



Patient Specific Three-Dimensional Printed Guides Reduced Operative Times and Blood Loss in Scoliosis Surgery: A Patient Matched Comparison

Christina K. Hardesty, Matthew Folkman, Nihal Punjabi, Elizabeth LaPlante
Rainbow Babies and Children's Hospital, Case Western Reserve University,
Cleveland, Ohio

Background

Customized pedicle screw guidance systems use pre-operative imaging to construct 3-D printed guides (3DPG) that precisely fit spinal anatomy at individual levels. Few studies have measured their effectiveness. We aimed to evaluate whether the use of a patient-specific 3D pedicle screw guidance system would lead to a reduction in operative time, blood loss, need for transfusion, and radiation exposure compared to conventional techniques.

Methods

We retrospectively reviewed our prospectively collected database and identified 47 patients who underwent spinal fusion for scoliosis using patient-specific 3D printed pedicle screw guides (Firefly®, Mighty Oak Medical, Englewood, CO). A control group of 47 patients who underwent fusion using conventional freehand techniques was constructed using propensity score matching based on scoliosis type and levels fused. All patients received treatment between 2013-2022 by a single surgeon at a pediatric hospital. Spinal deformity parameters, operative time, blood loss,

transfusion volume, and intraoperative radiation exposure were compared between the two groups.

Results

Both cohorts had similar preoperative major curve angles (56° vs. 58°), number of levels fused (14.1 vs. 13.6 levels), and number of screws placed (20.7 vs. 19.5 screws). Those treated with 3DPGs had reduced operative time (302 vs. 359 minutes, $p < 0.01$), lower blood loss (649 vs. 1134 mL, $p < 0.01$), lower mean blood transfusion requirements (171 vs. 265 mL, $p = 0.04$), and reduced intraoperative fluoroscopy exposure time (10.9 vs. 31.7 seconds, $p < 0.01$). There were no intraoperative complications in either group.

Conclusion

The use of 3DPGs in spinal fusion surgery leads to significantly reduced operative time, blood loss, and need for blood transfusion. Intraoperative radiation exposure can be significantly decreased as well. 3DPGs improved surgical outcomes in this cohort.

Disclosures

Christina K. Hardesty, MD: Consultant for Medtronic, OrthoPediatics, and Alcyone; Royalties from OrthoPediatics