Non-Operative Versus Operative Treatment of Z-Type Comminuted Clavicle Fractures in Adolescents: A Prospective Substratified Cohort Analysis

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Purpose: This study was conducted to assess clinical, radiographic, and patient-reported outcomes (PROs) in adolescents with comminuted «Z-type» midshaft clavicle fractures by comparing nonoperative and operative subcohorts.

Methods: A subcohort analysis was performed from a prospective observational cohort study at 8 tertiary-care pediatric centers on 909 patients 10 to 18 years old treated for a diaphyseal clavicle fracture, specifically evaluating patients with comminuted Z-type fracture patterns. 82 patients with Z-type comminuted fractures (37 that were treated nonoperatively and 45 treated operatively) were included, 60 (73%) of whom provided 2-year PROs. We compared operative and nonoperative cohorts with regard to complications and validated PROs.

Results: The only significant difference in demographic or fracture characteristics between the two cohorts was shortening, which was greater in the operative cohort (23 mm vs 29 mm, $P = 0.01$). After controlling for this confounder through both regression and matched subgroup analysis, nonoperative versus operative cohorts showed no difference in rates of nonunion (none), delayed union (0% vs 2%, $P = 1.0$), symptomatic malunion (3% vs 0%, $P = 0.4$), refracture (3% vs 4%, $P = 1.0$), unexpected surgery (5% vs 11%, $P = 0.45$), or clinically significant complications (5% vs 16%, $P = 0.17$). There were no differences in PROs between cohorts, even when controlling for fracture shortening.

Conclusion: In this comparative investigation of complications and 2-year PROs in adolescents with comminuted Z-type clavicle fractures, nonoperative and operative treatment demonstrated similar outcomes.

Two-Year Patient Reported Outcomes (PROs), by Treatment Group

PRO	Non-Operative (n=26)	Operative (n= 34)	p-value*
ASES			
Mean Score (SD)	99.0 (4.8)	97.0 (8.1)	1.00
Patients (%) with Score <90†	1 (4.2%)	2 (5.7%)	
QuickDASH			
Mean (SD)	0.4 (1.8)	2.2 (4.6)	0.50
Patients (%) with Score >10†	0 (0.0%)	2 (5.9%)	
EQ-VAS			
Mean (SD)	94.5 (5.6)	92.6 (7.4)	0.50
Patients (%) with Score <80†	0 (0.0%)	2 (5.9%)	
EQ-5D Score			
Mean (SD)	0.98 (0.1)	0.95 (0.1)	1.00
Patients (%) with Score <0.80†	1 (3.8%)	1 (2.9%)	
General Satisfaction			
Mean (SD)	1.5 (0.8)	1.4 (0.7)	0.39
Patients (%) with Score >2†	4 (15.4%)	2 (5.9%)	
Mars Shoulder Activity			
Mean (SD)	11.8 (5.5)	12.9 (5.8)	0.53
Patients (%) with Score ≤7†	4 (10.9%)	8 (17.8%)	

*Due to a severely skewed distribution of PRO scores seen on interim analyses, thresholds were established for dichotomized score adjustments for both †ceiling effects (ASES, EQ-VAS, EQ-5D, Mars Shoulder) and ‡floor effects (QuickDASH, General Satisfaction). P-values were calculated for the distribution of patients with suboptimal scores, rather than for mean scores.

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