bearing weight at the lower end; thus, the process of ascending fusion terminates with the formation of a sixth lumbar vertebra, along with four sacrum (►**Fig. 1**).

The prevalence of LSTV reported in the literature ranges from 4 to over 35%. Among all transitional states encountered at this junction, the prevalence of complete lumbarization is ~1.8%, which is very rare when compared with sacralization of lumbar vertebrae.[8]

Degenerative spondylolisthesis (DS) is a result of increased instability and hypermobility caused by degenerative changes, including disk degeneration with narrowing and loss of annular support or articular degeneration of the facet joints.

Spondylolisthesis of lumbo-sacral junction and midlumbar spine is most commonly involved followed by cervical and rarely the thoracic vertebra but is rarest in lumbarized sacral vertebra.[2]

In most of the patients, LSTV leads to back pain and disk degeneration with herniation leading to impingement or radiculopathy. Increased mobility and abnormal rotatory movements at the intervertebral disk are believed to place the disk and joints at increased risk of degeneration. The other cause leading to increased risk of degeneration is increase in lumbo-sacral angle, which puts increased stress on the joint and may cause remodeling of the facets leading to degeneration.

Abnormal angular motion and sagittal translation, which indicates hypermobility of the vertebrae, have been seen in people contributing to DS. The motion of the vertebrae increases as the sagittal orientation of the facets decreases and vice versa. The increased mobility puts mechanical stress that in turn leads to initiation of degenerative process in pars interarticularis and facets. Disk degeneration, which occurs due to loss of fluid and elasticity, leads to decrease in height of vertebrae and puts additional increase in pressure on facets leading to joint degeneration.[9]

In case of listhesis, there is reduced resistance of the anterior area of the facets and during flexion the superior facets of vertebrae below cannot prevent forward slippage of the above vertebrae.

Low-grade spondylolisthesis is managed conservatively with flexion-extension core strengthening exercises, which increases the stability of the spine with reduction in pain. Local steroid injections at nerve root may help in temporary relief to some patients, although patients with prolonged, severe, and worsening disease do require surgical intervention with the following goals:[10]

1. Stabilization and fusion of spine segment
2. Restoration of foraminal height

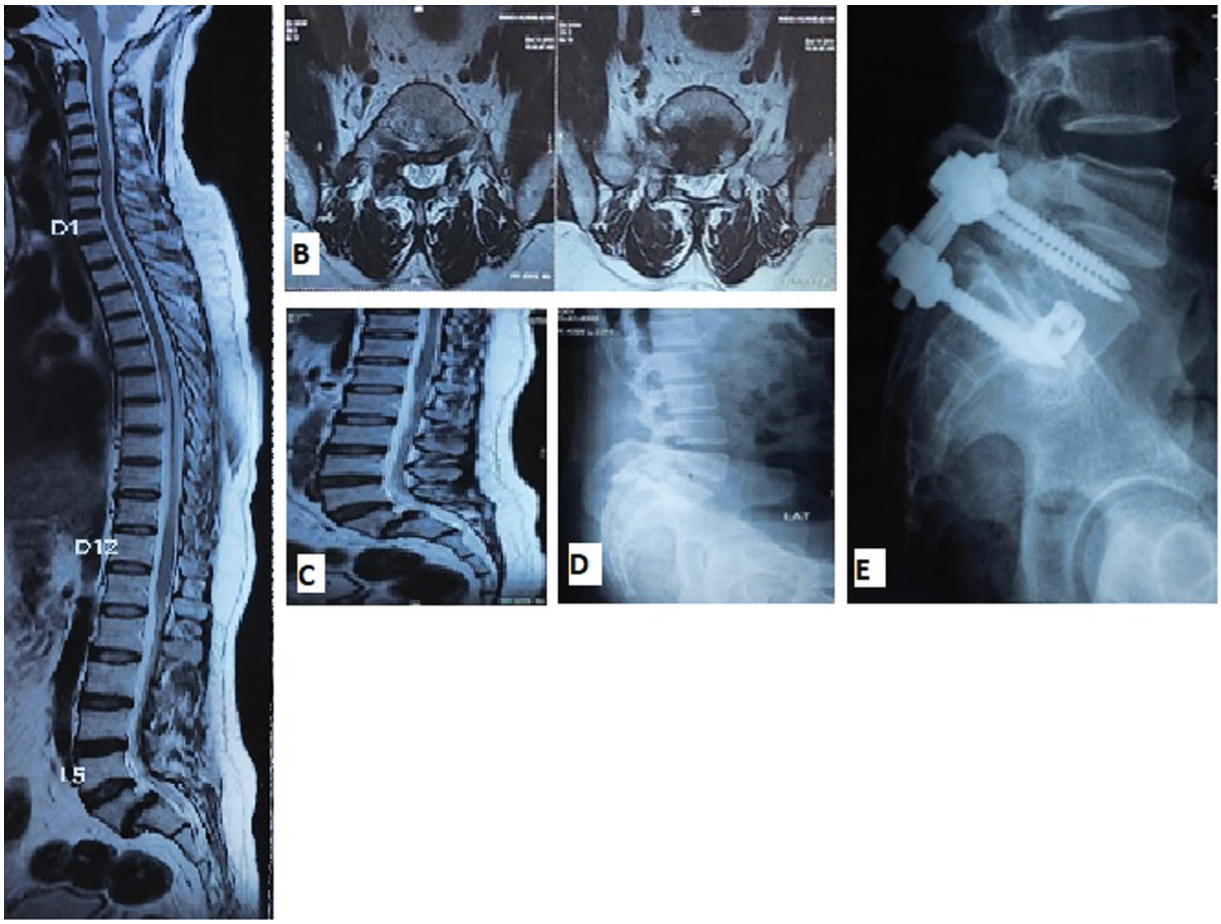

Fig. 1 (**A**) MRI suggestive of Lumbarised S1-S2 listhesis, (**B**) Axial cuts showing disk bulge, (**C**) Sagittal image of L-S spine, (**D**) Pre-op X-ray L-S spine Lateral view showing Grade 2 listhesis, (**E**) Post op X-Ray Lateral view

3. Avoidance of recurrence
4. Neural decompression

Interbody fusion restrengthens the anterior support and sagittal profile, and provides immediate stability. Posterior lumbar interbody fusion was started by Cloward for spondylolisthesis, which was later on modified by Harms and Jeszensky as TLIF.[2]

The risk of postoperative adjacent segment disease may increase in patients who have had advanced disk degeneration preoperatively. Post instrumentation, this increase may be due to decrease in function and biomechanical alteration in the segment below where fusion of the spine is done. The biomechanical alterations occur due to decreased elasticity and increased stiffness of the spine leading to increased intradiscal pressure and stress. The patients should be informed about its risk and should still be given benefit of surgery.[11]

The patient in our case underwent S1 laminectomy along with S1-S2 discectomy with bilateral S1 and S2 pedicle screws and rod fixation with S1-S2 TLIF. No reduction was tried as neurological decompression with fusion is the main aim in such cases, which could be achieved with or without reduction. The drawback with reduction attempt is root stretching or damage, which can result in neurological deficit.[12]

Conclusion

Lumbarized S1-S2 listhesis has rarely been reported and further case series are required to understand biodynamics of spondylolisthesis in association with the process of lumbarization and sacralization of vertebrae. Surgical treatment of lumbo-sacral lesions requires understanding of the underlying anatomy, which changes with growth.

Patient's Consent

A full and detailed consent from the patient/guardian has been taken. The patient's identity has been adequately anonymized. If anything related to the patient's identity is shown, adequate consent has been taken from the patient/relative/guardian. The journal will not be responsible for any medico-legal issues arising out of issues related to patient's identity or any other issues arising from the public display of the video.

Authors' contribution

The authors hereby certify that the work shown here is genuine and original and has not been submitted anywhere, either in part or full. They transfer the full rights to the journal. All the necessary permissions from the patient, hospital, and institution have been taken.

Conflict of Interest
None declared.

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