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Editorial

Commentary on "Robot-Guided Transforaminal Versus Robot-Guided Posterior Lumbar Interbody Fusion for Lumbar Degenerative Disease"

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Over the past 3 decades, minimally invasive spine surgery has gained world-wide popularity due to equivalent outcomes to open approaches with significant reductions in intraoperative blood loss, operative time, and hospital stays.[1] The adaptation and evolution of image-guided stereotactic navigational technologies have resulted in the rapid transformation of minimally invasive spine surgical techniques.[2,3] Utilization of navigation technologies for percutaneous pedicle screw insertion and interbody cage placement has allowed more efficient workflow and increased safety in minimally invasive spine surgical procedures.[4,5] Recently, innovative robotic surgical systems have been introduced for spine surgery procedures as competitive or complementary tools to the use of spinal navigation.[6,7] The advantages and feasibility of robotic-guided spine surgery have been well-established in the literature.[6] However, robotic-guided spinal procedures have not been adapted widespread yet since the robotic devices require greater set-up time, additional staff training, and high initial and maintenance costs.[2]

In March 2021 issue of *Neurospine*, Staartjes et al.[8] published an article to compare clinical outcomes following different robotic spine surgery techniques. The authors present a prospective cohort study that compares clinical outcomes and surgical variables of robotic-guided minimally invasive transforaminal lumbar interbody fusion (TLIF) and robotic-guided mini-open posterior lumbar interbody fusion (PLIF) procedures in patients with lumbar spinal stenosis and concomitant low-grade spondylolisthesis. The article provides detailed information including demographics, surgical time, length of stay, radiation exposure, and complications for each robotic-assisted surgery. The article provides well-described technical nuances and it shows overall safety profile of both robotic-guided approaches. The investigators collected pre- and postoperative patient-recorded outcome measures (PROM) over a period of 12-months, however, no significant difference was observed between the PLIF and TLIF experimental cohorts. In addition to the raw PROMs scores, authors outlined a framework for "minimum clinically important difference" (MCID) which was defined as a decrease of 30% or more from patient baseline. This analysis revealed that robot-guided PLIF (RG-PLIF) group showed greater postoperative improvement in terms of leg pain, however, this may be related to the fact that these patients have higher baseline visual analogue scale (VAS) leg pain scores compared to the robot-guided TLIF (RG-TLIF)

group. On the other hand, patients who underwent RG-TLIF experienced a greater clinical improvement in functional outcome scores. It is important to note that there were more patients with chronic low back pain/discopathy in the RG-TLIF group and the preoperative VAS back pain scores were also greater in the patient group compared to the RG-PLIF group. Although, the $p = 0.12$ suggests there was no difference in MCID achievement regarding back pain severity, this may be underpowered. The greater MCID achievement in functional outcome scores in RG-TLIF group may be a reflection of a more complete resolution of back pain in these patients. As the authors have pointed-out, the higher preoperative back pain and lower preoperative leg pain scores in RG-TLIF group may be caused by a selection bias. Future studies can address this concern by conducting prospective randomized controlled trials with larger sample size and stronger statistical power. Despite its limitations, the results of this article contribute well to the current literature on robotic spinal surgery techniques and demonstrate that both RG-TLIF and RG-TLIF are safe and equally effective treatments for patients with discogenic chronic low back pain and/or stenosis with spondylolisthesis.

The advantage of robotic surgery is the emphasis it puts on preoperative planning of instrumentation.[2] Conversely, a drawback of robotic-guided spinal surgery is that the currently available robotic navigation systems only allow for pedicle screw placement and not for active navigation. However, we remain optimistic that in the future integration of 3-dimensional navigation technologies will create opportunities for the broader application of robotic navigation by assisting in additional steps of spinal procedures other than pedicle screw placement.

CONFLICT OF INTEREST

The authors have nothing to disclose

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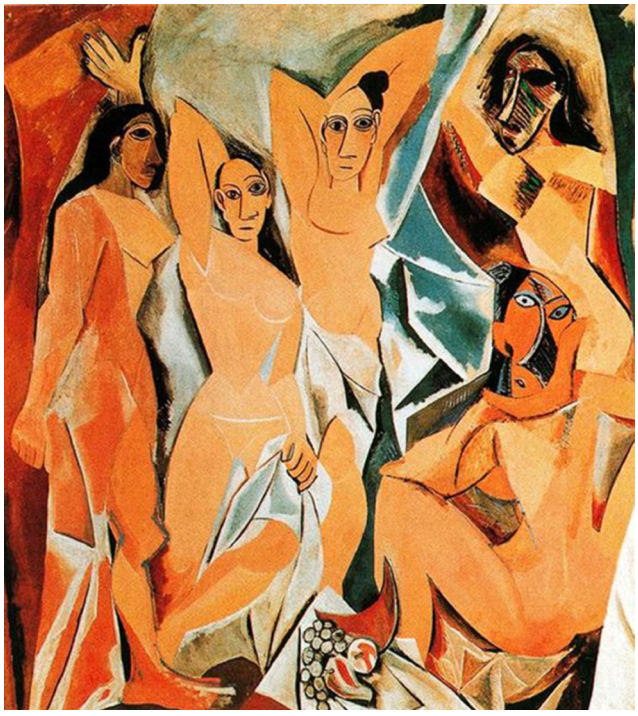

Title: The girls of Avignon
Artist: Pablo Picasso
Year: 1907

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