

Operative Versus Nonoperative Treatment of Severely Shortened or Comminuted Clavicle Fractures in Older Adolescent Athletes: Results from a Prospective, Multicenter, Level II Cohort Study

*David D. Spence, MD; Philip L. Wilson, MD; Donald S. Bae, MD; Michael T. Busch, MD; Eric W. Edmonds, MD; Henry B. Ellis, MD; Katelyn A. Hergott, MPH; Mininder S. Kocher, MD; G. Ying Li, MD; Elizabeth Liotta, MBBS; Jeffrey J. Nepple, MD; Nirav K. Pandya, MD; Andrew T. Pennock, MD; Crystal A. Perkins, MD; Coleen S. Sabatini, MD, MPH; David N. Williams, PhD; Samuel C. Willimon, MD; Benton E. Heyworth, MD
Boston Children's Hospital, Boston, MA, United States*

Purpose: Operative management of clavicle fractures is increasingly advocated for athletes and young adults. Surgical indications and optimal treatment for comminuted or severely shortened clavicle fractures in adolescent athletes remain unclear. The purpose of this study is to evaluate the outcomes of nonoperatively and operatively treated comminuted and/or severely shortened (>25 mm) clavicle fractures in older adolescent athletes.

Methods: 14- to 18-year-old athletes with midshaft clavicle fractures (treated 2013-2016) with nonoperative (NONOP) or operative (OP) treatment at one of eight participating centers were screened for the presence of comminution and/or fracture shortening >25 mm. Demographics, injury mechanism, fracture characteristics, and treatment (NONOP vs OP) were prospectively recorded. Complications, rates and timing of return to sport (RTS), and patient-reported outcomes (PROs: American Shoulder and Elbow Surgeons [ASES]; QuickDASH, an abbreviated version of the Disabilities of the Arm Shoulder and Hand questionnaire; MARX shoulder activity; EuroQol 5 Dimensions [EQ-5D]; EuroQol Visual Analog Scale [EQ-VAS]; and patient satisfaction) were analyzed.

Results: 137 patients (70 NONOP, 67 OP) met inclusion, with a similar distribution of various sports and rates of competitive athletes (NONOP: 81%, OP: 85%) represented in the two treatment groups. 100 patients (NONOP n = 52, 15.3 years, 44 [84.6%] M; OP n = 48, 15.5 years, 40 [83.3%] M) provided PROs at >2 years. Comminution (C) and shortening (S) were no different (NONOP C = 24 [46.2%], S = 28 [24.5, 33.2] mm; OP C = 35 [72.9%], S = 28 [25.0, 36.5] mm), but the OP group demonstrated 3 mm greater mean superior displacement (NONOP 13.0 [9.6, 18.0] mm, OP 16.0 [11.8, 21.0] mm; $P < 0.05$), which was controlled as a confounder in the comparative PRO analysis. There was no difference in nonunion (none), delayed union (NONOP = 2%; OP = 2%), symptomatic malunion (NONOP = 2%, OP = 0%), refracture (NONOP = 0%, OP = 2%), or clinically significant complications (NONOP = 4%, OP = 13%; $P = 0.27$) between treatment groups. Two years postinjury 75% of NONOP and 79% of OP patients reported RTS, with 61% and 57%, respectively, reporting achievement of same sport level, and similar RTS timing (OP = 10 weeks, NONOP = 11.6 weeks). When controlling for minor differences in superior displacement, regression and matching analyses demonstrated no difference in mean and dichotomized PRO scores between the NONOP and OP groups.

Conclusion: In this prospective multicenter cohort of comminuted and/or severely shortened (>25 mm) clavicle fractures in adolescent athletes, there was no difference in RTS or PROs between nonoperatively and operatively treated patients at 2 years. Despite several studies suggesting the contrary in adult populations, comparably excellent outcomes of severe clavicle fractures in adolescent athletes may be achieved with nonoperative treatment.

The FDA has stated that it is the responsibility of the physician to determine the FDA clearance status of each drug or medical device he or she wishes to use in clinical practice.