

Multidimensional Pelvic Fluoroscopy: A New and Novel Technique for Assessing Safety and Accuracy of Percutaneous Iliosacral Screw Fixation

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Purpose: Assessing iliosacral screw safety using traditional fluoroscopy can be difficult. Postoperative evaluation using CT, although controversial, is an accurate way to assess iliosacral screw placement. Multidimensional fluoroscopy is new technology that generates intraoperative CT-like imaging in axial, sagittal, and coronal planes. This technology is currently used intraoperatively to assess safety and accuracy of percutaneous iliosacral screws. We hypothesize multidimensional intraoperative imaging provides sufficient resolution to ensure safety of screw placement comparable to postoperative CT scan.

Methods: 52 consecutive patients at a Level-I trauma center with posterior pelvic ring disruptions were selected. These patients were treated with percutaneous iliosacral and transsacral screw fixation by a single surgeon using traditional inlet, outlet, and lateral sacral fluoroscopic imaging. Intraoperative multidimensional imaging was then used for all patients after iliosacral screw fixation. All patients received a postoperative CT scan per protocol. The intraoperative multidimensional imaging and postoperative CT scan for each patient were retrospectively reviewed by the treating surgeon and another trauma surgeon. Screws were graded in relation to the sacral neuroforamen using both imaging modalities. Screws that were intraosseous without abutting the neuroforamen were classified as extraforaminal. Screws that were abutting but not intruding into the neuroforamen were classified as juxtaforaminal. Lastly, screws that intruded into the neuroforamen were classified as intraforaminal.

Results: No iliosacral or transsacral screws were graded intraforaminal seen on intraoperative multidimensional fluoroscopy or postoperative CT scan by either reviewer. All iliosacral and transsacral screw fixation was found to be safe. Intraobserver and interobserver variability existed between reviewers when grading screws to be extraforaminal versus juxtaforaminal. This was not clinically significant as both reviewers agreed that extraforaminal and juxtaforaminal screw position is safe. Multidimensional fluoroscopy was utilized in 3 patients to assess guide pin placement prior to definitive iliosacral screw fixation. Three patients underwent a change in fixation after reviewing intraoperative multidimensional imaging including: reposition of a guide pin that was found to be intraforaminal in bilateral sacral neuroforamen, reposition of an iliosacral screw, and removal of a transsacral screw. There were no immediate postoperative neurological examination changes.

Conclusion: Intraoperative multidimensional fluoroscopy is a new technology not previously studied. By generating intraoperative CT-like imaging, iliosacral screw position and accuracy can be assessed in real time with minimal risk to the patient. This novel technology carries much potential in aiding the treatment of orthopaedic injuries.