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Titel des Beitrags: Accuracy of robot-assisted placement of lumbar and sacral pedicle screws: a prospective randomized comparison to conventional freehand screw implantation.

Abstract: Single-center prospective randomized controlled study. To evaluate the accuracy of robot-assisted (RO) implantation of lumbar/sacral pedicle screws in comparison with the freehand (FH) conventional technique. SpineAssist is a miniature robot for the implantation of thoracic, lumbar, and sacral pedicle screws. The system, studied in cadaver and cohort studies, revealed a high accuracy, so far. A direct comparison of the robot assistance with the FH technique is missing. Patients requiring mono- or bisegmental lumbar or lumbosacral stabilization were randomized in a 1:1 ratio to FH or RO pedicle screw implantation. Instrumentation was performed using fluoroscopic guidance (FH) or robot assistance. The primary end point screw position was assessed by a postoperative computed tomography, and screw position was classified (A: no cortical violation; B: cortical breach=2 mm to=4 mm to=6 mm). Secondary end points as radiation exposure, duration of surgery/planning, and hospital stay were assessed. A total of 298 pedicle screws were implanted in 60 patients (FH, 152; RO, 146). Ninety-three percent had good positions (A or B) in FH, and 85% in RO. Preparation time in the operating room (OR), overall OR time, and intraoperative radiation time were not different for both groups. Surgical time for screw
placement was significantly shorter for FH (84 minutes) than for RO (95 minutes). Ten RO screws required an intraoperative conversion to the FH. One FH screw needed a secondary revision. In this study, the accuracy of the conventional FH technique was superior to the RO technique. Most malpositioned screws of the RO group showed a lateral deviation. Attachment of the robot to the spine seems a vulnerable aspect potentially leading to screw malposition as well as slipping of the implantation cannula at the screw entrance point.