

3D-Navigated Percutaneous Screw Fixation of Pelvic Ring Injuries: A Case Series

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3D-fluoroscopic navigation is a safe tool providing high accuracy of percutaneous screw placement fo, Roma, Italy

Purpose: Screw fixation of pelvic ring fractures is a common but demanding procedure and navigation techniques were introduced to increase the precision of screw placement. The purpose of this case series was the evaluation of screw misplacement rate and functional outcome of percutaneous screw fixation of pelvic ring disruptions using a 3-dimensional (3D) navigation system. We also detected the ionizing radiation level to which the patient and the surgical team are exposed.

Methods: 10 cases of disrupted pelvic ring lesions treated in our center from February 2018 to December 2018 were included for closed reduction and percutaneous screw fixation of using with O-Arm 2 (Medtronic) and the acquisition by the Navigator (Stealth Station S8 Navigation System). Preoperative assessment was performed on the patients by means of multiplanar x-ray imaging and CT scan. For the postoperative evaluation, a fluoroscopic scan with 3D reconstruction was performed, after positioning the screws, in the operating room and a CT scan was carried out on third postoperative day. Measures of radiation exposure were extracted directly from reports provided by system. Quality of life was evaluated by Short Form-36 questionnaire 6 months after surgery.

Results: 12 iliosacral and 2 ramus pubic screws were inserted. In postoperative CT-scans the screw position was assessed and graded used the score described by Smith. The positioning of the implanted screws evaluated with the 3D fluoroscopic scan in the operating room did not show significant differences when compared with the postoperative CT examination. 75% of the screws showed a Smith score of 0. No wound infection or iatrogenic neurovascular damage were observed. No reoperations were performed. The radiation exposure was for the patient was similar to that resulting from the use of traditional 2D fluoroscopic systems, while the exposure for the surgical team was zero because, during the acquisition of the images, they are outside the room.

Conclusion: 3D fluoroscopic navigation is a safe tool providing high accuracy of percutaneous screw placement for pelvic ring fractures. At the same time, navigation has shown acceptable patient radiation exposure and absence of radiation exposure to the surgeons. The postoperative CT examination does not provide us with additional information on the possible malposition of the screws compared to the fluoroscopic examination with 3D reconstruction performed in the operating room. At the same time, the excellent results regarding the quality of life of the patients and the absence of complications allow us to look positively at the future of this technique, which needs further studies and improvements.