Robotic versus navigation assisted posterior lumbar fusion: A national database study

Michael J Gouzoulis, Anthony Enzo Seddio, Adam Winter, Sahir Jabbouri[1], Justin R Zhu[2], Daniel Rubio[2], Arya Giri Varthi[2], Jonathan N Grauer
[1]Yale School of Medicine, Department of Orthopaedic, [2]Yale School of Medicine

INTRODUCTION: Navigation has become increasingly utilized for posterior lumbar fusion (PLF). More recently, robotic assistance systems have been gaining traction. However, the incremental advantage of these systems has been unclear in the literature.
METHODS:
Patients undergoing one to three level PLF (with or without anterior or posterior interbody fusion) were identified from the 2015 – 2022 M161Ortho PearlDiver Database using CPT codes. Navigation assistance was identified based on CPT coding and robotic assistance was based on ICD-10 procedural coding. Navigation-assisted cases were matched 4:1 to robotic assisted patients based on age, sex, Elixhauser Comorbidity Index (ECI), number of levels fuse, and concomitant anterior fusion.

Incidence of 90-day adverse outcomes were assessed and compared with multivariable logistical regression, controlling for age, sex, ECI, number of levels fused, concomitant anterior fusion, and year of surgery. Bonferroni correction was applied for multiple testing. Rate of reoperation was assessed using a Kaplan-Meier survival analysis.
RESULTS:
From 2015 to 2022, there has been a significant increase in both navigation and robotic assisted lumbar fusions, with navigation-assisted surgery being significantly more common. After matching, there were 2,401 navigation-assisted cases and 651 robotic-assisted cases. On multivariate analysis, there no significant differences in 90-day any, severe, or minor adverse events. There was a significant increase odd of readmissions in the robotic cohort (OR: 1.77, $p < 0.001$).

There were no differences in three-year reoperation rates between the navigation-assisted and robotic-assisted cohorts (95.8% vs. 94.0%, $p = 0.30$).
DISCUSSION AND CONCLUSION: As spinal navigation has been gaining popularity and robotic assistance is starting to be further utilized, the incremental advantage of different techniques may be questioned. While further study and technique evolution are ongoing, the current study was not able to demonstrate 90-day or 3-year incremental advantages for robotics relative to navigation based on the metrics evaluated.