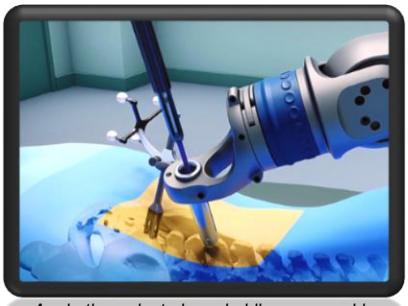

A robotic-navigated arm holding a screwdriver

Title:

Robotically Assisted Spine Surgery with CBT/MCS trajectory: Analysis of the First 100 Patients Utilizing the Robotic Navigation System

Abstract:

Introduction: Precision in pedicle screw placement is crucial to prevent potential harm to adjacent neural structures and blood vessels. As well, results cortical bone trajectory (CBT) and midline cortical screw (MCS) trajectory in an enhanced biomechanical stability compared to the traditional trajectory (TT). Recently robot-assisted navigation has also successfully made its introduction within spinal surgery.
And CBT/MCS trajectories accurately executed with the assistance of a robot, result in less muscle damage, reduced blood loss, shorter operation time and better postoperative ODI-scores (Oswestry Disability Index). That's why we made the change from freehand traditional trajectories to robot-navigation and CBT/MCS trajectories.

Methods: This single-centered study contains a retrospective analysis on the first 100 patients who underwent spine surgery at our institution with a robot-navigation system.
For all patients, demographic data were collected. Additionally, the following information was gathered: operation type (TLIF, PLIF, PLF), level of screw placement, number of levels with screws inserted, and total screws per patient. Primary outcomes include medial breach score (Gertzbein-Robbins classification), hospital stay, and return to work. While secondary outcomes encompass postoperative problems and return to OR. In total, 511 screws were placed, each individually reviewed on postoperative CT scans by two different doctors to accurately classify any medial breach.

Results: This study reveals the following distribution of operation types: 50% TLIF, 9% PLIF, 25% (PLF), and 16% combined procedures. The most common level of screw placement was observed at L4-L5 and L3-L4. A total of 511 screws were placed, with only 4 (<1%) exhibiting a medial breach (<2mm, Gertzbein-Robbins grade B).
The average length of hospital stay after operation (+-2,5 days) and time to return to work (+-5,5 months) also demonstrated improvements compared to the traditional methods. There were 3 early infections reported and 1 patient experienced a postoperative cerebral hemorrhage. The return to the operating room occurred in 3% of cases: one due to hardware problems, another after a traumatic displacement of the cage and one removal of hardware after fusion was achieved. No revisions were reported due to primary misplacement of the screws.

Discussion/Conclusions: Our analysis indicates that robotic-assisted spine surgery may lead to improved primary outcomes such as medial breach scores, hospital stay, and return to work. The secondary outcomes illustrate a potential trend towards fewer postoperative problems, better ODI-scores (as observed in literature) and reoperations in patients operated with the 'spine robot'. One of the significant strengths of this study lies in the absence of any exclusion criteria. Even the most complex patients were included, as it genuinely pertains to the first 100 patients. Further prospective studies are warranted to validate these findings and explore the long-term benefits of robotic-assisted spine surgery.

3D reconstruction of screw placement on RX view