

O-8-5

Prospective multicenter study of a pedicle screw insertion technique using patient-specific screw guide templates for the cervical spine

Taku Sugawara¹, Naoki Higashiyama¹, Shinya Tamura¹

¹*Akita Cerebrospinal and Cardiovascular Center, Spinal Surgery, Akita, Japan*

Background: Pedicle screw fixation is a standard procedure for spinal instrumentation, however, screw insertion carries the risk of injury to neuronal and vascular structures. To evaluate the efficacy of a patient-specific screw guide template system (SGTS) for inserting screws, the authors conducted a prospective clinical study of a multistep screw insertion method using SGTS for the cervical spine.

Research question: Is SGTS safe and accurate technique for cervical pedicle screw fixation?

Design: Prospective multicenter study

Methods: Preoperative bone images of the computed tomography (CT) scans were analyzed using 3D/multiplanar imaging software, and the screw trajectories were planned. Plastic templates with screw-guiding structures were created for each lamina using 3D design and printing technology. This patient-specific SGTS was used to perform the surgery and CT scanning was used to postoperatively evaluate screw placement. Screw insertion methods and templates are shown in figure 1.

Results: Enrolled to verify this procedure were 130 patients with cervical or cervicothoracic pathologies. The SGTS were used to place 868 screws. Preoperatively, each template was found to fit exactly and to lock onto the lamina of the vertebra models. In addition, intraoperatively, the templates fit and locked onto the patient lamina, and the screws were inserted successfully. Postoperative CT scans confirmed that 832 screws (95.9%) were accurately placed without cortical violation. There were no injuries to the vessels or nerves.

Discussion: The multistep, patient-specific SGTS is useful for intraoperative pedicle screw navigation in the cervical and thoracic spine. This method improves the accuracy of pedicle screw insertion and reduces the operating time and radiation exposure during spinal fixation surgery.

Figure 1: Screw insertion methods and templates

Fig. 1

