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Cochrane in CORR®: Surgical Versus Conservative Interventions for Treating Fractures of the Middle Third of the Clavicle

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Importance of the Topic

Middle-third clavicle fractures are among the most common upper extremity injuries managed by orthopaedic surgeons [5]. They most frequently result from high-energy or athletic trauma in young males, but they also occur as

insufficiency fractures following low-energy falls in the elderly [11]. Historically, the nonunion rate with conservative management was thought to be less than 1%. Malunion was considered unlikely to influence function, and patients with these injuries were expected to heal uneventfully [10, 15]. A 2009 Cochrane Review [7]

comparing sling immobilization and figure-of-eight bandage treatment found no significant advantage for either method.

Several recent prospective studies reported nonunion rates of 15% to 20% and greater residual weakness, dysfunction, and dissatisfaction in patients with displaced middle-third clavicle

A Note from the Editor-in-Chief: We are pleased to present to readers of Clinical Orthopaedics and Related Research® the next installment of Cochrane in CORR®, a regular feature. In this column, we will identify an abstract originally published in The Cochrane Library that we think is especially important, and Dr. Nathan Evaniew and his colleagues will provide expert perspective on it.

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Cochrane Reviews are regularly updated as new evidence emerges and in response to feedback, and The Cochrane Library (<http://www.thecochranelibrary.com>) should be consulted for the most recent version of the review.

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Cochrane in CORR

fractures that were treated nonoperatively [2, 8]. Symptomatic malunion has been identified as a unique clinical entity with characteristic orthopaedic, neurologic, and cosmetic deficits [13]. Operative treatment with plates and screws or intramedullary devices may lead to higher scores on disease-specific functional outcome instruments, but there are risks for infection, wound breakdown, and hardware irritation requiring subsequent removal [2]. In order to fully inform patients and clinicians about the benefits and harms of treatment, this Cochrane Review considered the results of all published randomized and quasirandomized clinical trials comparing surgical and nonoperative management for displaced or angulated middle third clavicle fractures.

Upon Closer Inspection

Seven of the eight trials reported functional outcomes using either the Constant score or the DASH. The Constant score is a 100-point scoring system in which 35 points are derived from patient self-assessment [3], and the DASH is a 30-item patient-administered instrument divided into physical function, symptoms, and social domains [4]. Neither is validated as a disease-specific outcome measure for patients with clavicle fractures, but they are both commonly used in

studies of upper extremity trauma [17]. This Cochrane Review did not find differences in functional outcomes between the groups treated surgically or nonoperatively.

The search strategy identified all published randomized and quasirandomized controlled trials. Randomization balances the known and unknown determinants of outcome between groups in order to minimize selection bias and differential treatment bias [1]. Quasirandomized methods of allocation such as by hospital chart number, alternation, or day of birth, may lead to exaggerated or inaccurate study results [1]. Of the eight included trials, five did not adequately report their methods of allocation, and four did not describe whether allocation was concealed. Still, the authors included a sensitivity analysis that found no change in the primary pooled estimates of the effect of treatment when the lower-quality trials were excluded.

Take-Home Messages

Given that the majority of displaced middle-third clavicle fractures affect young active males, early return to function is of substantial socioeconomic importance [12]. Most patients in this meta-analysis experienced similar functional outcomes regardless of whether they were treated operatively

or nonoperatively, which contrasts with a similar recent meta-analysis that found marginally superior long-term outcomes with operative treatment [9]. We suspect the no-difference finding in the current Cochrane Review, in contrast to that earlier study [9], can likely be explained by varying definitions of clinical significance and the inclusion of three additional trials. Neither meta-analysis incorporated a validated threshold of clinical importance, but both acknowledged that small statistically significant treatment effects may not be patient-important. The three additional trials had lower rates of symptomatic malunions in their nonoperative groups, which may have relatively improved the pooled functional outcome scores for non-operative treatment in this meta-analysis.

To date, all of the randomized trials have found that 15% to 20% of patients develop nonunion with nonoperative management, and that malunions are common with that approach, in contrast to nearly consistent achievement of union and a low frequency of major complications with operative treatment [9, 14]. Nonetheless, this meta-analysis failed to identify any advantages with operative management using validated functional outcome instruments. There may be some patients who would benefit from surgery. However, it remains unclear whether certain fracture characteristics

Cochrane in CORR

like shortening, comminution, or acute scapular winging caused by translation of the distal fragment (medially, inferiorly, and anteriorly) can reliably predict patient-important functional outcomes following nonoperative management

[6, 13, 16]. Factors such as concomitant polytrauma, functional demands, or cultural responses to pain and disability could potentially influence whether a surgical or nonoperative approach is more likely to result in a satisfied patient.

This Cochrane Review provides critical evidence-based insight into the management of displaced middle-third clavicle fractures, and clinicians must carefully integrate these findings with patient preferences during decision-making.

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Appendix

Surgical versus conservative interventions for treating fractures of the middle third of the clavicle (Review)

Lenza M, Buchbinder R, Johnston RV, Belloti JC, Faloppa F



This is a reprint of a Cochrane review, prepared and maintained by The Cochrane Collaboration and published in *The Cochrane Library* 2013, Issue 6

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Surgical versus conservative interventions for treating fractures of the middle third of the clavicle (Review)
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[Intervention Review]

Surgical versus conservative interventions for treating fractures of the middle third of the clavicle

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ABSTRACT

Background

Clavicle fractures are common, accounting for 2.6% to 4% of all fractures. Eighty per cent of clavicle fractures are located in the middle third of the clavicle. Although treatment of these fractures is usually non-surgical, displaced clavicle fractures may be considered for surgical treatment because of their greater risk of non-union.

Objectives

To assess the effects (benefits and harms) of surgical versus conservative interventions for treating middle third clavicle fractures.

Search methods

We searched the Cochrane Bone, Joint and Muscle Trauma Group Specialised Register (to December 2012), Cochrane Central Register of Controlled Trials (CENTRAL; in *The Cochrane Library* 2012, Issue 11), MEDLINE (1966 to December 2012), EMBASE (1980 to 2012 Week 40), LILACS (1982 to December 2012), and trial registries (December 2012). No language or publication restrictions were applied.

Selection criteria

Randomised and quasi-randomised controlled trials evaluating surgical versus conservative interventions for treating middle third of the clavicle fractures were considered. The primary outcomes were shoulder function or disability, pain and treatment failure (defined as the number of participants who had been given a non-routine secondary surgical intervention (excluding hardware removal) for symptomatic non-union, malunion or other complications).

Data collection and analysis

At least two review authors selected eligible trials, independently assessed risk of bias and cross-checked data. Where appropriate, results of comparable trials were pooled.

Surgical versus conservative interventions for treating fractures of the middle third of the clavicle (Review)

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Main results

We included eight trials involving 555 participants with middle third clavicle fractures. Four studies compared plate fixation with wearing a sling and four studies compared intramedullary fixation with wearing either a sling or a figure-of-eight bandage. Almost all trials had design features that carry a high risk of bias, thus limiting the strength of their findings.

Low-quality evidence from seven trials (429 participants) showed that, compared with conservative treatment, surgical treatment of acute middle third clavicle fractures may not result in a significant improvement in upper arm function at one year of more follow-up: standardised mean difference 0.46, 95% confidence interval (CI) -0.06 to 0.98. This corresponds to an absolute mean improvement of 3.2 points in favour of surgery (0.4 points worse to 7 points improvement) on the 100-point Constant score; this is neither clinically nor statistically significant. Low-quality evidence from seven trials (437 participants) indicates a marginal difference in the incidence of treatment failure between surgery (9/232, 3.9%) and conservative treatment (24/205, 11.7%) (risk ratio 0.38, 95% CI 0.15 to 0.99). However, this was dominated by the results of the largest trial, which had an unusually high number of symptomatic malunions in the conservative treatment group. One trial providing pain results at one-year follow-up found no difference between the two groups. No trials reported on quality of life.

No significant difference between groups was noted in the pooled results for adverse events but separate analyses by type of adverse events showed that wound infection and/or dehiscence (data from three trials) and secondary surgery due to hardware complications (data from five trials) occurred only in the surgical group. Skin and nerve problems were also more common after surgical treatment, although the difference between the two groups was not statistically significant (data from four trials). Conversely, stiffness or restriction of shoulder movement was more common after conservative treatment (data from three trials).

Authors' conclusions

Limited evidence is available from randomised controlled trials on the relative effectiveness of surgical versus conservative treatment for acute middle third clavicle fractures. Treatment options must be chosen on an individual patient basis, after careful consideration of the relative benefits and harms of each intervention and of patient preferences.

PLAIN LANGUAGE SUMMARY

Surgical versus conservative interventions for treating broken collarbones in adolescents and adults

This summary presents what we know from research about the effects of surgery compared with non-surgical (conservative) treatments such as wearing a sling or a figure-of-eight bandage for two to six weeks to treat a fractured (broken) collarbone.

The collarbone, or clavicle, acts as a bridge across the front of the chest to connect the arm and the rib cage. It helps to stabilise the shoulder while allowing the arm to move freely, and provides an area of attachment for muscles, functioning also as part of the musculoskeletal apparatus used in breathing. The collarbone also protects nerves and blood vessels, and plays an important aesthetic role in a person's physical appearance. The most common site of clavicle fracture is the middle third of the clavicle. The injury typically occurs in youths and older adults. It usually results from a fall directly onto the outer side of the shoulder. Most middle third collarbone fractures are treated conservatively. However, outcome can be unsatisfactory for the more serious fractures. Surgical treatment involves putting the bone back in place and, usually, performing internal fixation by using a plate and screws or a metal rod, which is inserted into the inner cavity (medulla) of the clavicle bone.

We included eight randomised trials involving 555 participants with displaced or angulated middle third clavicle fractures. Four studies compared plate fixation with wearing a sling, and four studies compared intramedullary fixation with wearing either a sling or a figure-of-eight bandage. The overall quality of the studies was low.

The review showed that surgery may not improve upper arm function or pain one to two years later but may slightly reduce the number of fractures that did not heal or that healed incorrectly compared with conservative treatment. Quality of life was not reported in the studies. We are uncertain whether surgery or a sling provides better cosmetic results (deformity, asymmetry, or scarring).

Wound infection and opening, and hardware irritation requiring removal of the fixation device occurred only in the surgical group, and skin and nerve problems may be more common after surgical treatment. Conversely, stiffness or restriction of shoulder movement was more common after conservative treatment.

The review concludes that evidence is insufficient to indicate whether surgical or conservative treatment is best for treating displaced middle third collarbone fractures.

Surgical versus conservative interventions for treating fractures of the middle third of the clavicle (Review)
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