Knee Surgery, Sports Traumatology, Arthroscopy
https://doi.org/10.1007/s00167-020-06377-8

SHOULDER

No differences between conservative and surgical management of acromioclavicular joint osteoarthritis: a scoping review

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Received: 19 September 2020 / Accepted: 13 November 2020

Abstract

Purpose To conduct a scoping review to clarify the management of acromioclavicular joint osteoarthritis, as well as to identify any existing gaps in the current knowledge.

Methods Studies were identified by electronic databases (Ovid, Pubmed) from their inception up to April 2nd, 2020. All studies reporting functional outcomes after conservative or surgical treatment of acromioclavicular joint osteoarthritis, either primary or secondary to trauma or distal clavicle osteolysis, were included. Following data were extracted: authors, year of publication, study design (prospective or retrospective), LOE, number of shoulders treated conservatively or surgically, patients' age, OA classification, type of conservative treatment, surgical approach, surgical technique, functional outcomes, complications, revisions, and length of follow-up. Descriptive statistics was used. Quality appraisal was assessed through the Cochrane risk of bias tool for LOE I/II studies, while the MINORS checklist was used for LOE III/IV studies.

Results Nineteen studies were included for a total of 861 shoulders. Mean age of participants was 48.5 ± 7.4 years. Mean follow-up was 43.8 ± 29.9 months. Four studies reported functional results after conservative treatment, whereas 15 studies were focused on surgical management. No studies directly compared conservative and surgical treatment. Seven studies reported a surgical approach after failure of previous conservative treatment. All studies reported functional improvement and pain relief. Complication rate was low. Overall methodological quality of included studies was very low.

Conclusion Conservative and surgical treatments are both effective in acromioclavicular joint osteoarthritis management. However, available data did not allow to establish the superiority of one technique over another.

Level of evidence Level IV.

Keywords Acromioclavicular · Osteoarthritis · Injection · Physical therapy · Distal clavicle excision

Introduction

Osteoarthritis (OA) is one of the most common cause of disorder of the acromioclavicular (AC) joint in adult patients [11], sometimes resulting in pain and physical limitations

Electronic supplementary material The online version of this article (https://doi.org/10.1007/s00167-020-06377-8) contains supplementary material, which is available to authorized users.

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Published online: 02 January 2021

with overhead and cross-body movements. As a matter of facts, it develops as a consequence of constant stress on the joint, often in people who perform repeated overhead lifting activities [6]. Diagnosis is mainly clinical, corroborated by typical radiographs and MRI findings, such as inferior osteophytes and joint space narrowing [1]. It is also often associated with distal clavicular osteolysis [3]. Although frequently overlooked [35], the prevalence of AC joint OA on MRI has been reported to be as high as 68% in patients aged 30 years or less, and up to 93% in patients older than 30 years [11, 44]. However, most of the time it is asymptomatic or causes mild localised discomfort, becoming severe in only 5% of cases, without significant difference between the two sexes [44].

AC joint OA often coexists with other shoulder pathologies such as subacromial impingement and rotator cuff tears [46], thus making its treatment algorithm even more debatable.

While the initial treatment is supposed to be conservative especially when AC joint pain seems to be isolated, a room for a surgical option is still open either way as a first line option or after failure of conservative treatment, regardless the presence of concurrent shoulder pathologies. The mainstay of conservative treatment is composed of: intra-articular injections, physical therapy, activity modifications and non-anti-inflammatory drugs (NSAIDs). From the surgical standpoint, the distal clavicle excision (DCE) represent the final solution [28].

Looking deeper into the current literature on this topic [8, 20], the best treatment option to manage isolated AC joint OA has not been clarified yet.

The purpose of the present study was to conduct a scoping review to systematically map the research done in this area, as well as to identify any existing gaps in the current knowledge.

Materials and methods

A scoping review was carried out according to the PRISMA (Preferred Reporting Items for Systematic reviews and Meta-Analyses) guidelines adapted for scoping reviews [45].

Literature search

Studies were identified by scanning the main electronic databases (Ovid, PubMed) from their inception to April 2nd, 2020. The search was first applied to MEDLINE through Ovid, and then adapted for PubMed. Search terms were chosen to be unspecific enough to encompass all possibilities for applicable studies. Full search strategies are available in Appendix 1.

All studies reporting functional outcomes after conservative or surgical treatment of AC joint OA, either primary or secondary to trauma or distal clavicle osteolysis, were included in the review (level of evidence, LOE I–IV). The diagnosis of AC joint OA was based on both clinical and radiological findings. On physical examination, patients affected by tenderness to palpation over the AC joint, pain in the AC joint with adduction of the arm across the chest, and/or localised AC discomfort with terminal abduction of the shoulder were considered eligible. Studies were included when also reporting imaging findings suggestive of OA, such as: joint space narrowing, sclerosis of the lateral aspect of the acromion and hypertrophic spurs on the superior and inferior aspects of both the acromial and clavicular sides of the joint [14, 40]. Conservative approach included any combination of non-surgical treatment: physical therapy (rest, activity modification, exercises, massages and manipulation, cryotherapy, heat), NSAIDs, single or multiple local injections of anaesthetic and/or corticosteroids. Surgical treatment included both open and arthroscopic approach.

Only published data on peer review journals were considered. No language restriction was first applied. Titles of journals, names of authors or supporting institutions were not masked at any stage.

Exclusion criteria were: clinical diagnosis of AC joint pain with no imaging, ACJ dislocations, any surgery in which concomitant procedures (rotator cuff repair, capsular shift, and labral repair) were performed, except for subacromial decompression, as it always reported when an arthroscopic indirect approach was chosen. Studies including revision surgery were excluded. Animal studies, biomechanical studies, case reports, technical notes, reviews, expert opinions and editorial pieces were also excluded.

As the functional assessment was the primary outcome, complications and revision rates were also recorded. Any functional outcome measurement reported by each study was included.

Two independent reviewers screened studies for eligibility. A first screening was based on titles and abstracts resulted from the search. Disagreement between the two reviewers was assessed by a third researcher, who took the final decision. All duplicates were excluded from further review process. Selected studies were screened again based on the full text by the same independent two reviewers. Again, any disagreement was judged by a third reviewer or solved by consensus.

A data extraction form was developed on an electronic spreadsheet. The form was tested on five included studies, then reassessed and refined. The following fields were included in the form and, therefore, the following data were extracted from the full text of each included study: authors, year of publication, study design (prospective or retrospective), LOE, number of shoulders treated conservatively or

surgically, patients' age, OA classification, type of conservative treatment, surgical approach, surgical technique, functional outcomes, complications, revisions, and length of follow-up.

Data were extracted by one investigator and cross-checked by another investigator.

When data were unclear or unavailable, no attempt was made to contact authors to obtain more information regarding methodology and findings. During data extraction, references of included articles were cross-checked to search for missed studies.

Quality appraisal

The methodological assessment of included studies was performed by two authors independently. Disagreement were then solved by consensus or third part adjudication.

The Cochrane risk of bias tool [10] was used for LOE I–II studies. Each domain was judged as either, low risk of bias if all requirements were adequately fulfilled, high risk of bias if the requirements were not adequately fulfilled, and as unclear risk of bias if insufficient data for a judgment was provided.

The MINORS checklist was used to evaluate the potential risk of bias, both in comparative and in non-comparative studies, LOE III–IV [42]. The index includes 12 items, 4 of which dedicated only to comparative studies. Each item was scored 0 if not reported, 1 when reported but inadequate, and 2 when reported and adequate. The ideal score was 16 for non-comparative studies and 24 for comparative studies. Studies with a MINORS score ≤ 12 and ≤ 20 for non-comparative and comparative studies, respectively, were considered at high risk of bias.

Statistical analysis

Descriptive statistics was applied to summarise the data, if a pooling was not possible. Comparable outcome data from individual studies were pooled to generate summary outcomes reported as frequency-weighted values (weighted mean and standard deviation). Number of shoulders in individual studies were used to determine the weight of reported outcomes and used to calculate the weighted values.

Results

Study selection

The electronic search resulted in 996 entries. After removing the duplicates, 616 studies remained. Of these, 560 were excluded based on their abstract and 37 additional studies were excluded based on the full-text article. Nineteen studies were finally included in the review [2, 5, 7, 12, 15, 17–19, 21, 23–26, 32–34, 37, 38, 43] (Fig. 1).

Study characteristics

Included studies reported data on 861 shoulders. Age of participants was 48.5 ± 7.4 years (range 19–85 years). The mean length of follow-up was 43.8 ± 29.9 months (range 0.5–192 months).

According to the LOE, only 1 study was level I [17] and 1 was level II [7], 12 studies were level III [12, 15, 18, 23–26, 32–34, 38, 43] and 5 studies were level IV [2, 5, 19, 21, 37].

Four studies [21, 25, 32, 37] reported functional results after conservative treatment, whereas 15 studies [2, 5, 7, 12, 15, 17–19, 23, 24, 26, 33, 34, 38, 43] were focused on surgical management. No studies directly compared conservative and surgical treatments, however, seven studies [5, 7, 17–19, 24, 38] reported a surgical approach after failure of previous conservative treatment.

Most common reported functional scores were: Visual Analogic Scale (VAS) for pain in eight studies, University of California, Los Angeles (UCLA) shoulder rating scale

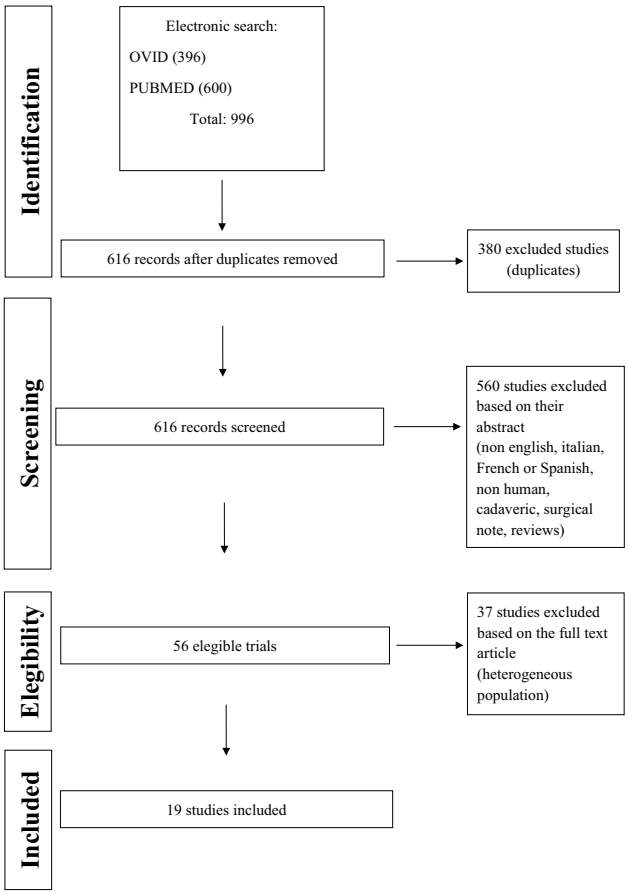

Fig. 1 Study selection based on PRISMA flow chart

[13] in seven studies, and American Shoulder and Elbow Surgeons (ASES) society standardised shoulder assessment form [36] in seven studies, Constant score [9] in three studies, and Disabilities of the Arm, Shoulder and Hand (DASH) score [22] in two studies.

Single-study characteristics, outcomes and complications are reported in detail in Appendix 2.

Conservative management

All included studies [21, 25, 32, 37] reported results after performing intra-articular AC joint injection of corticosteroids combined with local anaesthetic. Three studies [25, 32, 37] performed a single injection, whereas 1 study [21] deemed necessary 3 injections in 19 shoulders out of 25 to solve patients' symptoms. All studies reported functional improvement after treatment. Only Van Riet et al. [37] reported 37 drop out due to persistent pain after 1 months. All patients were offered an arthroscopic surgery. A data pooling was not possible due to the paucity of studies and heterogeneity of outcome measures.

Surgical management

Surgical treatment consisted of DCE, either arthroscopic [2, 7, 12, 17, 18, 23, 24, 26, 33, 38, 43] or open [12, 15, 17, 19, 34, 38]. One study [5] did not report separate results for arthroscopic and open approach. However, although all studies reported functional improvement after treatment, a direct comparison between arthroscopic and open approach was not possible due to insufficient data.

Risk of bias within studies

The methodological quality of the included studies was very low.

The Cochrane risk of bias graph is reported in Fig. 2. LOE I–II studies were both judged at high risk of bias. Detailed results of the MINORS checklist are reported in Table 1. Only two non-comparative studies were not considered at high risk of bias [5, 37]; while all comparative studies [2, 12, 26, 32, 38] were judged negatively.

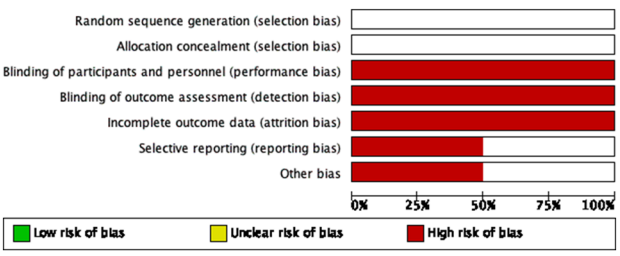

Fig. 2 Cochrane Risk of bias tool for LOE I/II studies

Discussion

The most important finding of the present study was to highlight the lack of knowledge on AC joint OA management. Although AC joint pain, due to osteoarthritic changes, is a common clinical finding, a standard treatment algorithm has not been defined yet. First-line option probably remains the conservative treatment. Included conservative studies only focused on the efficacy of steroids and local anaesthetic injections [21, 25, 32, 37], reporting high rate of success on pain relief, even in the long term [37]. However, some surgical studies also reported a previously failed combination of oral medications, physical therapy and intra-articular injections [5, 7, 17–19, 24, 38]. When a surgical approach was preferred, DCE was surely the procedure of choice. It can be performed either open or arthroscopically. Open resection was first described by Mumford in 1941 [30] and was originally used to treat chronic AC joint instability. Advance in arthroscopic techniques made nowadays the arthroscopic DCE a popular alternative, with the main goal of minimising trauma to the surrounding tissues and allowing a faster recovery. Moreover, arthroscopic resection can either be performed through an indirect (subacromial) or a direct approach [16]. Although still less common in clinical practice, the direct approach is supposed to improve the visualisation of the entire AC joint, to give a direct access to the joint, and to decrease bony debris in the subacromial space [26]. Only two studies [7, 26] focused on a direct comparison between direct and indirect approach. Both reported good functional results. However, while Levine et al. [26] highlighted a higher risk of superior capsule damage resulting in AC joint instability when using a direct approach, Charron et al. [7] suggested that athletes treated with the direct approach improved faster clinically and returned to sports earlier.

To summarise, it can be said that if best conservative option sounds to be a single injection of corticosteroids combined with a local anaesthetic, the situation gets confused when it comes to surgical management. Although DCE is the mainstay of treatment, surgical management can be approached as first-line option, especially when a concurrent rotator cuff tear is diagnosed or, more commonly as a second-line option after failure of conservative treatment in the setting of isolated AC joint OA. Although the DCE showed good functional outcomes and pain relief, rather than focusing on the approach, attention should be probably paid on the two critical steps of the procedure: the amount of bone resected and the preservation of the superior capsule. Even if the complication rate was very low, certainly postoperative residual AC joint instability could be an issue. Based on biomechanical results, DCE

Table 1 MINORS checklist for LOE III/IV studies

Author and year	1 A clearly stated aim	2 Inclusion of consecutive patients	3 Prospective collection of data	4 Endpoints appropriate to the aim of the study	5 Unbiased assessment of the study endpoint	6 Follow-up period appropriate to the aim of the study	7 Loss to follow-up less than 5%	8 Prospective calculation of the study size	9 An adequate control group	10 Contemporary groups	11 Baseline equivalence of groups	12 Adequate statistical analyses	Total
Barber 2006 [2]	1	2	0	1	0	2	1	1	1	2	1	0	12
Blazar 1998 [5]	2	2	0	1	1	1	1	1					9
Duindam 2014 [12]	2	2	0	2	1	1	0	2	2	2	2	2	18
Eskola 1996 [15]	1	1	0	1	0	2	0	2					7
Gartsman 1993 [18]	0	2	0	2	1	1	1	1					8
Gokkus 2016 [19]	2	2	0	2	1	1	0	1					9
Hossain [21]	2	1	1	2	1	2	0	0					9
Kay 1994 [24]	1	2	0	1	1	1	0	1					7
Kay 2003 [23]	2	2	0	2	1	2	0	1					10
Kurta 2005 [25]	1	1	2	1	0	1	0	1					8
Levine 2006 [26]	2	2	0	2	1	2	1	2	2	2	1	2	19
Park 2015 [31]	1	2	0	2	1	1	0	2	1	2	2	1	15
Park 2016 [32]	2	2	0	2	1	1	0	1					9
Petchell 1995 [33]	1	2	0	2	1	1	1	1					9
Robertson 2011 [37]	2	2	0	2	1	1	2	1	2	2	2	2	19
Snyder 1995 [42]	2	2	0	2	1	1	1	2					11
Van Riet 2012 [36]	2	2	2	2	1	2	2	2					15

carries a risk of reduced AC joint stability, as resection of 10 mm or greater of the distal clavicle showed reduced antero-posterior stability of the AC joint [4]. Therefore, a maximum resection of 5 mm is recommended [4]. Moreover, Morikawa et al. recently [29] highlighted the importance of the superior capsule showing that the superior half of the AC ligament complex is the most important for both posterior and rotational stability. From a clinical standpoint, Wang et al. [46] recently conducted a meta-analysis to evaluate the effect of DCE in patients who underwent rotator cuff repair. The authors highlighted that AC joint instability was only detected in patients who underwent DCE; therefore, they clearly stated that DCE is not recommended in patients with rotator cuff tears and concomitant asymptomatic AC joint OA.

Looking at the main results of the present review, the very low methodological quality of included studies did not allow any statistical comparison neither between conservative and surgical management nor between surgical approaches. Unfortunately, most of the studies were underpowered, retrospective, and did not report sufficient data for a proper pooling. Even LOE I–II studies [7, 17] were judged at high risk of bias for improper random sequence generation as well as patient allocation and reporting bias. Although a systematic review and meta-analysis was first planned, a scoping review was than chosen as study design because available data were far away to be sufficient for a data pooling or proper statistical analysis as well as to provide definitive conclusions on the topic [31]. Systematic and scoping reviews mostly shared the same methodology; however, a scoping review is usually preferred when only a "map" of the evidence can be provided, and this seemed to be the case.

Some other recent reviews have been published. Particularly, Hohmann et al. [20] attempted a systematic review and meta-analysis focused on open versus arthroscopic AC joint resection. The authors reported similar functional and clinical outcomes, but also observed a more favourable trend towards open resection. Only four studies were included in the analysis. From a methodological standpoint, analysing together LOE I and III studies is rather questionable. Moreover, the clinical results were obtained putting in the same analysis two different functional scores (ASES and Constant), which although similar in purpose, are not the same. Finally, studies performing a combined DCE and rotator cuff repair were also included. Although previous reviews stated that DCE in the setting of rotator cuff repair showed worse results at 3-month follow-up [27], but it does not influence the outcome at 24-month follow-up [27, 46], rotator cuff repair is surely a confounding factor when focusing on the results of DCE in the setting of AC joint pain. Therefore, studies performing a combined DCE and rotator cuff repair were excluded from the present review.

Chaudhury et al. [8] recently conducted a scoping review on management of AC joint pain including four systematic reviews and two randomised controlled trials. A critical appraisal of included studies was attempted. The CONSORT statement [39] was used for randomised controlled trials, whereas the AMSTAR tool [41] was applied for the systematic reviews. Once again, from a methodological standpoint the choice of putting together randomised controlled trials and systematic reviews was rather singular. Moreover, the CONSORT statement is meant to be a guideline for reporting randomised controlled trials rather than evaluating their quality. Anyhow, what it sounds clear in the present study as well as in previous reviews is that evidence to support one intervention over another is rather limited because high-level studies are lacking.

Strengths of the present review compared to the previous ones mainly stay in the methodology. Strict inclusion criteria and separate quality appraisal tools for LOE I/II and LOE III/IV studies were applied, clearly resuming the current state of the art. As a matter of fact, the knowledge gaps on the topic were revealed. AC joint osteoarthritis is somehow underestimated in clinical practice; however, results of the present paper surely called more attention to the pathology. Based on the results, a single injection of corticosteroids combined with local anaesthetic could probably be considered as the first line option; however, since no direct comparisons between treatments were possible, a definitive conclusion cannot be drawn. Therefore, trials comparing the efficacy of conservative and surgical treatment strategies as well as a definitive treatment algorithm are strongly needed.

Limitations of the present review are mainly related to methodological weaknesses of included studies: heterogeneity of outcome measures and treatment protocols as well as the absence of basic information such as standard deviation in some studies made a data pooling impossible, thus preventing the possibility to establish the superiority of one intervention over another.

Conclusions

Conservative and surgical treatments are both effective in AC joint OA management. However, available data did not allow to establish the superiority of one technique over another; therefore, further high-level studies are warranted.

Funding No funding was received.

Compliance with ethical standards

Conflicts of interest The authors reports no conflicts of interest in the authorship and publication of this article.

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