

Δ **Surgery for Unilateral Sacral Fractures: Are the Indications Clear?**

Paul Tornetta, MD¹; Julie Agel, ATC²; Sean Nork, MD²; Clifford Jones, MD, FACS³; Heather Vallier, MD⁴; Brian Mullis, MD⁵; Zachary Roberts, MD⁶; James Goulet, MD⁷; Anna Miller, MD, FACS⁸; Andrew Schmidt, MD⁹;

¹Boston Medical Center, Boston, Massachusetts, USA;

²Harborview Medical Center, Seattle, Washington, USA;

³Orthopaedic Associates of Michigan, Grand Rapids, Michigan, USA;

⁴Metrohealth Medical Center, Cleveland, Ohio, USA;

⁵Eskenazi Health, Indianapolis, Indiana, USA;

⁶University of Oklahoma Medical Center, Oklahoma City, Oklahoma, USA;

⁷University of Michigan, Ann Arbor, Michigan, USA;

⁸Wake Forest Baptist Hospital, Winston-Salem, North Carolina, USA;

⁹Hennepin Medical Center, Minneapolis, Minnesota, USA

Background/Purpose: Sacral fractures comprise approximately 75% of pelvic fractures. The most common type is a unilateral sacral injury with anterior impaction of the sacrum. Some prospective data have identified that these injuries do not displace over time and can be managed nonoperatively. Other surgeons believe that displacement may occur without stabilization, and are more aggressive in their approach. Additionally, sacral fractures may be complete and present with displacement. We designed a multicenter prospective trial to evaluate unilateral sacral fractures that is funded by the OTA. The purpose of this report is to compare the demographic, fracture, and displacement characteristics of the first 250 patients in this trial to determine what differences exist between the groups treated operatively versus nonoperatively.

Methods: Over a 7-year period we offered enrollment to all patients with unilateral sacral fractures in 16 centers. Exclusion criteria were: APC (anterior-posterior compression) injuries as demonstrated by symphyseal dislocation, pregnant patients or prisoners, and those who would not be able to follow up. All fractures were evaluated for location by zone and displacement (in mm) on the standard three views of the pelvis and CT scan. Displacement was measured at the level of the sacrum on all radiographs and CT. Vertical displacement was measured on the AP radiograph and “posterior” displacement on the inlet view. Additionally, the status of the anterior and posterior cortices of the sacrum were graded as impacted/nondisplaced, or displaced. Angulation of the affected hemipelvis as compared with the unaffected side was measured on the CT and inlet views. Injuries were also classified as having unilateral or bilateral rami fractures.

Results: All data are reported as percentages for the cells available so that not all results represent all cases. We enrolled 250 patients with an average age of 39 years and an average ISS of 13.9 of which 61% were female. The average BMI (body mass index) was 25.8. The most common mechanisms of injury were motor vehicle accident (50%) followed by fall from a height (23%). 60% had zone-1 sacral fractures. 26% had bilateral and 74% had unilateral rami fractures. The majority (62% AP, 63% inlet, 66% CT) of the patients had no displacement (0 mm). The anterior and posterior cortices of the sacrum were impacted or nondisplaced in 91% and 77% of cases, respectively. 171 patients were treated nonopera-

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tively and 79 operatively. There were no differences in age, gender, BMI, ISS, or mechanism of injury between the groups. The presence of bilateral versus unilateral rami, or having a displaced versus impacted anterior cortex did not correlate with surgery. Displacement on the inlet view and rotational displacements were also not different between the groups. Table #1 details the differences that were found between the operative and nonoperative groups. The major factors were having a zone 2 rather than a zone-1 injury, having posterior cortical displacement, and greater displacement on the AP radiograph and CT. However, the average displacement of those having surgery was only 2.5 mm and 2.9 mm as measured on the CT and AP radiograph. Finally, 45% of those treated surgically had zero displacement, and 72% had <5 mm of displacement.

Conclusion: We sought to evaluate the indications for operative management of unilateral sacral fractures by comparing the patient demographics and fracture location, pattern, and displacements (translational and rotational) of a prospective cohort of patients treated in 16 trauma centers. The only factors that correlated with the choice for surgery were zone 2 injury versus zone 1 and posterior cortical displacement on the CT. Most patients who were treated operatively had <5 mm of displacement of the sacrum. A large number of like patients are being treated operatively and nonoperatively by different surgeons that may lend itself to a randomized controlled trial.

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Table #1: Differences in patients treated operatively vs nonoperatively

	Zone 1 vs 2	Posterior cortex Displaced No vs Yes	Displacement AP X-ray (mm)	Displacement CT (mm)
Operative	24 vs 37	46 vs. 19	2.9 ± 4.2	2.5 ± 4.0
Nonoperative	92 vs 36	114 vs. 8	0.8 ± 2.2	0.8 ± 2.7
P value	< 0.0001	0.0001	<0.0001	0.011