

## Outcomes Are Similar for Acute versus Delayed Surgical Treatment of Displaced Diaphyseal Clavicle Fractures

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**Background/Purpose:** The management of displaced diaphyseal clavicle fractures has changed over recent years. Classically, surgical intervention was reserved for fractures that failed conservative treatment resulting in nonunion or malunion. Recent randomized trials suggest clinical benefits to acute operative management. As a result more surgeons are recommending acute fixation of displaced diaphyseal clavicle fractures. There is a lack of literature comparing outcomes and surgical complications of acute clavicle fracture fixation to late fixation of nonunion or malunion. Combined with known rates of nonunion with conservative treatment, this information would allow surgeons to better inform patients about the outcomes with delayed treatment of these injuries.

**Methods:** According to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, a systematic review was conducted. Studies reporting outcomes following acute and delayed clavicle fracture surgical fixation were identified in PubMed, CINAHL, EMBASE, sportDiscus (EBSCO), and Cochrane Central Register of Controlled Trials databases. Distal and medial clavicle fracture reports were excluded. Studies that failed to report timing to surgery were also excluded. All clavicle fixation methods were included. Cohorts were classified as “delayed surgery” when diagnoses of nonunion or malunion were cited as indications for surgery.

**Results:** After review, 27 studies met inclusion criteria, reporting outcomes of 1018 patients. Fracture union was reported in all studies and was similar between acute (97.6%) and delayed (95.4%) surgical groups ( $P = 0.83$ ). There were 16 studies that reported Constant scores at final follow-up. The mean Constant score for acute surgery was slightly higher than delayed surgery (91.1 vs 87.9); however, this did not reach significance ( $P = 0.31$ ). Reoperation was common, and data were reported in 19 studies. Reoperation rates were similar after acute and delayed surgery (22.5% vs 26.7%) most commonly for implant removal. Reported complications were more common after acute surgery (30.5%) than in delayed surgery (8.5%). The most common complications reported were surgical wound site irritation or numbness (17.4% in acute, 6.2% in delayed), implant failure or bending (3.9% in acute, 1.1% in delayed), and superficial infection (2.6% in acute, 0.0% in delayed). Overall, there were fewer complications in the delayed surgery group ( $P = 0.01$ ).

**Conclusion:** We found that good outcomes can be expected after both acute clavicle fracture surgery and delayed surgery to address nonunion or malunion. Patient-reported outcomes were slightly higher after acute surgery; however, this did not reach significance. Reported complications rates for delayed surgical intervention were consistently lower than for acute fixation of these injuries. Surgeons may counsel patients that a trial of non-operative management for diaphyseal clavicle fractures will likely not have a significant impact on union or clinical outcome with surgical intervention. Lower rates of surgical complications may be seen with delayed 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.