Use of Guided Tubular Retractors for Lumbar Transpedicular Instrumentation

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Poster ID: 42317
Disclosures

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- None
Introduction

- Advances in minimally invasive techniques have led to increased accuracy of spine instrumentation placement, minimization of radiation exposure and tissue dissection trauma, and increased efficiency in workflow.

- Indications for minimally invasive spine surgery has broadened to include surgical treatment of trauma, deformity, degenerative, malignancy, and vascular conditions.

- One such technique is the use of percutaneous screws for minimally-invasive fixation. However placement still presents the challenge of significant tissue damage and inefficiency of trying to re-identify the entry site either through K-wires or 3D Navigation techniques.
Methods

- Consecutive patients were selected to undergo placement of percutaneous pedicle screw through a navigated tubular system from Sept. 2017 to Feb. 2018.

- Indications for surgery included lumbar stenosis, foraminal stenosis, lateral recess stenosis, and spondylolisthesis due to degenerative disease.

- These percutaneous transpedicular screws used were in conjunction with either a trans- or pre-psoas muscle approach for interbody fusion.
Technique Steps

- Using 3D-CT navigation, skin incisions approximately 2.5cm from midline were planned. The muscle fascia was then dissected open.

- Serial dilators were used to split muscle and identify the entry point. Once docked onto an acceptable entry point - a 14mm Metrx tube was then placed over the dilators and locked into place with the Metrx arm.

- A navigated awl-tap is used to pre-drill screw trajectory with a probe to verify no breaches.

- A pre-determined length screw (to take a 4.75mm rod) was then placed.

- Once done the serial dilators were then placed over the caudal facet joint and the Metrx tube was again locked into place.

- The caudal facet joint was then drilled and packed with allograft.

- This sequence is continued until all pedicle screws were placed and facet joints decorticated and packed with bone.

- A drop down rod is then passed and locked into place with set screws.

- Incisions are closed.
Results – Case 1

70 y/o F with canal stenosis at L4-5 and spondylolisthesis as well as moderate L3-4 canal stenosis secondary to ligamentous hypertrophy. She demonstrated favorable anatomy for trans-psoas approach to these disc levels. She underwent L3-5 XLIF and L3-5 percutaneous screw fixation with facet joint fusion as per protocol described. Patient tolerated the procedure well and discharged the day after stage 2. She returned 8 weeks post-op with significant improvement in pain and increased daily activities.
Results - Case 2

57 y/o M with L4-5 Type II Modic changes with significant loss of disc height, mild disc bulge, and associated neural foraminal stenosis. He underwent L4-5 interbody fusion using pre-psoas approach. One surgeon performed the pre-psoas approach using interbody cage while the other surgeon simultaneously performed unilateral percutaneous screw fixation using the technique described prior. He was discharged on POD2. He returned at 9 weeks with significant improvement in pain and off all narcotics.

![Images of medical scans]
Results – Case 3

- 47 y/o M with severe degeneration of L4-5 disc space with significant canal and lateral recess stenosis as well as incompetent facets. He underwent L4-5 lateral trans-psoas interbody fusion. The prior mentioned method was used to place bilateral percutaneous screws at L4 and L5. The patient tolerated the procedure well and was discharged the day after stage 2. He returned at 8 weeks with significant improvement in back and leg pain.
Discussion

- The use of intra-operative navigation systems have significantly decreased the incidence of nerve root damage.\(^3,4,5\)
- Systems such as 3D fluoroscopy navigation reporting 85% “excellent” pedicle screw placement compared to traditional fluoroscopy\(^6\), as well as 96.6\(^7\) accuracy rate using the O-arm navigation based system (Medtronic, MN).
- Radiation exposure is still a risk for the patient, as 3D fluoroscopic spins provide roughly 20mGy in standard mode or 30mGy in high density mode compared to 6mGy with standard fluoroscopy.
- Potential disadvantages of this technique include violation of cranial facet, initial increased operative time and steep nature of learning curve.
- However, the technique allows both anterior/posterior stages at the same operation without the need to reposition and re-drape the patient.
Conclusion

- This method of navigation-guided tubular retractors for lumbar transpedicular instrumentation minimizes tissue disruption, increases efficiency of work flow, and increases accuracy of screw placement.
- Its utility includes surgical fixation for degenerative disease, trauma, deformity, and malignancy conditions.
- There has been observed improved efficiency, allowing patients to remain in the single lateral position for both anterior/lateral interbody cage and posterior percutaneous fixation during a single operation.
- Further data is needed to compare the operative time, blood loss, hospital stay, functional outcome, and post-operative pain control between our method and more traditional methods of posterior instrumentation.