

Navigated Screw Osteosynthesis for Pelvic Fractures Using A Hybrid-Operating Room

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Purpose: Sacroiliac (SI) screw fixation is the standard treatment for fractures of the dorsal pelvic ring. Intraoperative 3-dimensional (3D) navigation can be an advantage for placement of screws especially in dysmorphic sacra. Osteoporotic sacral and acetabular fractures are becoming a major concern in the aging population. Minimally invasive treatment options are needed to ensure minor surgical trauma and early mobilization with full weight bearing.

Methods: In the hybrid operating room at the University of Ulm (Germany), a 3D flat-panel detector is fixed on a robotic arm and linked to a navigation system. All SI screws, navigated and nonnavigated, and all navigated acetabular screw fixations performed in the hybrid operating room in 2016 were included.

Results: 58 sacroiliac screws were implanted in 47 patients (13 male, 34 female). 22 patients received transiliac transsacral screws, stabilizing the entire sacrum and both SI joints with a single screw. In 23 patients conventional SI screws were implanted stabilizing only 1 SI joint. 2 patients received both screw types. For 2 patients no navigation was used, because of a malfunction of the navigation software. 27 patients (24 women, mean age 77 years) with sacral fractures had no adequate trauma and were classified as insufficiency fractures. 18 of these patients got transiliac transsacral screws. Mean surgical time for navigated SI screw fixation was 36.9 minutes (SD 10.1). There was no neurological complication or return to surgery because of screw malplacement. One navigated conventional SI-screw had to be removed after 4 months because of loosening in an elderly patient with an insufficiency fracture. In 4 patients with osteoporotic or mildly displaced acetabular fractures navigated, minimally invasive screw fixation was performed. 2 patients (age 77 and 72 years), who did not have an adequate trauma, were allowed to start full weight bearing after surgery. No screw loosening, infection or neurological, damage could be seen in the short aftercare interval.

Conclusion: Navigated SI and acetabular screw placement is a safe and efficient surgical technique in pelvic trauma. With a hybrid operating room a 3D scan of the entire pelvis in an excellent image quality can be obtained. This is an advantage in pelvic screw fixation especially for transsacral transiliac and acetabular screws. They seem to be a good treatment method ensuring early mobilization in elderly patients. No screw loosening of transsacral, transiliac, or acetabular screws could be seen.