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# Tips and Tricks: Lumbar Spinal Peri-implant Lucency with Spontaneous Resolution- A Decision to Stay the Course

## Introduction

Pedicle screws are threaded implants inserted through the vertebral pedicles in the spine. They are widely used to achieve rigid, tri-columnar fixation of the spine during posterior spinal instrumentation surgery.<sup>1</sup> With appropriate technique, they have been shown to increase fusion rates and therefore provide better outcomes in patients suffering from compressive pathologies.<sup>2,3</sup>

One of the complications of pedicle screw placement is screw loosening. This can occur due to bony remodeling secondary to decreased load going through the fixed bone (stress shielding), intraoperative microfractures caused by screw placement, or the presence of osteoporotic bone which precludes adequate fixation of the screw.<sup>4,5</sup> Screw loosening frequently presents as worsening back pain and can result in pseudoarthrosis and increased patient morbidity. Motion at the sites of instrumentation can also cause neurologic symptoms by compressing on the neural elements. This can cause a recurrence of the symptomatology that was supposed to be alleviated by the index spinal procedure. A reliable method of identifying screw loosening is evaluating for radiographic lucencies on CT imaging.<sup>6</sup> Although MRI is the usual test of choice in the setting of spinal pathology, CT scans are also heavily utilized in order delineate osseous architecture especially in the setting of prior instrumentation. CT imaging is also helpful to assess for evidence of hardware failure and relative amounts of peri-implant osteopenia.

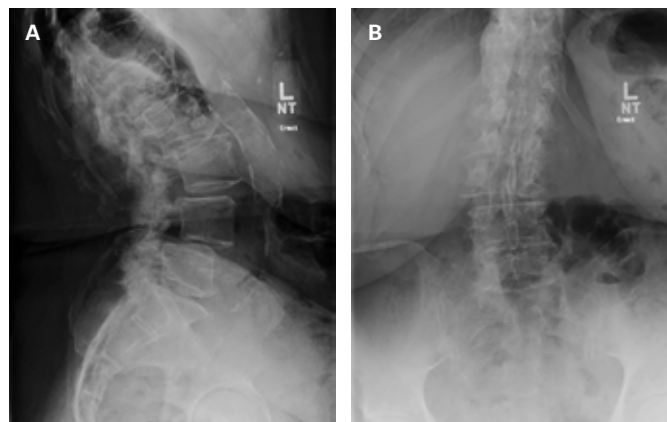
Treatment for pedicular screw loosening varies based on clinical significance and

presence of pseudoarthrosis. Patients with minimal back pain and evidence of successful spinal fusion can pursue nonoperative management. However, evidence of pseudoarthrosis, hardware malposition that can threaten neural elements, worsening back pain, and progressive neurological deficits may require revision spinal surgery.<sup>7</sup> We present a case of posterior spinal decompression and fusion with postoperative screw lucency that not only resolved with nonoperative treatment, but also had a disappearance of the peri-implant lucency.

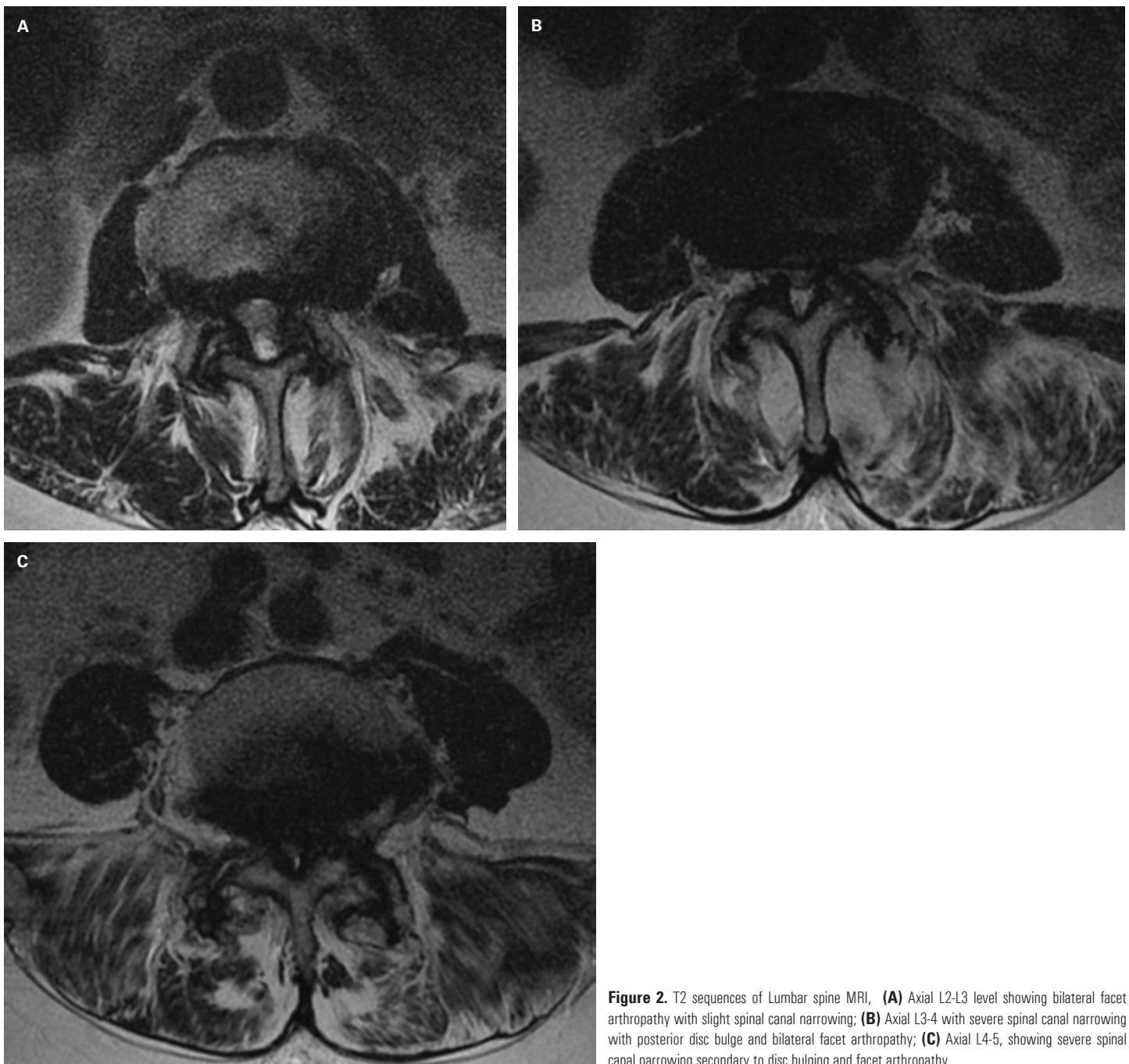
## Case presentation

A 73-year-old female presented to the office on July 2014 with low back and bilateral leg pain that had been present for 2-3 years. The pain radiated laterally down the leg to the foot with numbness in the buttocks and leg, and her left leg pain radiated posteriorly to the knee with associated numbness. Conservative treatment with physical therapy, epidural injections, and anti-inflammatories provided only minimal relief. On exam, she had normal range of motion to the lumbar spine with no point tenderness. She was neurovascularly intact except for decreased sensation to light touch in the left lower extremity.

A lumbar spine x-ray demonstrated mild lumbar scoliosis and L3-L4, L4-L5 spondylolisthesis (Figure 1). Lumbar spine MRI revealed multilevel lumbar disc degeneration, disc bulges, facet arthropathy, and spinal stenosis, most pronounced L3/L4 and L4/L5 (Figure 2).



**Figure 1.** Lumbar spine x-ray. (A) Lateral x-ray showing L3/L4, L4/L5 spondylolisthesis; (B) AP x-ray showing mild lumbar scoliosis.



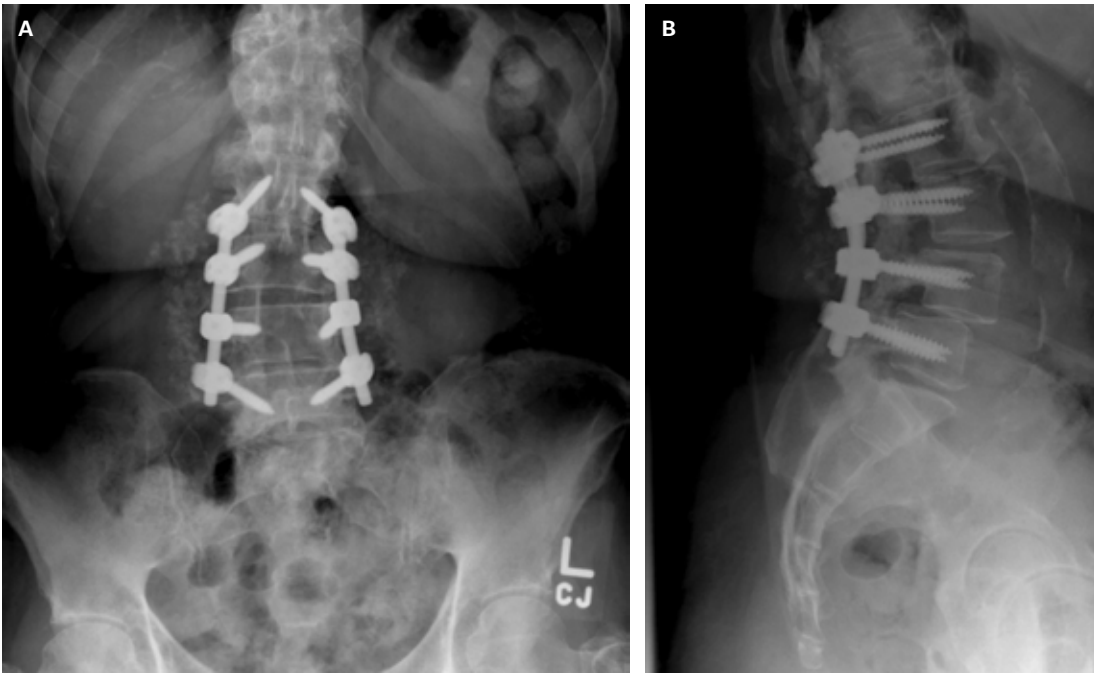
**Figure 2.** T2 sequences of Lumbar spine MRI, (A) Axial L2-L3 level showing bilateral facet arthropathy with slight spinal canal narrowing; (B) Axial L3-4 with severe spinal canal narrowing with posterior disc bulge and bilateral facet arthropathy; (C) Axial L4-5, showing severe spinal canal narrowing secondary to disc bulging and facet arthropathy.

Based on imaging findings and clinical presentation, the patient was diagnosed degenerative spondylolisthesis with multilevel lumbar stenosis. Given the failure of nonoperative treatment in alleviating symptoms, the patient decided to proceed with elective surgery. The patient underwent L2-L3, L3-L4, L4-L5 posterior lumbar decompression and fusion on September 2014. There were no complications during the postoperative hospital course and the patient was discharged on post op day 3.

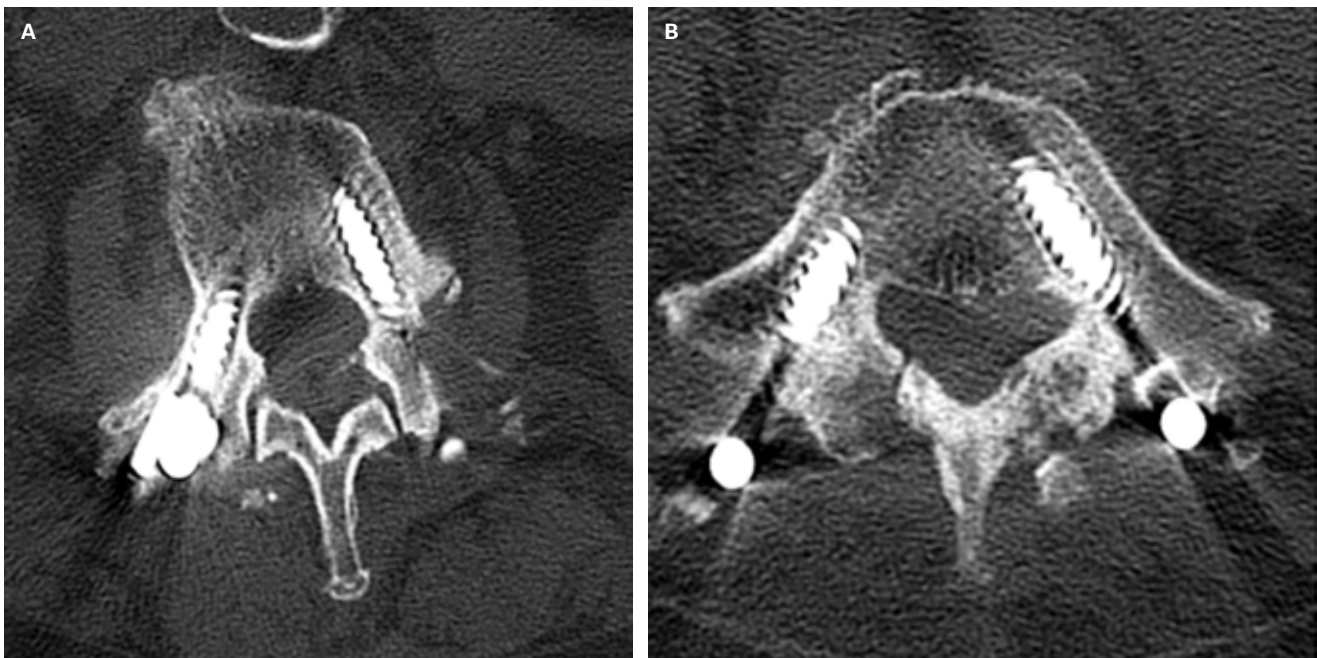
At 2- and 6-weeks follow-up, the patient's sensation in the lower limbs normalized and X-rays revealed stable hardware in adequate position. (Figure 3).

At seven months follow-up, the patient reported increased back pain and right lateral hip pain impeding activities of daily living. Aquatic physical therapy was recommended and provided moderate symptom improvement. At one year follow-up, the patient reported continued back pain and a CT scan was obtained to evaluate for hardware positioning (Figure 4). Images revealed lucencies adjacent to the bilateral pedicle screws at L2 and L5, suggestive of hardware loosening. There was a fusion mass present.

Given the imaging findings suggestive of hardware loosening, the option of a revision fusion procedure was discussed with the patient. After a risk versus benefits



**Figure 3.** (A) AP and (B) lateral x-rays of the lumbar spine at 6 week follow up showing L2-L5 posterior spinal fusion in adequate position.



**Figure 4.** 1-year post-op Axial CT images highlighting bilateral pedicle screw lucencies at (A) L2 and (B) L5.

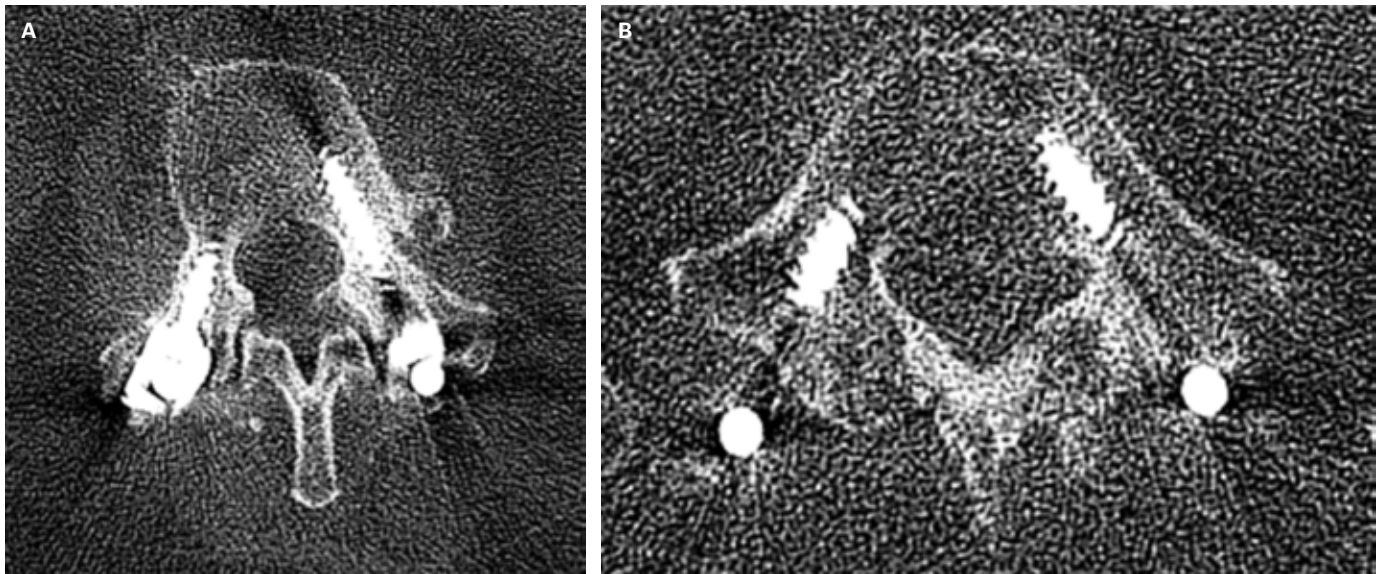
discussion, the patient elected to proceed with conservative treatment options and was referred to a pain management specialist for symptom management.

At three years postoperative follow up, the patient had improved functionality and was no longer complaining of back pain. A repeat CT scan was obtained to characterize hardware positioning. Images revealed no lucencies about the pedicle screws at L2 and L5 (Figure 5). There was successful osseous fusion across L2-L5 with no evidence of hardware malposition.

## Discussion

Pedicle screws can be used reliably to achieve spinal fixation in deformity correction surgery. Possible complications include screw loosening, which can present with post-operative back pain that is refractory to medications and physical therapy. Assessing for peri-hardware radiolucent zones, indicating osteolysis, is a reliable way to track screw loosening.<sup>8</sup>

Historically, persistent back pain in the setting of hardware loosening has been viewed as an indication



**Figure 5.** 3-year post-op Axial CT images at (A) L2 and (B) L5 highlighting stable pedicle screws in the lumbar spine. There appears to be resolution of the bilateral pedicle screw lucencies compared to two years prior.

for revision surgery. It may be a marker of ongoing pseudoarthrosis which can increase the risk for patient disability. We present a case of postoperative screw loosening treated nonoperatively with subsequent resolution of peri-implant lucency.

There is limited literature on nonoperative treatment of screw loosening, so the mechanism for resolution of peri-screw osteolysis in this case report remains unclear. Some authors track screw loosening differently by assessing for screw pull out (either partial or complete). Studies have shown that screw loosening rates may be more than four times higher when defined by radiolucent zones as compared to implant pullout.<sup>8</sup> This may indicate that in patients with a higher risk for screw loosening, such as osteoporosis, implant pullout assessment should be used to supplement radiolucent findings on imaging.

## Conclusion

Radiolucent zones around pedicle screws are a marker of osteolysis and ongoing screw loosening. Osteoporotic patients are at higher risk for osteolysis and need careful assessment of spinal implant positioning. Radiolucent zones may represent false positivity as concerns screw loosening in such patients. Implant pullout should always

be assessed prior to surgical consideration. Consideration of the patient symptomatology and desires for further surgical intervention should be explored as well. More literature is needed to track long term outcomes in such patients.

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