

Research studies highlight advantages and potential of computer-guided spinal surgery

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In a series of research studies, Cedars-Sinai spinal surgeons show that a new method of computer-guided spine surgery is beneficial for spinal reconstruction and for treating complex tumors and degenerative spine problems, resulting in fewer complications and better outcomes for patients.

The Cedars-Sinai surgeons highlight the advantages of a "spinal navigation" technique that uses high-speed computerized tomography (CT) imaging to navigate in and around the spinal column from different angles. They present their findings in six articles published in the current issue of *Neurosurgical Focus*, an online peer-reviewed journal published by the American Association of Neurological Surgeons.

Investigators say the three-dimensional navigational method is a major improvement over traditional two-dimensional fluoroscopic X-rays. It allows surgeons to more precisely and accurately place reconstruction screws in the narrow bony corridors of the [spine](#), avoiding nerves, blood vessels and other critical structures. This reduces or may even avoid complications, post-operative pain and the need for follow-up surgeries, they write.

"Computer-guided surgical navigation technology delivers on quality and safety," said J. Patrick Johnson, MD, a neurosurgery spine specialist and director of Spine Education and the Neurosurgery Spine Fellowship program in the Department of Neurosurgery. "It clearly improves outcomes in spine care."

The computerized navigation system uses a mobile CT-scanner to take cross-sectional images of the spine while a patient is in surgery. The images are transferred to a computer, which displays them on overhead monitors that allow precise tracking of surgical instruments as surgeons insert screws for reconstruction and perform other complex procedures on the spine.

Surgeons said the technique is superior to existing methods because of its precision and speed. They point out that even small miscalculations with two-dimensional technology can cause problems that require follow-up operations because hardware was initially out of place. The Cedars-Sinai surgeons say they have cut these to nearly zero by using computer-guided methods.

The surgeons said the technology has others applications for treating spinal disorders, serving as a tool to remove tumors, decompress the spinal column and perform minimally-invasive surgery.

"This approach represents a major leap forward for instrumented [spine surgery](#)," said Terrence T. Kim, MD, an orthopedic spine surgeon in the Cedars-Sinai Spine Center and expert in the computer-guided navigation field. "We're looking at the future."

Joining Drs. Johnson and Kim as study co-authors are Doniel Drazin, MD, a senior resident in the Department of Neurosurgery, and Robert S. Pashman, MD, a clinical associate professor and orthopedic spine surgeon at the Cedars-Sinai Spine Center.

The group's studies accounted for six of 10 articles in the March issue of *Neurological Focus*. A spokeswoman at the online journal said it is highly unusual for a single institution to publish a majority of articles in a single journal issue.

One of the Cedars-Sinai studies showed that the mobile CT-scanner and computer-aided system used during minimally invasive surgery increased the accuracy of screw placement into vertebral pedicle bones.

Another study found that the computerized navigation system and the mobile CT scanner allowed for more accurate surgical placement even within the narrowest parts of the thoracic spine,

particularly challenging regions in women and children who have smaller vertebral pedicle bones than most men.

A third study determined that the image-guided technique can be useful for other minimally invasive procedures, including thoracic endoscopic spine surgery to remove tumors, infections and other conditions accessed through the chest cavity.

The final two articles offer an overview of computer-guided surgery of the spine, including its use in "revision" or "redo" spine surgeries that are often the most complex; and the potential future use of robotic spine surgery with computer navigation.

Provided by Cedars-Sinai Medical Center

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