

# Augmented Reality to Guide MIS-TLIF Procedures



Sommer et al. (2022), in *Neurospine*

## Products

Microscope Navigation, Elements Spine Curvature Correction, Elements SmartBrush Spine, Airo

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## Clinical Background

Transforaminal lumbar interbody fusion (TLIF) is an established surgical technique for the fusion of spinal motion segments through implantation of cages and/or bone grafts. It is performed either open or minimally-invasive (MIS) with increased use of image-guided navigation. Since common landmarks may not be easy to identify during MIS-TLIF, augmented reality (AR) can provide additional support by superimposing structures onto the surgeon's view in either a head's up display (HUD) or through microscope integration. Due its minimally invasiveness, the MIS-TLIF workflow is particularly suited to overlaying preoperatively defined landmarks which are transferred and fused to the updated intraoperative CT with AR to guide surgeons through the procedure.

## Study Objectives

Aim of the study was to evaluate the applicability and benefits of AR-aided procedural workflow guidance by predefined landmarks for the tubular MIS-TLIF approach.

N = 10, prospective case series, single level

## Results

- AR protocol was applicable and safely implemented in all cases with these **landmarks sequentially marked**:
  - Ipsilateral
    - Inferior medial edge of lamina
    - Pars interarticularis (Pars)
    - Superficial facet joint space
    - Pedicle of the caudal vertebra (IP)
  - Disc space
  - Contralateral pedicles
- 160.6 ± 31.9 min Ø procedure time  
→ AR added Ø 1.72 ± 0.37 min
- Surgeons' subjective assessment:
  - Overlay precision perceived < 2 mm in all cases
  - Additional guidance by AR perceived as helpful
  - Subjective time advantage rated as "insignificant" in all cases
- Neurological outcomes improved while no complications occurred

## Summary

- The application of AR enabled **reproducible workflow guidance** in tubular MIS-TLIF by identifying pre-planned surgical landmarks, thus providing step-by-step guidance through surgery. The subjective assessment proved that the **surgeons trusted the AR**
- AR injection **mitigated the problem of limited visibility** of anatomical landmarks
- **No procedural changes** were required with only minimal increase in total time
- *Outlook: The ease in finding landmarks can potentially speed up the procedure, increase the surgeon's comfort and thus minimize fatigue-related errors, which in turn increases accuracy, especially in complex cases. AR can also aid in educational and training scenarios independent from the physical location*