

# Study evaluates robotic- and navigation-assisted pedicle screw placement in adult degenerative spinal surgery

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The use of robotics and computer navigation in spinal surgery is rapidly expanding. Increasing numbers of hospitals and spine surgeons are adopting the technology, which aims to enhance precision, accuracy and

predictability, according to Darren R. Lebl, MD, MBA, a spine surgeon at Hospital for Special Surgery (HSS).

He believes the technologies have reached a tipping point. "I think they're good enough to greatly improve what we do in terms of minimally invasive [surgery](#)," said Dr. Lebl. "In my own practice, I've seen the benefits for patients in terms of a shorter hospital stay, quicker mobility and decreased healing times."

The main barriers to implementing the new technologies include additional [time](#) in the operating room (OR) and concerns regarding the accurate placement of pedicle screws. Many spinal surgeries require the use of hardware such as pedicle screws to stabilize the spine, and precise positioning is critical.

Dr. Lebl and colleagues at HSS launched a study to evaluate the accuracy of robotic- and navigation-assisted technology in screw placement. They also set out to determine the extra time needed in the OR, noting that there is a learning curve for a [surgical team](#) when implementing a new system.

The study, "K-wireless Robotic and Navigation Assisted Pedicle Screw Placement in Adult Degenerative Spinal Surgery," was presented today at the American Academy of Orthopaedic Surgeons (AAOS) 2021 annual meeting. The results were also published in the *Journal of Spine Surgery* in June 2021.

"Our main finding was that the screw positioning was very accurate, and the additional time needed to adopt these technologies into practice was small," Dr. Lebl noted. "In our study, the speed of robotic screw placement showed improvement within the first several cases."

The research included 65 adult patients (mean age of 59) with lumbar

degenerative pathology who underwent a robotic-navigated posterior spinal fusion from June 2019 to July 2020. A total of 364 instrumented pedicle screw implants were planned robotically. A single orthopedic surgeon performed the surgeries using the Medtronic Mazor X Stealth Edition system.

The robotic/navigation time in the OR, screw placement times and positioning times were recorded. Following screw placement, all patients had intraoperative 3D fluoroscopy, and screw trajectory was compared to a preoperative CT image. Reasons for conversion from robotic navigation to k-wire or freehand technique were recorded.

"The spine surgeon in the study had more than 10 years of experience and had placed thousands of screws with previous techniques, such that he had alternatives if it was determined that robotic-assisted placement of a screw would not be possible," said Fedan Avrumova, BS, a research assistant in the HSS Spine Service. "It is important to note that the robot can be a valuable 'assistant' but does not replace surgical experience and good judgment."

The mean time per screw placement was 3.6 minutes robotically versus 3.7 minutes freehand, with a significant decrease in time between the first 10 and last 10 cases: 5.5 minutes versus 2.3 minutes. Setting up the robotic navigation system in the OR showed a decrease in time between the first 10 and last 10 cases: 9 minutes versus 6 minutes.

"Many [spine surgeons](#) recognize the value of the technology, but the concern has been the additional time needed in the OR," Dr. Lebl said. "As we got further along in our study, we found that it actually saved time in the OR. The benefits of the technology easily outweigh the additional time needed in the early implementation of the system because the accuracy is unmatched."

"When we evaluated outcomes, we found zero complications and no revision surgeries were needed," Ms. Avrumova noted. "The surgical team learned how to use the robot successfully and became more efficient with robotic implantation when compared to conventional minimally invasive and conventional open techniques. In addition, the accuracy was as good as, if not better than, open or conventional minimally invasive techniques, which we confirmed with a 3D imaging study in every patient during surgery."

"Just a few years ago, there were two FDA-approved robots to assist in spine surgery. Now there are five or six," said Dr. Lebl. "The technology is revolutionizing the way we do things, and it's a very exciting time to be a spine surgeon."

**More information:** Fedan Avrumova et al, Evaluation of K-wireless robotic and navigation assisted pedicle screw placement in adult degenerative spinal surgery: learning curve and technical notes, *Journal of Spine Surgery* (2021). [DOI: 10.21037/jss-20-687](https://doi.org/10.21037/jss-20-687)

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