Hybrid-3D robotic suite

In modern Hybrid ORs, the synergies of navigation and robotics are assumed to contribute to the optimisation of the treatment in trauma, orthopaedic and spine surgery. Despite promising evidence in the area of navigation and robotics, previous publications have not definitively proven the potential benefits. Therefore, the aim of this retrospective study was to evaluate the potential benefit and clinical outcome of patients treated in a fully equipped 3D-Navigation Hybrid OR.

Methods: Prospective data was collected (March 2022- March 2024) after implementation of a fully equipped 3D-Navigation Hybrid OR (“Robotic Suite”) in the authors level 1 trauma centre. The OR includes a navigation unit, a cone beam CT (CBCT), a robotic arm and mixed reality glasses. Surgeries with different indications of the spine, the pelvis (pelvic ring and acetabulum) and the extremities were performed. Spinal and non-spinal screws were inserted. The collected data was analysed retrospectively. Pedicle screw accuracy was graded according to the Gertzbein and Robbins (GR) classification.

Results: A total of n = 210 patients (118 m:92f) were treated in our 3D-Navigation Hybrid OR, with 1171 screws inserted. Among these patients, 23 patients (11.0%) arrived at the hospital via the trauma room with an average Injury Severity Score (ISS) of 25.7. There were 1035 (88.4%) spinal screws inserted at an accuracy rate of 98.7% (CI95%: 98.1-99.4%; 911 GR-A & 111 GR-B screws). The number of non-spinal screws were 136 (11.6%) with an accuracy rate of 99.3% (CI95%: 97.8-100.0%; 135 correctly placed screws). This resulted in an overall accuracy rate of 98.8% (CI95%: 98.2-99.4%). The robotic arm was used in 152 cases (72.4%), minimally invasive surgery (MIS) was performed in 139 cases (66.2%) and wound infection occurred in 4 cases (1,9%). Overall, no revisions were needed.

Conclusion: By extending the scope of application, this study showed that interventions in a fully equipped 3D-Navigation Hybrid OR can be successfully performed not only on the spine, but also on the pelvis and extremities. In trauma, orthopaedics and spinal surgery, navigation and robotics can be used to perform operations with a high degree of precision, increased safety, reduced radiation exposure for the OR-team and a very low complication rate [1)].

1)
Haida DM, Mohr P, Won SY, Möhlig T, Holl M, Enk T, Hanschen M, Huber-Wagner S. Hybrid-3D robotic suite in spine and trauma surgery - experiences in 210 patients. J Orthop Surg Res. 2024 Sep 14;19(1):565. doi: 10.1186/s13018-024-05044-9. PMID: 39272126; PMCID: PMC11401291.