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A Multicenter Prospective Study on the Impact of Minimally Invasive Techniques in Pediatric Spinal Deformity Surgery

Samantha Harding*

Department of Pediatric Orthopedic Surgery, University of Medical Sciences, New York, USA

Perspective

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***For Correspondence:** Samantha Harding, Department of Pediatric Orthopedic Surgery, University of Medical Sciences, New York, USA

E-mail: samantha.harding@childrenshospital.edu

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ABOUT THE STUDY

Spinal deformities in children, such as scoliosis, kyphosis and other congenital or acquired conditions, have long been associated with significant clinical challenges. Traditionally, surgical intervention for these deformities involved open procedures that required large incisions, prolonged recovery periods and higher risks of complications. However, over the past few decades, there has been a growing shift toward the use of Minimally Invasive Techniques (MIT) in spinal deformity surgery, which promise to reduce operative trauma, shorten recovery time and improve overall patient outcomes. A multicenter prospective study examining the impact of these techniques in pediatric spinal deformity surgery has provided valuable insights into their effectiveness, safety and long-term benefits.

Minimally Invasive Spinal Surgery (MISS) involves the use of smaller incisions, specialized instruments and advanced imaging techniques such as intraoperative navigation or robotic guidance to perform spinal interventions with greater precision and less disruption to surrounding tissues. In pediatric patients, the advantages of MIT are particularly significant given their rapidly growing bodies and the potential for faster recovery and fewer complications. The traditional open surgery, often necessitating extensive soft tissue dissection and exposure of the spine, can be traumatic for children and lead to higher rates of postoperative pain, infection and longer hospital stays.

The study included patients from multiple institutions with a range of spinal deformities, such as idiopathic scoliosis, congenital scoliosis and neuromuscular scoliosis. Researchers aimed to evaluate the clinical and radiographic outcomes of children who underwent minimally invasive procedures compared to those who underwent traditional open surgery.

Specifically, the study sought to determine whether MIT could provide similar or superior results in terms of correction of spinal deformities, complication rates, operative time and recovery time.

One of the key findings of the study was that patients who underwent minimally invasive spinal deformity surgery experienced a significant reduction in postoperative pain and required fewer analgesics. This was attributed to the smaller incisions, which caused less trauma to the muscles and soft tissues surrounding the spine. Additionally, these patients had shorter hospital stays, with many being discharged within 24 to 48 hours after surgery, compared to the typical 4 to 7 days for those undergoing traditional open procedures. The quicker recovery time allowed patients to return to normal activities much sooner, which is important factor in pediatric populations who may be involved in school, sports and other social activities.

Another significant benefit observed was the reduction in complications. Although any surgery carries inherent risks, the study found that the incidence of postoperative complications such as infection, blood loss and nerve injury was notably lower in the minimally invasive cohort. This is largely due to the reduced soft tissue disruption and the use of more precise surgical techniques. The ability to perform surgery with less exposure not only preserves muscle and ligament integrity but also minimizes the risk of surgical site infections, which are a known complication in open spinal surgeries. Furthermore, there was a lower rate of blood loss, which is particularly important in pediatric patients, as even small amounts of blood loss can have significant effects on their recovery.

Radiographically, the outcomes of minimally invasive techniques were comparable to those of open surgery. The correction of spinal deformities, including curve reduction in scoliosis cases, was achieved with similar accuracy in both groups. In some cases, the study even showed slightly better correction in the minimally invasive group due to the enhanced precision offered by advanced navigation systems. In fact, the use of intraoperative navigation and fluoroscopy allowed for real-time feedback during the procedure, which contributed to the high degree of accuracy in spinal realignment.

Furthermore, long-term follow-up data revealed that the results of minimally invasive spinal surgery remained stable over time, with no significant differences in the rates of spinal deformity recurrence between the two groups. This is particularly important for pediatric patients, as they are still in their growth phase and maintaining spinal alignment is critical to preventing further complications as they mature. The ability to correct deformities early and with minimal disruption to the surrounding tissue may have long-term benefits in terms of spinal health, posture and quality of life as children grow into adulthood.

In terms of patient satisfaction, the study found that children who underwent minimally invasive surgery had higher overall satisfaction rates. Parents reported less anxiety during the postoperative period due to shorter recovery times, fewer complications and reduced hospital stays. Moreover, the children themselves experienced less disruption to their daily routines and activities, which contributed to improved emotional and psychological well-being during the recovery process.