

Uncortical Retrograde Pubic Rami Screws have a Higher Incidence of Failure after Fixation of Minimally Displaced Lateral Compression Type 1 Pelvic Ring Injuries

Nicholas Jerome Tucker, Stephen Stacey, JC De Leon, Raveesh D Richard¹, Austin Heare, Cyril Mauffrey, Joshua A Parry²

¹Denver Health Department of Orthopedics, ²Denver Health

INTRODUCTION:

The purpose of this study was to evaluate variables associated with loss of fixation/reduction of retrograde rami screws (RRS) in the treatment of stress-positive minimally displaced lateral compression type 1 (LC1) injuries.

METHODS:

A retrospective review at a single level-one trauma center identified 38 patients with LC1 pelvic ring injuries treated with 40 RRS. The medical record was reviewed to determine loss of fixation/reduction, defined as >5 mm of fracture or implant displacement on follow-up radiographs; Reoperations.

RESULTS:

The median patient age was 64 years (IQR 42.5 to 73.3 years), 71.1% (27/38) were female, and 52.6% (20/38) of injuries were secondary to low-energy mechanisms. Posterior ring fixation was performed in 92.1% (35/38). Loss of fixation/reduction occurred in 15% (6/40) of RRS with 10% (4/40) of screws requiring revision surgery. Variables associated with loss or fixation/reduction included increased dynamic displacement on stress radiographs (22.1 vs. 15.4 mm; observed difference (OD) 6.6 mm, 95% confidence interval (CI) 2.0 to 11.3; p=0.02), uncortical screws (83.3% vs. 8.8%; OD -74.5%, CI -95.6 to -32.3%; p=0.0005), short screws ending medial to acetabulum (50.0% vs .8.8%, OD 41.1%, CI 2.7 to 75.0%; p=0.03), and partially-threaded screws (66.7% vs. 23.5%; OD 43.1%, CI 1.1 to 73.9%; p=0.04)(Table). Loss of fixation/reduction was not associated with age, gender, BMI, low-energy mechanism, sacral fracture completeness, bilateral rami fractures, rami comminution, and distal rami fractures.

DISCUSSION AND CONCLUSION:

Short and/or uncortical partially-threaded retrograde rami screws were associated with loss of fixation/reduction and represent a modifiable factor to decrease complications after fixation of minimally-displaced LC1 pelvic ring injuries.

Table 1: Comparison of patients with and without loss of fixation/reduction

	Loss of fixation/reduction (n=6)	None (n=34)	OD (CI)	OD/CI	P-value
Age	54.0 (44.0 to 61.5)	65.5 (36.5 to 77.3)	-9.5 (-24.0 to 20.0)	0.21	0.29
Female	5 (83.3%)	23 (67.7%)	15.7% (-25.3 to 42.1%)	0.23	0.65
Body Mass Index	21.6 (18.3 to 24.2)	21.6 (19.5 to 24.8)	-0.62 (-4.5 to 2.6)	0.08	0.65
Low energy mechanism	4 (66.7%)	17 (50.0%)	16.7% (-24.8 to 49.8%)	0.22	0.66
Tobacco user	1 (16.7%)	7 (20.6%)	-3.9% (-30.2 to 35.7%)	0.06	1.00
Injury Severity Score	9.5 (5.0 to 16.3)	13.5 (9.0 to 26.0)	-4.0 (-14.0 to 1.0)	0.26	0.19
ASA 23	1 (16.7%)	21 (61.8%)	-45.1% (-70.0 to 2.3%)	0.63	0.07
Dynamic displacement (mm)	16.2 (12.7 to 20.2)	13.3 (11.1 to 18.4)	1.6 (-1.5 to 5.0)	0.25	0.37
Complete sacral fracture	4 (66.7%)	21 (61.8%)	4.9% (-35.7 to 38.5%)	0.06	1.00
Denis classification					0.08
1	5 (83.3%)	14 (41.2%)			
2	1 (16.7%)	20 (58.8%)			
Nakatani type 1 (medial)	5 (83.3%)	25 (73.5%)	9.8% (-30.6 to 36.1%)	0.14	1.00
S. Rami comminution	5 (83.3%)	32 (94.1%)	-10.7% (-48.0 to 14.7%)	0.17	0.39
Bilateral rami fracture	0 (0.0%)	13 (38.2%)	-38.2% (-54.3 to 1.5%)	0.68	0.15
Displacement on stress (mm)	22.1 (19.8 to 26.4)	15.4 (12.2 to 18.3)	6.6 (2.0 to 11.3)	0.71	0.02
# of sacral screws					0.72
0	0 (0.0%)	3 (9.4%)			
1	5 (83.3%)	25 (73.5%)			
2	1 (16.7%)	4 (12.5%)			
Rami screw size (mm)					0.05
4.5	1 (16.7%)	0 (0.0%)			
6.5	4 (66.7%)	29 (85.3%)			
7.3	1 (16.7%)	5 (14.7%)			
Cannulated screw	5 (83.3%)	33 (97.1%)	-13.5% (-50.0 to 11.9%)	0.22	0.28
Uncortical rami screw	5 (83.3%)	3 (8.8%)	-74.5% (-95.6 to -32.2%)	*1.40	0.0005
Short rami screw	3 (50.0%)	3 (8.8%)	-41.1% (-7.7 to 75.0%)	0.57	0.03
Screw type					0.08
Partially-threaded	4 (66.7%)	8 (23.5%)			
Fully-threaded	2 (33.3%)	17 (50.0%)			
Headless-compression	0 (0.0%)	3 (8.8%)			
Partially-threaded screw	4 (66.7%)	8 (23.5%)	43.1% (1.1 to 73.9%)	0.59	0.04

(ASA: American Society of Anesthesiologists classification; OD: Observed difference; CI: confidence interval)
 *Median difference for nonparametric, continuous data and proportional difference for nominal data
 Bold P-values (<0.05) were considered to be a statistically significant