Midshaft Clavicle Fractures

When Is Surgical Management Indicated and Which Fixation Method Should Be Used?

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KEYWORDS

• Midshaft clavicle fracture • Operative versus nonoperative treatment management
• Intramedullary fixation • Malunion

KEY POINTS

- Operative treatment is recommended for displaced midshaft clavicle fractures, as this provides earlier return to work and sport, greater patient-reported satisfaction with appearance, and significantly decreased incidence of nonunion and malunion when compared with conservative treatment.
- Nonoperative treatment is recommended for nondisplaced fractures or minimally displaced fractures without significant shortening.
- Overall cost data analysis has shown increased cost-effectiveness with operative treatment for displaced clavicle fractures.
- Athletes can benefit significantly from operative treatment.

INTRODUCTION

Clavicle fractures are common traumatic injuries in adults and are caused by a direct impact to the shoulder; 75% to 80% of all clavicle fractures occur in the middle third segment of the clavicle, commonly referred to as midshaft.[1] The Allman classification of clavicle fractures published in 1967 in Journal of Bone and Joint Surgery (JBJS) describes types by location of the fracture along the shaft broken up by thirds: type I middle (most common), type II lateral, and type III medial (least common).[2] The most commonly fractured middle third of the bone lacks strong muscular or ligamentous attachments compared with the medial and lateral aspects of the bone and adjacent joints. Therefore, this section is prone to injury and displacement following trauma. When fractured, the medial fragment is pulled posterosuperiorly by the sternocleidomastoid muscle and the lateral fragment is pulled inferomedially by the pectoralis major tendon and the weight of arm[3] (**Fig. 1**).

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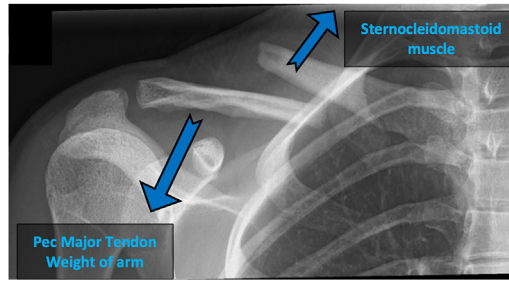

Fig. 1. Midshaft clavicle fracture displacing forces.

Clavicle fractures are associated with significant pain and dysfunction during the acute injury phase and in cases of significant malunion can contribute to chronic shoulder dysfunction. Decision-making regarding care of midshaft clavicle fractures has long been controversial, with the pendulum swinging from nonoperative treatment to more operative treatment for significantly displaced fractures in light of many well-done comparative studies.

DIAGNOSIS

Diagnosis is made with history, physical examination, and radiographs. As with most acute fractures, a history of some trauma, physical examination showing point tenderness, possible deformity and ecchymosis, and abnormal motion at the fracture site are all clear indicators of an underlying fracture. Radiographs will show the evidence of fracture and any comminution, displacement, and shortening. In addition to standard upright anteroposterior (AP) radiographs of bilateral shoulders, clavicle-specific radiographs can be helpful to obtain views along the anatomic axis of the clavicle, perpendicular to the maximal deforming forces, and to eliminate overlapping scapula in the view. An AP with a 30° cephalic tilt of the radiography beam is recommended to best depict true displacement of midshaft fractures (Fig. 2). Other clavicle views such as a Zanca view, which is done with the radiography beam angled with a 15° cephalic tilt, are helpful for distal third clavicle fractures, and a Serendipity view, using a 45° cephalic tilt, is recommended to show the medial clavicle and sternoclavicular

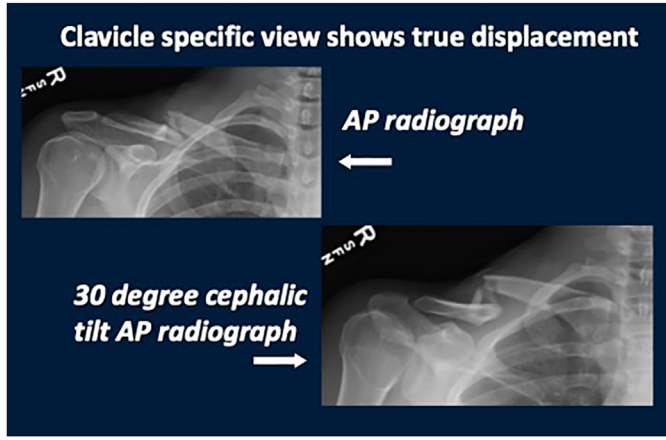

Fig. 2. Clavicle-specific radiographs.

(SC) joint best. These can help demonstrate true displacement and allow for specific comparison in follow-up images. Radiographic interval follow-up depends on fracture type and treatment. For example, minimally displaced fractures are generally not expected to displace further, and therefore, nonoperative management with radiographic follow-up at 6 and again at 10 to 12 weeks is reasonable. Significantly displaced, shortened fractures would require operative treatment. After operative treatment, radiographs are checked at 2, 6, and again at 10 to 12 weeks after fixation.

TREATMENT OPTIONS

Nonoperative treatment of clavicle fractures has long been an accepted treatment option; however, treatment algorithms have shifted from nonoperative to more operative management of displaced midshaft fractures in the era of randomized prospective trials. Nonoperative treatment is still considered the standard of care for nondisplaced or minimally displaced fractures (displaced <100%) in the absence of neurovascular injury or skin threatening.[4,5] In addition, time to presentation to a medical professional with interval healing, combined with potentially limited resources for surgical intervention among some patient populations, can be reasons for nonoperative management. Conservative treatment consists of a sling for 4 to 6 weeks with progression to light strengthening starting at 6 to 10 weeks. Consistent radiographic follow-up throughout the initial 2 to 6 weeks is necessary to ensure no further displacement and appropriate healing.

Nonoperative treatment with completely displaced midshaft fractures has shown to harbor certain healing risks. In addition, significant shortening has historically resulted in worse patient satisfaction and higher risk of nonunion when treated conservatively.[6,7] Nonunion can occur in 10% to 18% of fractures treated conservatively.[8,9] Clavicle fractures treated nonoperatively, even in the adolescent population, have been shown to have a malunion rate of 10% to 20%.[10] When planning treatment options, the patient and provider must consider patient activity level, occupation, and demands, in addition to overall physiologic propensity for healing. Furthermore, the biomechanical risk factors for malunion or nonunion must be considered, including degree of displacement, shortening, and comminution of the fracture.[11] Nonunion presents as continued or unresolving pain in some patients or can present as increased fatigue after activities. Malunion affects patients on a spectrum of reported severity, and although might not be painful, residual deformity of the fracture sight can be bothersome to patients cosmetically or with certain clothing or pack/bag wear.

If nonoperative treatment is not indicated, options and reasons for operative treatment should be thoroughly discussed with the patient and their family. All stabilization methods require an implant that may or may not be permanent. These include open reduction and internal fixation (ORIF) with plates and intramedullary (IM) fixation. The advantages of operative fixation are immediate postoperative stability and decreased fracture-associated pain from movement of fragments and restoration of anatomy and length of the clavicle. Absolute indications for operative intervention are associated vascular injury, open fracture, or impending skin compromise due to displaced bone tenting the overlying skin. Other indications for patients older than 12 year old with less remodeling potential include shortening of greater than 2 cm.[12] Females achieve 80% of their clavicle length by 9 years of age and boys by 12 years of age[13]; therefore, angulation would result in some permanent amount of shortening.

Furthermore, in polytrauma patients, with multiply fractured extremities, it can be helpful in rehabilitation and recovery efforts to stabilize all upper-extremity fractures to allow for assisted weight-bearing and mobilization.

ORIF can be performed with either single or dual-plating technique. Historically, a single plate (commonly a 3.5-mm compression plate), placed superiorly along the clavicle (Fig. 3), has led to durable and predictable results for stabilization and healing. With advances in implants, pre-contoured and anatomic clavicle-specific plate designs with locking screw options have been introduced with success. Varying the type and thickness of the plate can assist in decreasing plate prominence and symptomatic hardware. Positioning of the plate has also been shown to affect symptomatic hardware and subsequent removal rates. Anterior plating has been shown to have lower incidence of hardware removal when compared with superior plate positioning, but in biomechanical testing has been shown to be less stiff in axial and torsion forces when compared with superior plating.[14,15] Dual-plating techniques are also an option and allow for stabilization of the bone with lower profile and thinner plates while still providing enough strength to stabilize the bone.[16] This can be done using mini-fragment plates that can be easily contoured to fit the clavicle.

INTRAMEDULLARY FIXATION

IM fixation for clavicles was first reported in the 1940s using wires.[17] Historically, the technique was developed using various pin-type implants.[18,19] More recently due to desire for increased strength and stability, surgeons have transitioned to using titanium elastic nails (TENs)[20] similar to those used in pediatric fractures or threaded IM devices (Fig. 4). There are various implants including IM screw options with compression. Hardware prominence can depend on the implant and technique. The TEN and Rockwood pin can require subsequent surgery for implant removal due to prominence or potential for migration.[21] IM implants are frequently removed for these reasons, but this is done only after complete fracture healing. IM techniques provide appropriate stability as the longitudinal design can counteract the deforming forces of the posterosuperior pull of the sternocleidomastoid on the medial fragment and the inferomedial pull of the lateral fragment by the pectoralis major. IM options adequately maintain length and allow for early use of the arm. Simple fracture patterns that are displaced with minimal comminution and minimal obliquity to the fracture are more amenable biomechanically to IM devices.[22]

The advantages of IM fixation are smaller, more cosmetic incisions and less disruption to surrounding tissues and periosteum, which provide the majority of the blood supply to the midshaft clavicle. Infection rate and refracture rate after implant removal have also been shown to be lower when using IM devices compared with plate fixation.[21,23,24]

Therefore, patients can theoretically safely return to sports faster after removal of an IM device compared with a plate. IM fixation is more technically demanding than standard plate fixation. Furthermore, it is not a practical treatment option for patients that

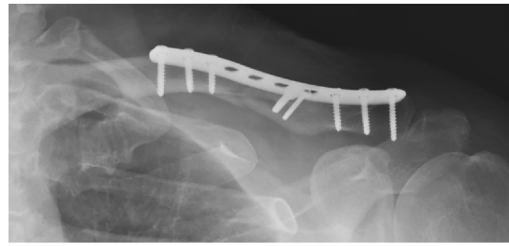

Fig. 3. Superior plate.

Fig. 4. Intramedullary fixation of clavicle fracture.

are delayed in presentation for fracture care if the fracture fragments are relatively nonmobile.

FRACTURE-ASSOCIATED PATIENT FACTORS

Sleep positioning can be difficult with upper extremity fractures, and pain and disrupted sleep can lead to difficulties with mood changes, productivity decreases, and sequela associated with psychologic stress and fatigue. Owing to the faster stability achieved with internal fixation, pain relief and function can usually be restored faster with operative treatment.[25] Likewise, a gentle range of motion and even return to functional weight-bearing can be allowed after operative fixation, allowing patients to restore some basic activities of daily living.[26]

Of note, clavicle fractures are not as severe or disruptive as lower extremity fractures, and postponed presentation to a provider can influence injury management. Delay in seeking medical attention could make open reduction and internal fixation more difficult due to callus formation and deformity or drive the patient to elect a trial of nonoperative treatment. With late presentation, the patient could have already undergone a significant portion of the healing process, which is usually expected by 3 to 4 weeks after injury depending on patient age. The initial phases of injury are the most debilitating and painful part of recovery. Therefore, if the patient has already suffered through the hardest weeks, continued nonsurgical treatment can frequently be a practical management option, as this would avoid an operation that would restart the healing process, cause additional pain, and impart the risk of surgical complications.

RECENT TRENDS

Studies of trends from the early 2000s showed that the incidence of clavicle fractures has been increasing both in and outside of the United States. Moreover, the rate of operative fixation has disproportionally been increasing with a reported 300% to 700% increase in operative fixation of clavicle fractures.[27,28] Further investigation of trends in clavicle fracture surgeries in the United States found that patients who were white, privately insured, and of high-income status had higher rates of surgical fixation of their fractures. Whereas delay in surgery was associated with patients of lower income status, suggesting varied access to care.[28]

DISCUSSION

Current Evidence for Operative Versus Nonoperative Intervention

A review of published evidence in the last 15 years supports surgical intervention for midshaft clavicle fractures in adults that are either completely displaced, shortened greater than 2 cm, or are significantly comminuted.[29] Most of this literature reports on open reduction and plate fixation and shows improved functional outcomes,

patient-reported satisfaction with appearance, and significantly decreased incidence of nonunion and malunion when compared with conservative treatment without surgery.

The Canadian Orthopaedic Trauma Society (COTS) published their multicenter, prospective randomized clinical trial of 132 patients with a displaced midshaft clavicle fracture. They randomized patients to either operative treatment with plate fixation or nonoperative treatment with a sling and evaluated radiographic and functional outcomes using the Constant and disabilities of the arm, shoulder, and hand (DASH) scores. Both functional scores demonstrated significantly improved outcomes in operatively treated fractures compared with their nonoperative counterparts. Timing until radiographic union was also significantly decreased in the operatively treated fractures by an average of 12 weeks faster in the surgical group. In this RCT, the COTS reported a mean time to radiographic union of 28.4 weeks in the nonoperative group compared with 16.4 weeks in the operative group. They found this to be statistically significant with a *P*-value = .001. In addition, nonunions and symptomatic malunions occurred significantly more frequently in the nonoperatively treated fractures compared with the operatively treated group. Although there were more complications reported in the operatively treated fractures, these were generally due to prominent hardware and could be treated with hardware removal. Ultimately, patients who underwent surgery were more likely to be satisfied with the appearance of their shoulder at 1 year post-op.[11]

Similarly, Fuglesang and colleagues published a report reviewing 59 patients with 2.7 year outcome data who underwent conservative treatment of their completely displaced midshaft clavicle fractures. They showed fair to poor clinical results and patient-reported DASH scores. Patients with 100% or greater displacement of the fracture fragments reported significantly lower upper extremity function in those treated conservatively versus operatively. Moreover, the investigators found a significantly increased rate of nonunions in conservatively treated patients. This risk for nonunion increased with age.[30]

In a JBJS 2017 randomized controlled trial (RCT) of 160 adults, Woltz and colleagues published their findings on plate fixation compared with nonoperative treatment for displaced midshaft clavicular fractures. Their primary outcome was to evaluate union at 1 year, and the group found that open reduction and plate fixation provided more reliable healing compared with nonsurgical treatment. They also evaluated DASH and Constant scores for all patients at different time points, but in contrast to prior research discussed, they did not find any statistically significant differences in these functional scores between the two groups at all time points.[31]

A randomized clinical trial out of Denmark, published in 2018, in The Bone and Joint Journal, again evaluated operative versus nonoperative treatment of displaced midshaft clavicle fractures. They randomized 146 adult patients to operative versus nonoperative treatment of displaced clavicle fractures and evaluated union and function scores (DASH and Constant scores) at different time points during the first year. Early function scores, both DASH and Constant scores, were improved in the operative group, which was statistically significant at 3 months. After 6 months and at 1 year, the investigators found no statistically significant differences between the surgically and conservatively treated patients. Nonunion rates were significantly lower in the operatively treated patients. Twenty-five percent of the surgically treated patients underwent hardware removal in their study.[25]

Qin and colleagues performed a meta-analysis of nine randomized clinical trials comparing open reduction and plate fixation versus nonsurgical treatment for displaced midshaft clavicle fractures. They found that the surgical treatment of fractures

showed significant advantages over conservative treatment when analyzing for nonunion rate, malunion rate, and appearance dissatisfaction rate. The analysis of the nonoperative treatment group showed the lower rate of reported complications. The analysis did not find a significant difference in functional outcome when comparing reported DASH scores among the RCTs. Overall, they found that in regard to complete healing and appearance, patients reported better outcomes with ORIF over nonsurgical treatment.[32]

Level 1 evidence from Axelrod and colleagues also showed surgical intervention had improvements in all outcomes evaluated, most notably union rates, when compared with conservative treatments. They do acknowledge that although operative treatment showed statistically superior upper extremity function results versus conservative treatment, these results were not always above the minimal clinically important differences. In their 2020 report: What Is the Best Evidence for Management of Displaced Midshaft Clavicle Fractures? A Systematic Review and Network Meta-analysis of 22 RCTs, they analyzed studies that totaled over 1000 patients with midshaft clavicle fractures to identify which treatment had the highest union rate, lowest revision rate, and highest functional outcomes at 1 year. Union rates were significantly higher in the surgically treated group, with the number needed to treat being 10 patients to avoid one nonunion. When counseling patients, they recommend discussing the evidence that union rates are more predictable after an operation, but that patients should understand a second operation might be needed to remove symptomatic hardware once the fracture has healed.[8]

In 2022, investigators from The University of Hong Kong published a systematic review and meta-analysis of RCTs comparing operative and nonoperative management of midshaft clavicle fractures. Their study analyzed a total of 3094 adult patients across all 31 RCTs that included among the operatively treated fractures both plate fixation and IM fixation. DASH and Constant scores, time to union, and risk of treatment related complications were compared between the surgically treated and conservatively treated patients. Overall, they found that surgical intervention led to better functional outcome scores and decreased time to union. They further analyzed available data for comparison of short-term results (3 months), intermediate-term (6–12 months), and long-term (>24 months) clinical outcomes. From their subgroup analysis, they reported that not only did they see improvements in DASH and Constant scores in the early term results, but these higher functional scores were still noted in the operatively treated groups after 24 months.[33]

DIFFERENCES IN FIXATION TECHNIQUES

Described fixation techniques for midshaft clavicle fractures include IM fixation and various plating options including superior, anterior inferior, and dual min-fragment plating. Each of these techniques has specific advantages and disadvantages specific to biomechanical strength, wound problems, hardware prominence, and need for removal of hardware.

Superior plating has been shown to be a biomechanically stronger construct that is stiffer in axial compression than anteroinferior positioning.[15] However, it is associated with more hardware prominence and irritation. Clinically, when comparing superior and anteroinferior fixation positioning, there are no significant differences in regard to stabilization and complete healing. A meta-analysis study published in 2017, in the Journal of Orthopedic Trauma, analyzed surgical fixation methods comparing anteroinferior plating versus superior plating. In their analysis of 34 articles, there were no statistically significant differences detected in union, malunion, or nonunion

rates. Their study showed that anteroinferior plating was associated with significantly lower rates of symptomatic hardware and therefore lower subsequent implant removal when compared with superior plating. They found no differences in postoperative shoulder function scores when examining DASH and Constant scores among the two interventions.[14]

Dual mini-fragment orthogonal plating has been shown to have similar biomechanical strength as superior plating using a single larger plate.[16,34] Dual-plating techniques as previously described allow for lower profile hardware and less prominence and therefore lower rates of symptomatic hardware removal.[16] You and colleagues published a systematic review and meta-analysis of single plate versus dual plating and reported a 4% rate of removal of symptomatic hardware in the dual plating. In contrast, the single-plate group had a 3.9 times higher implant removal rate due to symptomatic hardware. Healing was the same between both groups.[35]

A systematic review and meta-analysis of RCTs of plate fixation or IM fixation for midshaft clavicle fractures published in Journal of Shoulder Elbow Surgery (JSES) in 2016 showed no differences in union, infection, or wound problems between the two treatment options. They found that hardware removal was common in both fixation techniques, but that IM nailing had significantly higher rates of secondary surgery for implant removal (mean of 73% for TEN vs 38% for plate). Their study also showed that refracture after removal of hardware was more common with plate fixation.[36] Ju and colleagues published another systematic review and meta-analysis of RCTs comparing plate fixation and IM fixation of midshaft clavicle fractures analyzing 10 RCTs. They evaluated DASH and Constant function scores and found no statistically significant difference between the two groups. They found an associated slight increase in the risk of infection and less satisfaction with cosmetic appearance with plate fixation when compared with IM fixation. Overall, their analysis results did not suggest any difference between the two groups in long-term functional outcomes.[37]

In a 2020 study of 94 adolescents evaluating clinical and radiographic outcomes of midshaft clavicle fractures, Kim and colleagues evaluated four different treatment options: conservative figure-of-8 brace, open reduction and internal fixation with a plate (OPL), minimally invasive plate osteosynthesis (MIPO), and IM nail fixation with a threaded Steinmann pin (TSP). They found that all groups had satisfactory outcomes and obtained full fracture union, but Constant scores were higher in the surgically treated groups compared with nonoperative treatment. Angulation and bone length was closest to normal in OPL and TSP groups. TSP and MIPO groups had faster bone healing. Scar appearance satisfaction was highest in the TSP group as expected.[38]

COST-EFFECTIVENESS

The cost of injury is associated not only with the cost of treatment interventions but also in the time required for recovery and return to full activity in addition to the value placed on quality of life. Although less quantifiable, time lived without pain and dysfunction can be considered more valuable in terms of quality of life. A 2013 JSES study of 204 patients showed that patients with displaced clavicle fractures obtain significant improvements both clinically and financially from operative fixation. Althausen and colleagues found significantly less chronic pain, deformity, weakness, and better range of motion reported in patients who underwent operative stabilization. This led the surgically treated patients to return to work faster (missing 8.4 vs 35.2 days of work), require less assistance at home, and incurred less physical therapy costs ($971.76 vs $1820). Overall, although the initial hospital bill was higher due to

surgical costs, the total cost savings for patients was reported as $5091.33 of less cost in favor of operative treatment.[39] This cost analysis highly depends on the resources available to a patient. A study published in JBJS in 2019 by Liu and colleagues also reported on cost-effectiveness of operative versus nonoperative treatment of displaced midshaft clavicle fractures. They did this by analyzing calculated quality-adjusted life years (QALYs) and Medicare costs for operative and nonoperative treatment of substantially displaced midshaft clavicle fractures. The investigators used a Markov model to evaluate clinical results at 5 years and predicted lifetime results. They used this model in their cost-effectiveness analysis to determine how long clinical benefits in operatively treated patients must persist for operative intervention to be more cost-effective than nonoperative treatment for displaced midshaft clavicle fractures. They found that the cost per QALY with operative management was less than $38,000 in the first 5-year and less than $8000 in the lifetime analyses. These costs were below the willingness-to-pay threshold of $50,000 per QALY. They therefore concluded that for operative treatment to be cost-effective, patients must see clinical benefits for at least 3 years postoperative fixation.[40]

RETURN TO SPORT

In athletes, return to sport can be a significant driver of treatment, as a critical aspect of their quality-of-life centers around ability to participate in their sport. Their conditioning and strength are dependent on consistent training, and days missed are important considerations in a patient-specific treatment algorithm. A systematic review of 10 studies on midshaft clavicle fractures showed that return to sports was significantly decreased with operative treatment (mean of 10 weeks missed vs mean of 21 weeks missed with conservative management) of displaced midshaft fractures.[41] For patients who participate in contact sports, the investigators recommend at least 6 weeks of no contact after fixation. If the removal of hardware is desired by the athlete, this should be done after the season has ended to limit the risk of refracture after initial implant removal. Return to sport for nonoperatively treated clavicles is recommended only after union is clearly seen on radiographs, and the athlete has no pain along the clavicle. Depending on the fracture type and patient's desired activities, that is, high-level contact sports, this could be longer than 12 weeks if radiographic union is not proven. Athletes may return to lower extremity training and cardio conditioning during the early postoperative period to allow for fitness maintenance. In addition to the physical benefits of continued training, encouragement of lower extremity work outs, cross-training, and continued team involvement provides the athlete connection and psychological benefits, allowing them to return to play with more mental preparedness and less effects on quality of life that are associated with an injured mentality.

CASE STUDY: RECURRENT CLAVICLE FRACTURE AFTER NONOPERATIVE TREATMENT

Presentation

We present a case of an 18-year-old high school football player, running back, who presented to the author's clinic 5 weeks after sustaining a mildly displaced midshaft clavicle fracture. He had been treated with nonoperative management at outside facility and presented to clinic for a second opinion. There were no concerning neurovascular or skin findings on examination, and his pain was improving. Radiographs showed early bridging callus formation, mild deformity, and a clearly visible fracture line (**Fig. 5**). The patient reported that he had no pain and was eager to return to play.

As he showed signs of healing with mild deformity and no concerning findings on examination, the decision was made to continue with nonoperative management. At

Fig. 5. Case: Presenting radiographs 5 weeks after initial injury.

12 weeks following his initial injury, he returned to clinic for routine follow-up. He reported no pain and on questioning, he admitted to pain-free to return to full-weight bench press, contrary to the recommendations of conservative management from the provider. On examination, the fracture site was non-tender and without crepitus or motion. Radiographs showed bridging bone across the deformity (Fig. 6). The patient was cleared to return to contact play after 12 weeks of nonoperative care. On return to play, a contact injury was sustained, and the patient suffered a refracture at the prior site. Subsequent radiographs showed refracture with additional displacement at the fracture site (Fig. 7).

Treatment Options

At this point, a discussion was had with the athlete and his family in regard to treatment options, and surgical treatment was recommended to expedite healing and reduce nonunion and malunion risk. Open reduction and internal fixation with orthogonal dual mini-fragment plating yielded anatomic results (Fig. 8). The athlete subsequently healed the fracture, was able to return to sport, and had no further issues.

Discussion

The duration of nonoperative treatment before return to play must be individualized based on the type of sport, clinical examination, and serial imaging demonstrating healing. Patients returning to high-risk sports may benefit from CT imaging as an additional modality before return to contact play to reduce the risk of refracture. The argument can be made that for athletes whose main goal is to return to sport expeditiously and reliably, operative treatment is the best choice to give them a strong construct and predictable results. Shared decision-making should include discussion of risk of refracture with nonoperative treatment, risks of surgical treatment, and reduced time to return to play with surgical treatment.

Fig. 6. Case: Radiographic follow-up 12 weeks after initial injury.

Fig. 7. Case: Radiographs with refracture after return to play.

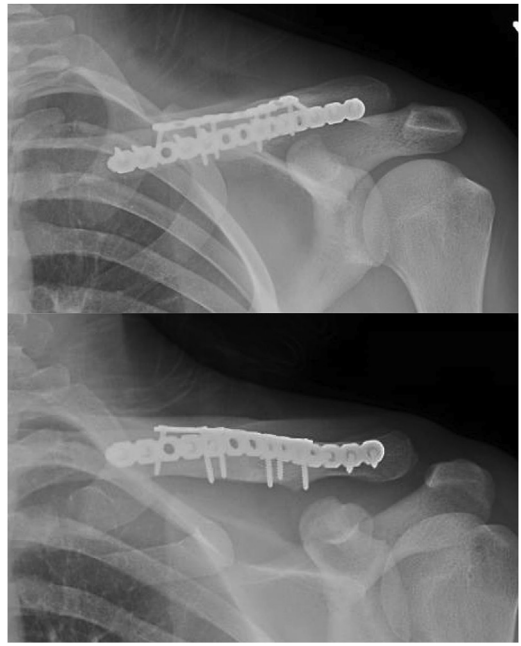

Fig. 8. Status post dual mini-fragment plating with healing.

SUMMARY

The recent literature has continued to evaluate management options for midshaft clavicle fractures and various outcome data. For fractures that are significantly displaced, operative treatment either with open reduction and plate fixation or with IM fixation has been shown to provide improved functional outcomes, earlier return to work, greater patient-reported satisfaction with appearance, and significantly decreased incidence of nonunion and malunion when compared with conservative treatment without surgery. Return to sport has also been shown to be faster in operatively treated fractures. When considering return to contact sports, even minimally or mildly displaced fractures should be considered for surgical stabilization, as this can have significant benefits for athletes and their training and can protect the original injury site from reinjury. However, as with all surgical management, operative intervention is not without risk that otherwise is avoided with conservative treatment. Although initially more expensive, the opportunity for more time with improved quality-of-life and return to productivity makes operative fixation an attractive option when evaluating cost-effectiveness data. Ultimately, shared decision-making with the patient and their support system combined with understanding patient goals allows the provider to recommend a management option to achieve a satisfactory outcome.

CLINICS CARE POINTS

Pros and cons of operative versus nonoperative treatment of midshaft clavicle fractures

Operative	Nonoperative
Advantages	
Improved short-term function	Avoids complications associated with surgical risk

Earlier return to work and sport	Acceptable and practical option if delayed presentation
Lower rate of malunion and nonunion	Avoids symptomatic hardware
Cost-effective when considering less time lost, of productivity and quality of life (QOL)	
Equivocal improvements in long-term function	Equivocal improvements in long-term function
Disadvantages	
Symptomatic hardware commonly can require secondary surgery for implant removal	Varying cosmetic deformity and shortening
Additional risks of surgery (numbness in supraclavicular nerve distribution, wound healing problems, infection)	Higher rate of malunion and nonunion

DISCLOSURE

The authors have no conflicts of interest to disclose that pertain to this topic.

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