Does Fracture Pattern Really Predict Clinically Important Displacement of LC1 Sacral Fractures?

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Purpose: Bruce et al previously reported that minimally displaced lateral compression type 1 (LC1) fractures with a complete sacral fracture and bilateral ramus fractures have a 68% chance of displacing if treated nonoperatively. The present study attempted to confirm this finding by assessing the proportion of LC1 pelvic fractures that displace following nonoperative management in a larger sample and to quantify the magnitude of this displacement.

Methods: The methodology of Bruce et al was replicated in a cohort of 273 patients who sustained a high-energy LC1 pelvic ring fracture with less than 5 mm of sacral displacement. Fracture morphology was characterized using CT and plain radiographs. Absolute and interval pelvic ring displacement was quantified using the mean of 9 measurements obtained on AP, outlet, and inlet radiographs. The primary outcome was sacral displacement greater than 5 mm or ramus displacement greater than the ramus width at follow-up. The secondary outcome was the magnitude of interval pelvic ring displacement. This was quantified as the difference between the mean of the 9 measurements performed on injury radiographs compared to the measurements performed on follow-up pelvic radiographs.

Results: 35 (13%) of the pelvic ring injuries displaced. Bruce et al reported 35% (6 of 17) displacement of complete sacral fractures and unilateral ramus fractures compared to the present study, which reports 12% (7 of 58), P = 0.06. Bruce et al reported 9% (2 of 22) displacement of incomplete sacral fractures and bilateral ramus fractures compared to the present study, which reports 10% (5 of 52), P = 1.00. Most interestingly, Bruce et al reported 68% (15 of 22) displacement of complete sacral fractures and bilateral ramus fractures compared to the present study, which reports 31% (15 of 49), P = 0.004. In those fractures that met the criteria for displacement, the average interval displacement was 4.3 mm (95% confidence interval: 1.82 to 6.81).

Conclusion: Many clinicians currently operate on minimally displaced pelvic ring fractures if a complete sacral fracture exists with bilateral ramus fractures based on the influential study of Bruce et al. Using the same methodology in a larger cohort, we found that a high proportion of displacement was observed with this particular fracture pattern. However, displacement occurred significantly less often than previously reported. Interestingly, the average interval displacement was 4.3 mm. The clinical importance of this magnitude of interval displacement remains unknown, but our data question the rationale for operating on these minimally displaced fractures based on fracture pattern alone.