



## PERCUTANEOUS SACROPLASTY FOR THE TREATMENT OF SACRAL PEDICLE SCREW LOOSENING IN AN OSTEOPOROTIC PATIENT

İlker ÇÖVEN <sup>1</sup>,  
Fikret ŞAHİNTÜRK <sup>2</sup>

<sup>1</sup> *Beyin Cerrahi Kliniği, Sağlık Bilimleri Üniversitesi, Konya.*

<sup>2</sup> *Baskent University School of Medicine Department of Neurosurgery Ankara Turkey*

**Address:** İlker Çöven,  
Yeni Meram Caddesi, No: 97,  
Konya, Türkiye.  
**Phone:** +90 533 524 74 49  
**E-mail:** covenilker@yahoo.com  
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### ABSTRACT:

Pedicle screw loosening is a major concern especially in the osteoporotic spine. It results from the loss of metal-bone interface integrity. Once a screw pullout occurs, the surgeon should revise the implant. Different salvage techniques exist such as using larger screws, screws with a larger thread depth and pitch, expandable screws, screws with bicortical purchase, milled bone graft impacted into the pilot hole, or PMMA augmented screws. We describe a new, minimally invasive salvage technique that could be an alternative to open revision surgeries. As an alternative to open, major revision surgeries for failed and/or loosened instrumentation systems, we suggest minimally invasive cement augmentation procedure under local anesthesia.

**Key words:** pedicle screw, sacrum, augmentation, vertebroplasty, polymethylmethacrylate

**Level of Evidence:** Case report, Level IV

### INTRODUCTION

Pedicle screw placement is a well-known and increasingly performed technique used to achieve fixation and fusion in thoracolumbar surgery. Since its first introduction by Harrington and Tullos in 1969 <sup>(6)</sup>, the use of pedicle screw instrumentation has become increasingly popular and effective in the management of spinal disorders <sup>(6-7,16)</sup>. Despite technical advances, pedicle screw insertion is still associated with complications such as nerve root or spinal cord injury, vascular or visceral injury, cerebrospinal fluid leakage, pedicle fracture, screw breakage, screw pullout and late spinal instability <sup>(5,11)</sup>.

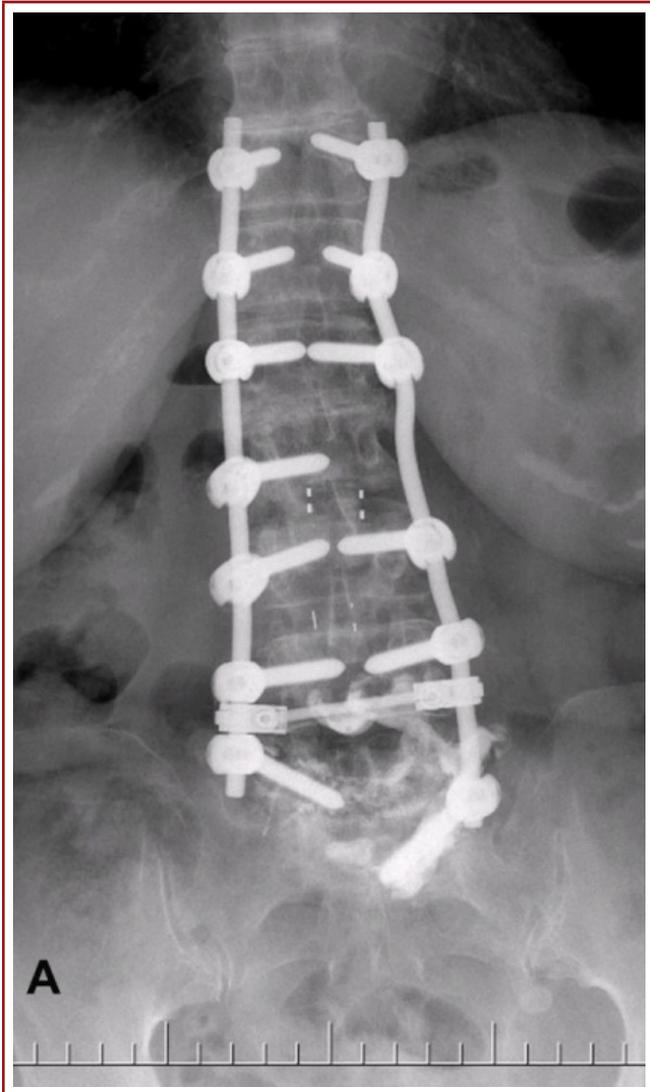
The key determinant of pedicle screw performance is the strength of attachment to the spine, which was shown to be directly related to the quality of bone at the insertion site <sup>(6-8)</sup>. Chronic diseases such as osteoporosis, diabetes or osteolytic lesions negatively affect bone quality and leads to screw loosening. Once the pedicle screw has loosened, restarted symptoms often overcome by further extensive revision surgeries <sup>(2,4)</sup>.

In this report, the authors describe a unique, minimally invasive method for the treatment of screw loosening that could be an alternative to more extensive revision surgeries.

### CASE REPORT

71-year-old female patient was admitted to our department with the chief complaint of severe low back pain radiating to her left hip and posterior aspect of left thigh for 2 months. She described increasing pain while sitting and standing. Sacroiliac region was painful on examination. She had a history of previous lumbar disk and instrumentation surgeries. At the last surgery, loosened L5 screws had been removed and PMMA augmentation had been performed. Larger diameter screw had been replaced on the right L5 pedicle, however left L5 screw had not been replaced successfully. So, the construct on the left side had been extended to the sacrum. She was under medication for diabetes mellitus, coronary heart disease and osteoporosis.

X-Ray images showed asymmetric thoracolumbosacral instrumentation with anterior fusion and PMMA augmentation. Radiolucent halo was observed both around the left S1 and right L5 pedicle screws (Figure-1).



**Figure-1.** AP X-Ray images showing asymmetric thoracolumbosacral instrumentation with anterior interbody fusion and PMMA augmentation.

According to the patient's symptoms, we decided to revise the S1 screw and to lengthen the implant to the iliac wings. But cardiology and anesthesiology departments indicated high risk for the induction of general anesthesia. In that situation, we thought to augment the loosened sacral pedicle screw with polymethylmethacrylate (PMMA) under local anesthesia.

The patient was operated on the prone position. After the injection of local anesthesia, Jemshdy needle and then working cannula was placed under the guidance of fluoroscopy. After

the confirmation of proper placement of working cannula, PMMA was injected slowly. Approximately 7,5 cc cement was administered to the radiolucent zone around the S1 screw. Procedure was ceased immediately when the cement leakage occurred.

Patient was mobilised on the postoperative fourth hour and she did not experience any low back pain. Control X-Rays revealed total obliteration of the radiolucency around the screw with PMMA (Figure-2).



**Figure-2.** AP postoperative X-Ray images showing total obliteration of the radiolucency around the sacral screw with PMMA.

## DISCUSSION

Pedicle screw loosening is a major concern especially in the osteoporotic spine<sup>(2,4-5,11-12)</sup>. A recent review by Gautschi et al<sup>(5)</sup> reported screw loosening on 38 cases of 585 cases. It results from the loss of metal-bone interface integrity<sup>(2,4,12)</sup>. Poor bone density (osteoporosis), excessive strain on the implant, residual sagittal imbalance, screw hole preparation technique, torque of insertion, screw purchase, and direction of screw placement may influence the pullout strength of pedicle screws<sup>(9)</sup>.

Radiolucent 'halo' around the screw is a definite sign of loosening of the screw<sup>(12)</sup>. This halo is seen as a result of the fibrous tissue surrounding the screws that were formed secondary to excessive movement of screws in bone<sup>(12)</sup>. Once a screw pullout

or loosening occurs, the surgeon should revise the implant <sup>(2)</sup>. Different salvage techniques occur such as using larger or expandable screws, screws with bicortical purchase, milled bone graft impacted into the pilot hole, or PMMA-augmented screws <sup>(2,4,9,14)</sup>.

PMMA is commonly used in vertebral augmentation procedures <sup>(13-14)</sup>. It is typically used to interdigitate with surrounding trabecular bone to increase fixation strength and firmly anchor the screw <sup>(8)</sup>. Studies showed that cement augmentation with pedicle screw fixation, can increase pedicle screw strength and prevent pedicle screw loosening <sup>(2,4,9)</sup>. However, PMMA augmentation has also some serious complications such as leakage, thermal and chemical injury <sup>(1,4,13)</sup>.

Calciumphosphate/calcium triglyceride cements could be alternative to PMMA. But they perform weaker constructs than PMMA cements <sup>(14)</sup>. Sacral screws are prone to loose easily especially in osteoporotic, long segment instrumented and inadequate anterior column supported patients <sup>(2-3,15)</sup>. In a biomechanical study of long segment 86 fusion model, Fleischer et al <sup>(3)</sup> found that anterior interbody fusion is very important and significantly reduces the strain on S1 screws similar as iliac screws.

Percutaneous vertebroplasty (PVP) is a minimally invasive procedure that involves radiographic-guided injection of various types of bone cement directly into the vertebral body <sup>(13-14)</sup>. PVP has gained extensive popularity for the treatment of painful vertebral lesions including metastatic disease and osteoporotic fractures <sup>(13)</sup>. In our case, unicortical S1 screw was loosened since long segment instrumentation was not balanced adequately with anterior support and/or iliac wings were not involved to the construct. We performed PVP to the radiolucent zone around S1 screw under local anesthesia. We injected PMMA until the radiolucent zone was filled completely. Some cement leakage occurred without any symptoms. Our case is unique since PVP under local anesthesia was performed first time in the literature for treating screw loosening.

## CONCLUSION

In the treatment algorithm of loosened sacral screws, percutaneous sacroplasty should be kept in mind before extensive major revision surgeries were performed.

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