

High Accuracy of Fluoroscopic Based Navigation of Pedicle Screw Fixation in the Lumbar Spine Utilizing Cylinder Pedicle Design, Innovative Technique

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Introduction

Navigation in spine surgery used with different software registration techniques, Fluoroscopic based registration has advantage of easy operation, no need for CT scan, navigating our target without the need to localize, but it miss out the 3rd dimension (axial), so less experienced surgeon may have some difficulty to target a pedicle screw in the lumbar area.

A perfect pedicle screw placement was taught through considering the pedicle as a cylinder to control the trajectory of pedicle screw in the lumbar spine, applying it in practice with standard fluoroscopy was technically demanding tasks since it require 2 simultaneous trajectories and a highly experienced surgeon. In this study we used fluoroscopy based navigation utilizing this idea to make lumbar pedicle screw targeting simple, highly accurate and safe.

Methods

Using fluoroscopic based navigation utilizing the pedicle cylinder design, 37 consecutive adult cases with 196 lumbar pedicle screws placed in 2 trauma, 7 degenerative/28 with spondylolisthesis grade I, excluded scoliosis, we did fluoroscopic –CT fusion technique on few cases for demonstrative and teaching

purposes to help understanding the idea but the fluoroscopic based navigation was the only images used for targeting the pedicles. A CT scan was done after all cases to check accuracy.

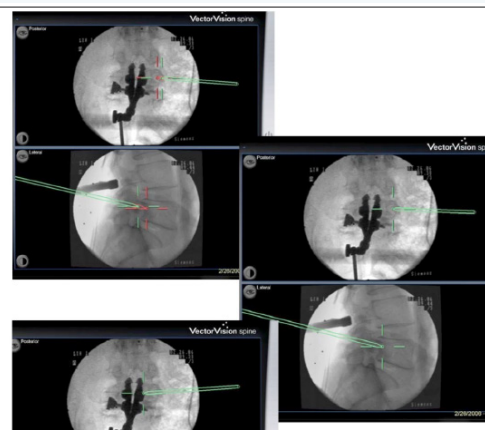
Results

Misplacement rate was 2.6%, (5screws) 2 screws had cortical encroachment medially (both are L1) the other 3 had lateral minor breach (<2mm) to the pedicle (all were L4), none resulted in neurological symptoms [1-5].

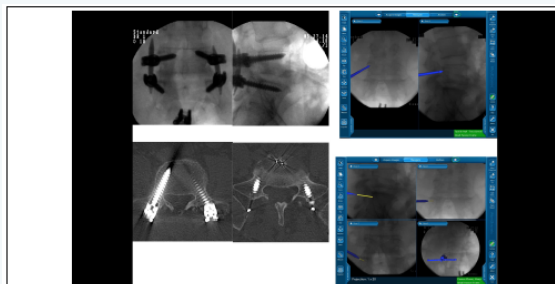
Learning Objectives

By the conclusion of this session, participants should be able to:

1. Describe the deferent methods of registration in spine navigation
2. Discuss, the pedicle cylinder design format
3. utilizing the pedicle cylinder design on 2 D fluoroscopic navigation
4. discuss if any other method could be applied (Figure 1 & 2)



(Figure1)

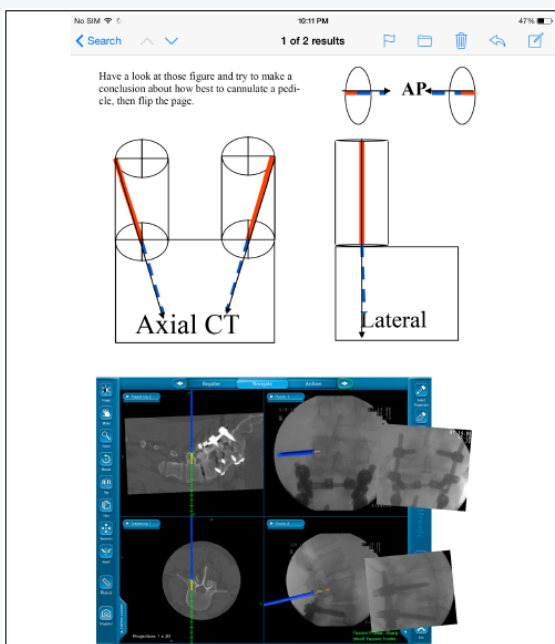


(Figure 2)

Conclusion

Using fluoroscopic based navigation on the lumbar spine utilizing pedicle cylinder design is safe and reliable way for targeting lumbar pedicle and may achieve a high level of accuracy, applying Fluoro-CT fusion can be used initially to understand the principle. Pedicle divided into 4 identical quadrants\entries to the pedicle has a medial point, a lateral point and a center in a horizontal meridian AP view, anterior is considered as the isthmus and is seen on a lateral view to cannulate

1. Perfect AP view with sharp upper endplate and centered spinous process and perfect lateral view
2. Place probe at the lateral edge of the horizontal meridian at the AP, which correspond to at the mid cephalocaudal point on the lateral.
3. Elongate virtual probe to Navigate to the center point that is the intersection of both meridian of the pedicle at the isthmus of the pedicle on AP (Figure 3).



(Figure 3)

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