The elderly population in societies is gradually increasing. Among many factors, the developments in the healthcare services also play a role in this. Like in many other healthcare areas, degenerative diseases constitute an important part of our daily practice in spinal surgery also.

In Europe, while 10.8% of the society was over 65 in 1950, this rate had reached 14% in 1970, and 19.1% in 1995. According to some sources, the ratio expected for 2025 is 30.1%, and 42.1% for 2050.1

With the increase of life expectations, the health expenses of the elderly population in the society also reach important amounts. Eight percent of the 65+ population in the United States have at least one chronic health problem, and 50% have at least two.2

The spine is a very special anatomical and functional structure. Every elderly individual have a degenerating spine, however, in contrast with the knee and hip arthrosis, only a small portion of these are symptomatic.

Lumbar fusion is a common procedure applied in degenerative diseases. Fusion can be achieved more rapidly and with higher rates in the instrumented spine. Various instruments have been developed with this purpose. Currently, the pedicle screws are used as the standard fixation materials, because they control all the three columns of the vertebra. However, serious muscular dissection is carried out for an ideal pedicle screw placement. This in turn affects the outcomes negatively because of problems like serious postoperative pain, blood loss and infection. As an alternative to the standard technique, the percutaneous pedicle placement application provides the same fixation with minimum tissue damage.

Minimal invasive spinal surgery involves many diverse techniques. The purposes are to prevent the muscular damage by not retracting the muscle, not to disturb the stabilizing ligaments and not to cause iatrogenic instability, not to disturb the dorsolumbar fascia, to prevent bone loss and to reduce the surgical access.

Posterior lumbar muscles are responsible for the posture. In addition, the paraspinal muscles protect the discs, facet joints and ligaments against the excessive motion. Peeling the muscles from the bones in the midline approach of the classical posterior spinal surgery creates big damage on the muscles. This in turn causes atrophy and functional losses in the muscles in the long term. The largest damage is given to the multifidus in this approach. The are exposed to the largest traction since they are nearest the medial. The idea underlying the placement mini-invasive pedicle screw is to protect the functions of the multifidus.

Pedicle screws can be placed with a mini-invasive approach, through a tube placed in a paramedian mini incision or percutaneously. In another approach, mini-open technique is used on the decompression or interbody fusion side, while percutaneous technique is used on the counter-lateral side. Although it is not technically difficult, the procedure becomes more difficult with the increasing deformation in the spine. In the percutaneous technique, access to the pedicle is ensured with a Jamshidi cannula under the guidance of
fluoroscopy, a Kirschner wire is passed through the cannula, and the cannula is removed. (Figure 1) Under the guidance of this wire, first the soft tissue dilators and the working cannula are passed, then the guide and cannulated pedicle screw are passed through. (Figure 2) The rod is fixed by settling onto the screws with the help of the senders again designed for this procedure. (Figure 3) This procedure is performed with 6 tiny incisions in some systems and with 4 in some others. (Figure 4)

Figure 1: a) Dilators and working cannulas have been placed, b) Dilators have been removed

Figure 2: Sending the screw though the working cannula
**Figure 3:** Sending the rod through the third incision

**Figure 4:**

a) Rods have been placed through a separate incision  
b) Rods have been placed through the same incision with the screw
Safety of the minimal invasive pedicle screws has been proven in many studies. Ringel and colleagues\(^3\) examined the 488 screws they placed percutaneously in 103 patients, and found inappropriate locations in \(3\%\) of the screws. Heintel and colleagues\(^4\) found inappropriate locations only in 8 (2%) of the 502 percutaneous pedicle screws applied to 111 patients. Revision was required in only 1 of these 8 screws. However, in the meta analysis of 130 articles studying screws applied with the classical method, 37,337 pedicle screws were analyzed, and wrong locations were found with a rate of 8.7\%.\(^5\) In this respect, the error rate of the percutaneous technique was not found to be higher as compared to the classical technique. Percutaneous application requires more meticulous evaluation, more concentration and more fluoroscopic takes. These explain the fact that the error margin is comparable to the open technique.

Combining the percutaneous screw application with anterior cage procedures provides 360-degree fixation. In this case, percutaneous fixation provides mechanically rigid fixation with a lower morbidity.\(^6\) Kim and colleagues\(^7\) published the 5-year results of the mini-ALIF + posterior percutaneous pedicle screws that applied to 63 patients with isthmic spondylolisthesis. The authors concluded that the results were successful and the incidence of the adjacent segment disease low. The percutaneous technique can be used for more than one level. Kim and colleagues\(^8\) reported their results on 42 patients that they had performed two- and three-level PLIF + percutaneous screw surgery and found that the results were comparable to the open technique.

Percutaneous screw applications involve some difficulties particularly in the degenerated spine. Narrow pedicles, changing axis of the pedicle with rotation and impairment of the pedicle impairment makes the procedure more difficult.\(^9\) In the percutaneous pedicle screw applications, utmost care must be given to avoidance of the damage on the facet joint in the upper screw area. Babu and colleagues\(^10\) examined 126 screws placed with standard technique and 153 screws placed with percutaneous technique.

In conclusion, we can say that the percutaneous pedicle screw application as a minimal invasive technique is a good alternative as the parallel to the developing trend, applied singly or as supplementary in the treatment of degenerative diseases with the shorter hospital stay, minimized muscular damage, less postoperative pain and small incision scars.

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**References**

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