Case Report
Volume 9:5, 2020
DOI: 10.37421/jsp.2020.9.455

Journal of Spine

ISSN: 2165-7939 **Open Access**

New-Onset Radiculopathy on Unaffected Side Post Spine Surgery-S1 Screw Irritating L5 Nerve Root: A Case Report

Manoj D. Singrakhia and Ibad Sha*

Department of Spine Surgery, Shanta Spine Institute, Nagpur, Maharashtra, India

Abstract

Acute onset of neuropathic pain after lumbosacral fusion spine surgery can be due to multiple causes including a laterally directed bicortical S1 pedicle screw. We here are reporting a case where a laterally directed S1 pedicle screw irritating the L5 nerve root and producing a postoperative acute onset radicular pain on an unaffected side. After the failure of 1-month conservative treatment, the patient was operated and S1 screw was revised. While placing bicortical sacral screw, surgeons should stick to safe window described on cadaveric studies and MRI is a non-invasive and reliable method to identify anay nerve root irritation by bicortical sacral screws.

Keywords: Radiculopathy • Bicortical sacral screw • Root irritation • Lumbosacral fusion • MeSH terms • Lumbar vertebrae/surgery • Pedicle screws/Adverse effects • Radiculopathy/Etiology • Spinal fusion/Adverse effects • MRI • Rootography

Introduction

Acute onset of neuropathic pain after spine surgery can be due to multiple causes such as residual stenosis, instability, pedicle screw malposition etc. [1]. The sacrum is a trapezoidal structure with no true pedicle (no well defined cortical ring [2]). They have maximum bone mass on the anterior and lateral sides, and these regions have been considered suitable for screw placement. But it has been reported once before that there is a possibility of lumbar nerve root irritation by a laterally directed pedicle S1 pedicle screw [3]. We here are reporting a case where a laterally directed S1 pedicle screw irritating the L5 nerve root and producing a postoperative acute onset radicular pain on the unaffected side.

Case Presentation

The patient was a 40-year-old complaining of back pain for 3 years which increased over past month. She had radicular pain on the right lower limb for 1 month. Clinical evaluation showed restriction of back flexion and extension with features corresponding to L5 Radiculopathy. There was no motor impairment. Radiological evaluation using flexion-extension Xray and MRI was done. X-ray showed spondylolysis at L4-L5 and L5-S1 levels with spondylolisthesis at L5-S1 level. MRI confirmed the finding of spondylolisthesis and also showed narrowing of both right and left L5 foramen (Figure 1). After routine preop evaluation, she underwent elective L4-L5 PLIF with L4-L5-S1 laminectomy, bilateral L4, L5 foraminal decompression and posterior instrumented fusion from L4-L5-S1. Surgery was uneventful and adequate decompression of bilateral L4 and L5 foramen was confirmed prior to closure. Postoperatively the right leg radicular pain disappeared and rehabilitation was started from day 2 onwards as per hospital protocol. By day 3 evening she developed a new-onset of radicular pain on the left side which was unaffected before surgery. The pain increased on walking and decreased on lying down.

***Address for Correspondence:** Sha I, Department of Spine Surgery, Shanta Spine Institute, Nagpur, Maharashtra, India, E-mail: ibadshah47@gmail.com*

Received 28 July 2020; **Accepted** 17 August 2020; **Published** 24 August 2020

Postoperative radiograph was taken and didn't show any pedicle screw malposition other than S1 screw on left side directing laterally. On examination, the pain on the left leg was of radicular type and straight leg raising test was positive. One dose intravenous methylprednisolone infusion was given to the patient and she had some relief. She was treated conservatively for 1 month with analgesics and gabapentin. On review after 1 month, her left leg radicular pain increased in severity and her walking distance was reduced to less than 10 blocks. She was radiologically evaluated with CT and MRI (Figures 2 and 3). CT didn't show any significant medial or inferior wall breach by any of the pedicle screws. MRI showed S1 screw on the left side directing laterally was impinging the left L5 nerve root which was lying anterior to sacral ala. With the radiological findings of S1 screw impinging L5 nerve root she was advised revision surgery and after getting consent she was operated. Intra op thorough inspection of dural sac and nerve roots were done and no compression of L4 or L5 nerve root was noted. The S1 screw was removed and reinserted directing medially (Figure 4). Postoperatively her left lower limb radicular pain disappeared completely. She started walking post op day 2 and was completely relieved of pain. 6 month follow-up showed no recurrence of radicular pain.

Discussion

Lumbosacral fusion is the standard treatment in case of lumbosacral instability or deformities. Stable internal fixation of the lumbosacral junction along with the grafting is needed to obtain a high rate of solid fusion [4]. Sacral pedicle screws with a good bony purchase will increase the stability and fusion rates. It has been well described that S1 pedicle screw can have anteromedial and anterolateral trajectories either 30° medial into the pedicle or 45° to 50° lateral into the sacral ala with a 10° to 20°caudal tilt in the sagittal plane [5]. Cadaveric studies done previously regarding sacral pedicle screw placement describes the risk of injury to lumbosacral trunk (L4-L5) [6]. The L4 nerve root joins the L5 nerve root superior to the first sacral foramen. In 33% cases L4 nerve roots may join the L5 nerve root lower down above the most anterior part of the sacroiliac joint thereby increasing the chance of direct L4 nerve root injury also [7]. The L5 nerve root is the closest anterior relation to the sacrum running just 0.1 mm off of the anterior periosteal surface [8]. L5 nerve root location can also be variable with its position occurring either laterally on the ala near the SI joint or medially over the Sacral pedicle. Even though previous studies by Krag et al. and Roy-Camille et al. strongly recommended avoiding anterior cortex penetration as it increases the risk of neurovascular injury, the increased biomechanical stability and pull out strength of bicortical screw have been well documented in the literature [9-11]. To increase, the stability many spine surgeons opt for a bicortical sacral screw. Cadaveric study by

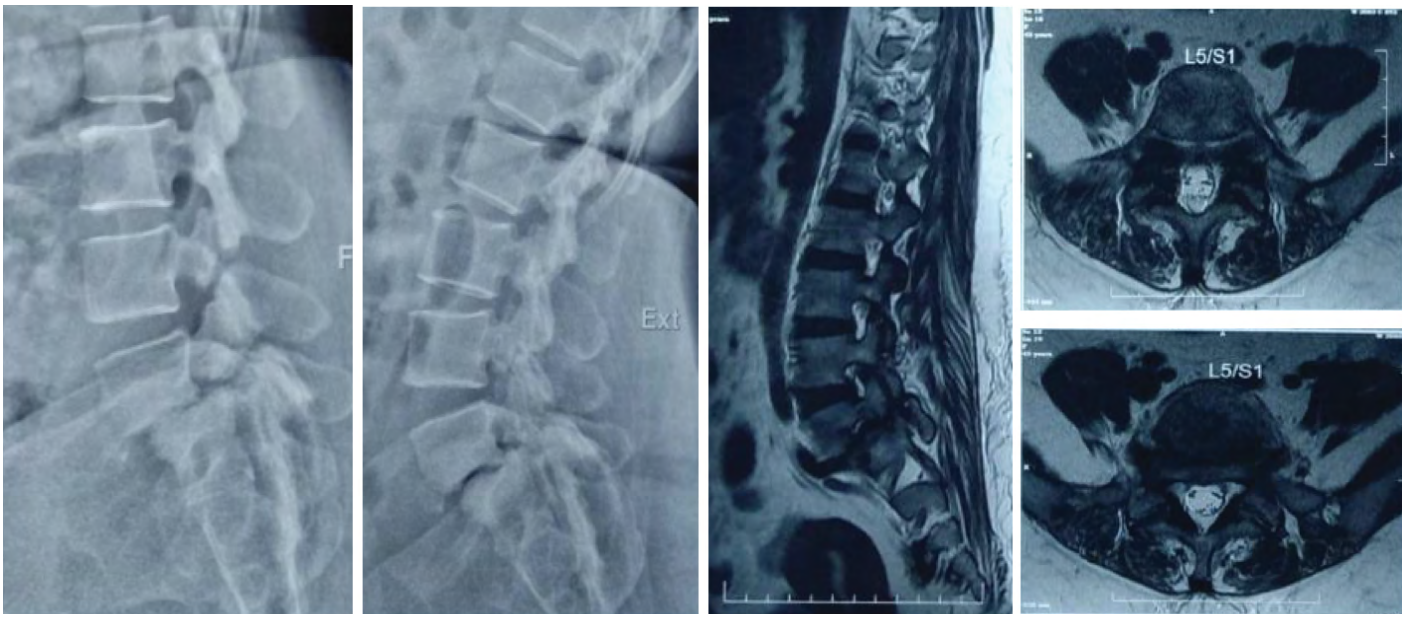

Figure 1. Pre-operative X-ray and MRI showing L4-L5 and L5-S1 spondylolysis with L5 – S1 listhesis and foraminal narrowing.

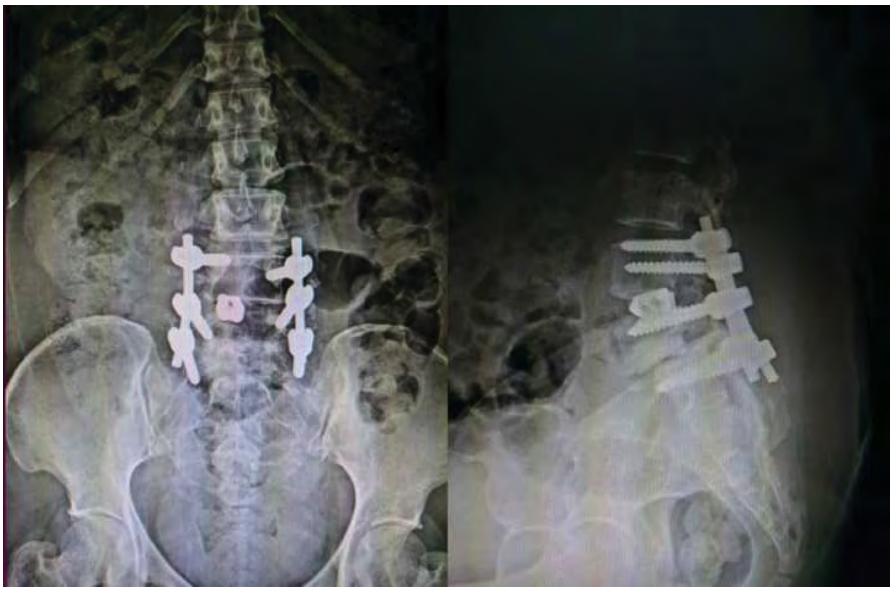

Figure 2. Post-operative X-ray showing laterally placed S1 screw on left side.

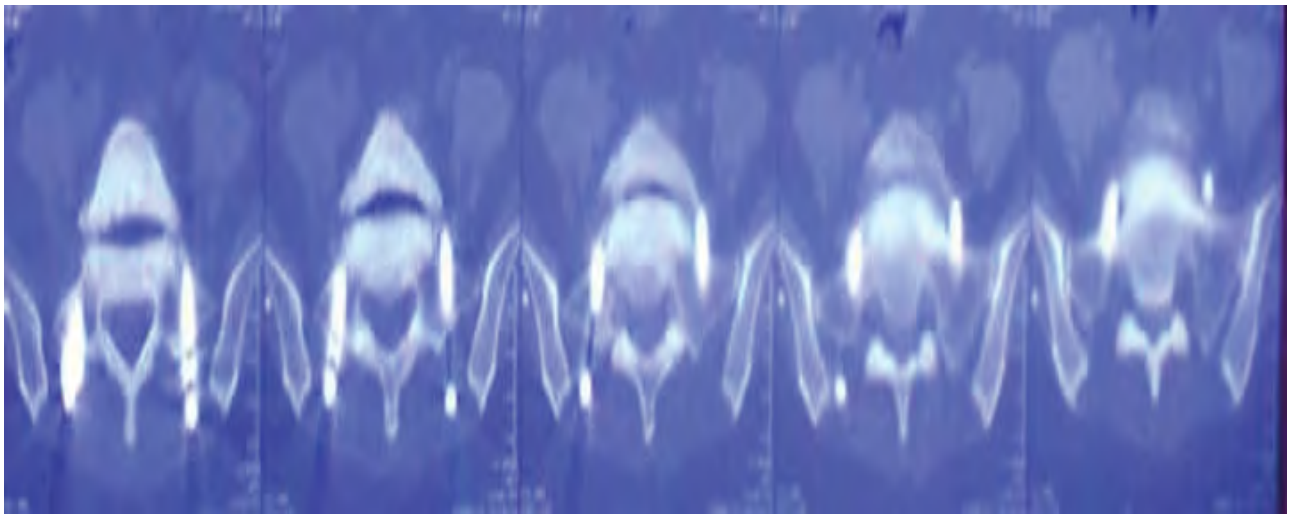

Figure 3. CT scan showed no medial or inferior pedicle breach by pedicle screws.

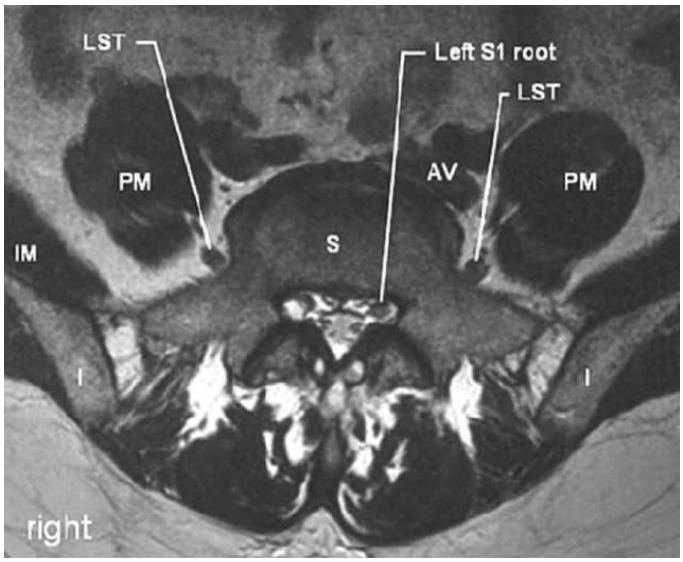

Figure 4. Normal anatomy at S1 pedicle level showing relationship of Lumbosacral Trunk (LST) and sacral ala.

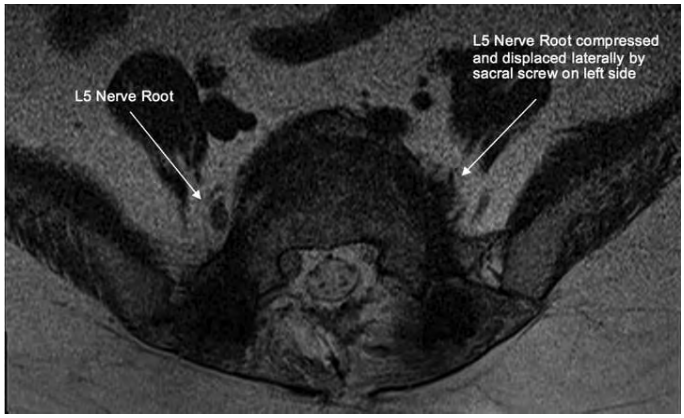

Figure 5. MRI axial cut at the level of S1 pedicle showing impingement and lateral displacement of L5 Nerve root by S1 pedicle screw.

Figure 6. Post-operative X-ray showing realigned medially directed pedicle screw.

Ergur et al. also described risk of neurovascular injury with anterior cortical penetration [12].

There has been only one paper till now reporting neurological injury following a laterally directed sacral screw. They used selective rootgraphy to identify the nerve root injury while in our case report we found that MRI is faster, non-invasive and reliable method to detect nerve root irritation by S1 pedicle screw. Like in the previous case report, in our case also X-ray and CT did show any evidence of nerve root irritation by any of the pedicle screw. In our case, we used the criteria for Post-Operative Revision Scores of Pedicle Screw Malpositioning (PRSPSM) in the lumbosacral canal described by J.Y. Du et al. [13]. In our case the score calculated before patients discharge was less than 5 and score at the time of review was 6. We also used nerve root tracing in MRI axial cut to confirm the nerve root irritation. Surgeons should be aware of the critical surgical parameters about medial and lateral safe zones described by Mirkovic et al. [14]. The lateral safe zone is 16 mm wide and is bordered by the SI joint laterally and the lumbosacral trunk medially while the medial zone is 24 mm wide safe zone and is bordered by the sacral promontory medially and the internal iliac vein laterally [14]. Even still due to the variation in anatomy the chances of a bicortical sacral screw injuring a neural or vascular structure should always be kept in mind. Hence in a case of new onset post operative radiculopathy, always look for a malpositioned pedicle screw and MRI is a non-invasive tool to detect the same

Conclusion

New-onset radiculopathy in post-surgery patients can be due to a malpositioned pedicle screw and bicortical sacral screw should be always evaluated for any nerve root irritation. MRI is a better non invasive tool than rootgraphy to evaluate for nerve root irritation by malpositioned sacral screw. In cases where conservative treatment fails, reinsertion of the pedicle screw is advised.

References

1. Jae Hwan Cho, Jae Hyup Lee, Kwang-Sup Song and Jae-Young Hong. "Neuropathic Pain after Spinal Surgery." *Asian Spine J* 11 (2017): 642-652.
2. Ipek Ergur, Omer Akcali, Amac Kiray and Can Kosay, et al. "Neurovascular Risks of Sacral Screws with Bicortical Purchase: An Anatomical Study." *Eur Spine J* 16 (2007): 19-23.
3. Masahiro Inoue, Gen Inoue, Tomoyuki Ozawa and Masayuki Miyagi, et al. "L5 Spinal Nerve Injury Caused by Misplacement of Outwardly-inserted S1 Pedicle Screws." *Eur Spine J* 3 (2013): 461-465.
4. Hu, Huang. "Contralateral Radiculopathy after Transforaminal Lumbar Interbody Fusion in the Treatment of Lumbar Degenerative Diseases." *Med* 97 (2018): 469.
5. Peretti, Fang. "Anatomic and Experimental Basis for the Insertion of a Screw at the First Sacral Vertebra." *Surg Radiol Anat* 13 (1991): 133-137.
6. Mirkovic, Sou. "Anatomic Consideration for Sacral Screw Placement." *Spine* 16 (1991): 289-294.
7. Saranatra Waikakul, Supichya Chandraphak and Pichet Sangthongsil. "Anatomy of L4 to S3 Nerve Roots." *J Orthop Surg* 18 (2010): 352-355.
8. Yoshihiro Katsuura, Eric Chang, Shahbaaz A. Sabri and Warren E. Gardner, et al. "Anatomic Parameters for Instrumentation of the Sacrum and Pelvis: A Systematic Review of the Literature." *J Am Acad Orthop Surg Glob Res Rev* 2 (2018): 34.
9. Krag, Martin. "Biomechanics of Thoracolumbar Spinal Fixation: A Review." *Spine* 16 (1991): 84-99.
10. Raymond Roy-Camille, Garard Saillant and Christian Mazel. "Internal Fixation of the Lumbar Spine with Pedicle Screw Plating." *Clin Orthop* 203 (1986): 7-17.
11. Ronald A. Lehman, Timothy R. Kuklo, Philip J. Belmont and Romney C. Andersen, et al. "Advantage of Pedicle Screw Fixation Directed into the Apex of the Sacral Promontory over Bicortical Fixation: A Biomechanical Analysis." *Spine* 27 (2002): 806-811.
12. Ipek Ergur, Omer Akcali, Amac Kiray and Can Kosay, et al. "Neurovascular Risks of Sacral Screws with Bicortical Purchase: An Anatomical Study." *Eur Spine J* 16 (2007): 1519-1523.

13. Yunfen, Wu. "Treatment Strategies for Early Neurological Deficits Related to Malpositioned Pedicle Screws in the Lumbosacral Canal: A Pilot Study." *Bone Joint Res* 5 (2016): 46-51.

14. Mirkovic, Sam. "Anatomic Consideration for Sacral Screw Placement." *Spine* 16 (1991): 289-294.

How to cite this article: Manoj D. Singrakhia and Ibad Sha. "New-Onset Radiculopathy on Unaffected Side Post Spine Surgery-S1 Screw Irritating L5 Nerve Root: A Case Report." *J Spine* 9 (2020): 455. DOI: 10.37421/jsp.2020.9.455