

Pedicle screw misplacement

[Pedicle screws](#) are routinely used in contemporary [spinal surgery](#).

The placement can be technically challenging.

Findings indicate that [electromyography](#) may not be a highly reliable tool in determining an anatomical breach during [lumbar pedicle screw placement](#). [O arm](#) may be better for detecting either medial or lateral breaches than electromyography stimulation if there are concerns about screw placement or for confirmation of placement prior to leaving the operating room ¹⁾.

Epidemiology

Malpositioned screws occur in up to 15% of patients and could result in radiculopathy or instrumentation failure.

Screw misplacement may be asymptomatic, but is also correlated with potential adverse events.

It can be devastating when it occurs in the proximity of neurovascular and visceral structures.

A literature search was performed using MEDLINE (between 1999 and June 2011) for studies on pedicle screw placement in thoracolumbar surgery.

Gautschi et al., included randomized controlled trials, case-control studies, and case series (≥ 20 patients) from the English-, German-, and French-language literature. The authors assessed study type, the number of patients, the anatomical area, the number of pedicle screws, duration of follow-up, type of pedicle screw placement, incidence of complications, and type of complication. The management of specific complications is discussed.

Thirty-nine articles with 46 patient groups were reviewed with a total of 35,630 pedicle screws. One study was a randomized controlled trial, 8 were case-control studies, and the remaining articles were case series. Dural lesions and irritation of nerve roots were reported in a mean of 0.18% and 0.19% per pedicle screws, respectively. Thirty-two patients in 10 studies (of 5654 patients from all 39 studies) required further revision surgeries for misplaced pedicle screws causing neurological problems. None of the analyzed studies reported vascular complications, and only 2 studies reported visceral complications of clinical significance.

Pedicle screw placement in the thoracolumbar region is a safe procedure with an overall high accuracy and a very low rate of clinically relevant complications ²⁾.

Based on the currently available data in the peer-reviewed literature, computer assistance in the form of [robotic](#) guidance or [navigation](#) has the potential to reduce the incidence of costly and clinically relevant postoperative revisions for [screw malposition](#). It is essential to further investigate on a higher level of evidence if the clinical benefits of computer-assistance warrant the high acquisition and maintenance costs inherent to these systems ³⁾.

A cost-effectiveness analysis in 2015 showed that for high-volume centers with a similar case

complexity to the studied population, this technology is economically justified ⁴⁾.

Thoracic Pedicle screw misplacement

For thoracic [pedicle screws](#) used in the treatment of spinal deformities, the incidence of screw misplacement increases up to 43% when all the inserted screws are evaluated by computed tomography (CT) in the postoperative period. The technical difficulties posed by thoracic screws in scoliotic deformities have the potential for significant neurologic, vascular and visceral injury ⁵⁾.

Case reports

An unusual case of acute radiculopathy due to a misplaced bicortical sacral screw causing L5 nerve root impingement on the anterior sacrum. A 39/M patient complained of severe rest pain (VAS 9/10) post-TLIF in the region of the L5 dermatome with sensory deficit along the right lateral leg and straight leg raise of less than 30°. The X-ray revealed an S1 screw protruding beyond the second cortex with a straight trajectory. CT scan revealed a protrusion of 11.4mm beyond the anterior cortex. The patient was taken for re-surgery and the trajectory and length of the screw were revised. Sciatic pain completely disappeared immediately after surgery. A 61/M patient was operated on elsewhere with instrumented decompression and fusion with screws passed at L4, L5, and S1 levels for lumbar canal stenosis, post-surgery patient developed new-onset radicular symptoms in the right lower limb. The patient was managed conservatively in the form of an L5 selective nerve root block. Pain and numbness improved. The bicortical purchase of an S1 screw though improves pull-out strength, is associated with a risk of neurovascular complications. Surgeons should be alerted to the misplacement of S1 pedicle screws to avoid involvement not only anterior to the anteromedial neurovascular tissue but also anterolateral to the arrangement of the L5 nerve root ⁶⁾.

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³⁾

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⁴⁾

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