

A Biomechanical Comparison of Two Fixation Methods for Unstable Lateral Compression Pelvic Ring Injuries

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Purpose: Management of the anterior component of unstable lateral compression (LC) (AO/OTA 61B2) pelvic ring injuries remains controversial. Common internal fixation options include plating and superior pubic ramus screws. These constructs have been evaluated in anterior-posterior compression fracture patterns, but no study has compared the two for unstable LC patterns, which is the purpose of this study.

Methods: A rotationally unstable LC pelvic ring injury was modeled in 10 fresh-frozen cadaver specimens by creating a complete sacral fracture, disruption of posterior ligaments, and ipsilateral superior and inferior ramus fractures. All specimens were repaired posteriorly with fully threaded 7-mm cannulated transiliac transsacral screws through the S1 and S2 corridors. The superior ramus was repaired with either a 3.5-mm pelvic reconstruction plate (n = 5) or a bicortical 5.5-mm cannulated superior ramus screw (n = 5). Specimens were loaded for 1000 cycles at 400 N followed by an additional 3 cycles at 800 N. Displacement and angulation of the superior and inferior ramus fractures were measured with a 3-dimensional motion tracker. The two fixation methods were then compared with Mann-Whitney U tests.

Results: Screw fixation had lower average displacement and angulation than plate fixation in all categories, with the motion at the inferior ramus at 800 N of loading showing a statistically significant difference.

Conclusion: Although management of the anterior ring in unstable LC injuries remains controversial, indications for fixation are becoming more defined over time. In this study, the 5.5-mm cannulated retrograde superior ramus screw significantly outperformed the 3.5-mm reconstruction plate in angulation of the inferior ramus fracture at 800 N. No other significance was found; however, there was a trend toward significance with the ramus screw demonstrating lower average displacements and angulations in all categories for both the inferior and superior ramus fractures.

Table 1: Fracture displacements and angulations. Significant comparisons are noted with a *.

Location	Loading	Displacement (mm)				Angulation (°)			
		400N		800N		400N		800N	
Superior Ramus	Repair	Screw	Plate	Screw	Plate	Screw	Plate	Screw	Plate
	Average	0.043	0.078	0.083	0.158	0.680	1.102	0.629	1.106
	St. Dev	0.036	0.032	0.083	0.063	0.593	0.987	0.495	0.782
	P-Value	0.210		0.144		0.210		0.144	
Inferior Ramus	Repair	Screw	Plate	Screw	Plate	Screw	Plate	Screw	Plate
	Average	0.154	0.341	0.306	0.814	0.345	1.103	0.698	1.840
	St. Dev	0.119	0.183	0.142	0.416	0.281	0.983	0.408	1.104
	P-Value	0.144		0.095		0.210		0.037*	

See the meeting app for complete listing of authors' disclosure information. Schedule and presenters subject to change.