

Comparative Outcomes of Pinning versus Permanent Fixation for Adolescent Supracondylar Humerus Fractures

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INTRODUCTION: Supracondylar humerus (SCH) fractures are a common injury treated with percutaneous pinning in children compared to open reduction and internal fixation in adults. However, the optimal treatment strategy for adolescent patients remains unclear. The purpose of this study is to compare the surgical outcomes of SCH fractures between pinning and permanent fixation in adolescents.

METHODS: A retrospective chart review was performed on all children aged 10 to 17 years old with an extra-articular SCH fracture who underwent surgical fixation between 2012-2022 at a level one pediatric trauma center. A total of 118 patients met inclusion criteria with pin fixation in 104 and permanent fixation in 14 patients. Bivariate analysis using Fisher's exact test and a t-test for continuous variables were performed. A multivariate regression model evaluated the effect of fixation type on time to union after adjusting for surgical approach, Gartland classification, and age

RESULTS:

The mean age was 10.9 years for the pins-only group and 13 years for the permanent fixation group (P<0.001). Unadjusted analysis of time to union was similar between groups (mean difference of -13.4 days, 95% CI: -37 – 10 days, P=0.05) as well as the presence and resolution of pre-operative and post-operative nerve deficits. The average elbow arc of motion was significantly higher in the permanent fixation group (135 vs 123 degrees, P=0.01). Multivariate model demonstrated that every additional year of age increased time to union by 3.6 days (P<0.001). Fixation type and surgical approach significantly impacted time to union, compared to pin fixation via a closed approach, pin fixation via an open approach increased time to union by 14.2 days (P=0.03) and permanent fixation via a closed approach increased by 10.4 days (P=0.001). Additionally, Gartland Type IIB and Type III fractures were associated with longer union times compared to Type IIA fractures (P<0.05).

DISCUSSION AND CONCLUSION:

Adolescent patients with SCH fractures had a longer time to union associated with the independent factors such as increasing age above 10 years old, more severe fracture type (IIB or III), and those that underwent fixation via an open approach. Permanent fixation demonstrated significantly greater average flexion-extension arc of motion compared to pins-only, though this difference is unlikely to be clinically significant and could be attributed to the small sample size in the permanent fixation group compared to the pins-only fixation group.

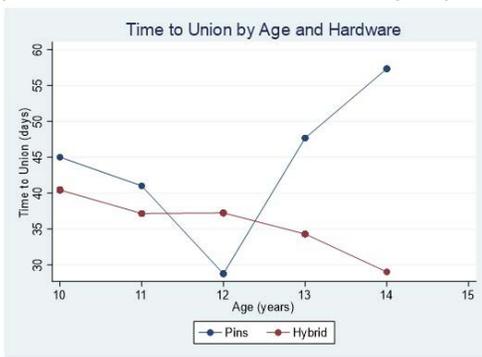


Figure 1: Average time to union for Pins only versus Semi-permanent fixation (Hybrid) delineated by Age

Table 1 Multivariate Regression with Coefficients, 95% CI, and p-values

	Time to union (days)	95%CI	P<0.05
Age	3.57	0.88 – 6.3	<0.001
Fixation/Approach			
Pins-Closed	Base	-	-
Pins-Open	14.2	4.7 – 23.7	0.003
Hybrid-Closed	-10.4	-16.7 – -4.2	0.001
Hybrid-Open	8.3	-0.65 – 17.2	0.069
Gartland Classification			
Type IIA	Base	-	-
Type IIB	8.8	0.71 – 16.8	0.033
Type III	7.9	1.17 – 14.6	0.021
Flexion Type	-0.44	-9.2 – 8.3	0.921
Constant	-13.2	-44.5 – 18.1	0.407
Observations	113	Bootstrapped	
Adjusted R ²	0.3472	CI – #100	
Root MSE	15.5		