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Outcomes of Arthroscopic Debridement of the First Carpometacarpal Joint: A Systematic Review

Andrew SHEHOVYCH*, Richard LAWSON*, David J. GRAHAM†, Brahman S. SIVAKUMAR*

*Department of Hand & Peripheral Nerve Surgery, Royal North Shore Hospital, Reserve Rd, St Leonards, Sydney, Australia
†Department of Musculoskeletal Services, Gold Coast University Hospital, Hospital Boulevard, Southport, Gold Coast, Australia

Background: Arthroscopic debridement is increasingly being utilised in patients with early-stage first carpometacarpal joint (FCMCJ) arthritis but has limited supportive evidence. This systematic review evaluates the literature, and reports on outcomes and adverse events following this procedure.

Methods: An electronic literature search of PubMed, Embase, Medline and Cochrane Central, looking for studies describing outcomes following arthroscopic debridement in FCMCJ arthritis, was performed in November 2022. Studies where bony resection or interposition was performed as adjuncts were excluded. Reported outcomes included visual analogue scores (VAS) for pain; Disabilities of Arm, Shoulder and Hand (DASH) scores; pinch and grip strength; complications and re-operations.

Results: Out of a total of 90 studies revealed from the search, only two studies were eligible for inclusion, with a cohort of 34 patients. Following arthroscopic debridement for FCMCJ osteoarthritis, the mean VAS improved by four units, mean DASH by 22 points, grip strength by 4.5 kg and pinch strength by 2 kg at mean follow-up of 18 months. The pooled complication and re-operation rates were 8.8% and 23.5%, respectively.

Conclusions: There is a lack of evidence supporting the utility of FCMCJ arthroscopy and debridement in the management of patients with early arthritis. Although the limited evidence suggests that there may be some therapeutic benefit, further large-scale prospective studies need to be performed before making conclusive recommendations.

Level of Evidence: Level III (Therapeutic)

Keywords: *Carpometacarpal joints, Osteoarthritis, Arthroscopy, Systematic review, Thumb*

INTRODUCTION

The first carpometacarpal joint (FCMCJ) is the second most common site of arthritis in the hand, after the distal interphalangeal joint.[1] Radiographic evidence of FCMCJ arthritis is seen in approximately one in five people, and is more common in women.[1] The FCMCJ is a saddle-shaped biconcavo-convex joint with little bony congruity, affording substantial motion at the expense of stability.[2] The complex lifelong multiplanar forces that the thumb is subjected to, combined with its inherent instability, often result in degeneration at the FCMCJ.[3] Upon failure of nonoperative measures, the goals of surgery are

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Correspondence to: Andrew Shehovych
Department of Hand and Peripheral Nerve Surgery
Royal North Shore Hospital, Reserve Rd
St Leonards, Sydney, Australia
Tel: +61-9463-1822
E-mail: andrew.shehovych@health.nsw.gov.au

to relieve pain, stabilise the joint and retain motion and strength.[4]

Traditional surgical modalities for treatment of early stage FCMCJ arthritis include volar beak ligament reconstruction (utilising autologous graft) and first metacarpal extension osteotomy, with satisfactory short to medium term outcomes.[3,5] However, open surgery for FCMCJ arthritis confers specific risks, including extended time to recovery, FCMCJ subluxation, neurovascular injury and persistent pain.[6] Arthroscopy has become increasingly utilised as a therapeutic modality in the early stages of FMCJ arthritis, and allows joint visualisation, debridement and staging of disease in a minimally invasive fashion. The theoretical advantages of arthroscopic treatment include a shorter recovery period, maintenance of the length of the thumb axis and preservation of the integrity of the joint capsule, which may be important in patients with instability.[2] There has been no review of the literature regarding FCMCJ arthroscopic debridement alone in the treatment of arthritis.[7]

The aim of this systematic review was to evaluate and report on outcomes and adverse events following FCMCJ joint arthroscopy with debridement.

METHODS

Search Strategy: An electronic literature search was performed in November 2022 in accordance with PRISMA guidelines,[8] using the databases PubMed, Embase, Medline and Cochrane Central. Various combinations of the following search terms were used: 'base of thumb', 'first carpometacarpal', 'arthroscopy', 'debridement' and 'arthritis'.

Eligibility Criteria: Articles were eligible for inclusion if they were published in the English language and reported on patient outcomes following FCMCJ arthroscopy, with debridement, osteophyte excision, removal of loose bodies and microfracture as necessary. Studies where any adjunctive bony resection (such as partial or complete trapeziectomy) or interposition was performed were excluded. Case reports and conference abstracts were also not included.

Title and abstract screening were performed following the literature search, prior to full-text review of potentially eligible studies. The references of eligible studies and prior reviews were also screened for further relevant articles. Uncertainty about potential study inclusion was resolved via discussion with the senior author.

Data Extraction and Analysis: Data was extracted from the text, figures, tables and supplementary material of included studies. Data assessed included patient demographics, surgical techniques, outcome measures (including the visual analogue score [VAS] and the Disability of Arm, Shoulder and Hand score [DASH]) and incidence of complications. Simple summary statistics were utilised when appropriate. Due to the low number of studies and heterogenous nature of results, a meta-analysis was not performed.

RESULTS

Search Selection: The search yielded a total of 90 studies (Fig. 1). After removal of duplicates, 53 articles remained for screening of title and abstract. Of these, 12 were selected for full-text review. After full-text review, 10 articles were excluded with reasons listed in Figure 1. Two studies satisfied the criteria for inclusion in this review. Both were non-randomised cohort studies, rendering them level III evidence based on the National Health and Medical Research Council (NHMRC) classification.[9] No additional articles were found while screening the reference list of eligible studies.[10–12]

Study Characteristics: The two studies yielded a final cohort of 34 patients with 34 thumbs undergoing intervention. The mean patient age was 55 years (range: 30–70), with 27 females and 7 males. Patients were followed up for a mean of 18 months (range: 12–24 months). Study characteristics are described in Table 1.

Outcomes: VAS for pain was assessed in both studies, and significantly improved from a mean of 7.4 preoperatively to 3.4 after the intervention ($n = 34$; mean follow-up = 18 months). Similarly, DASH scores improved from a preoperative mean of 57.4 to a 35.4 post-operatively ($n = 34$; mean follow-up = 16 months); however, only one study demonstrated a significant change. Grip strength was only measured in a single study, with Rog et al.[2] reporting an improvement of 4.5 kg at 15 months follow-up, from a mean of 17.7 to 22.2 kg ($p = 0.17$). Pinch strength was also assessed in only one study – Furia[6] noted an improvement of 2 kg at 20 months follow-up, from a mean of 4.2 to 6.2 kg ($p < 0.001$).

Both studies reported on complication and reoperation rates. A pooled complication rate of 8.8% was noted ($n = 34$; mean follow-up = 18 months), and included transient paraesthesia, superficial infection and pin-site infection. The pooled re-operation rate was 23.5% ($n = 34$; mean follow-up = 18 months). Furia[6] reported no further interventions, while Rog et al.[2] noted that 8 of 11 patients underwent another operation due to incomplete symptom relief (refer Table 2).

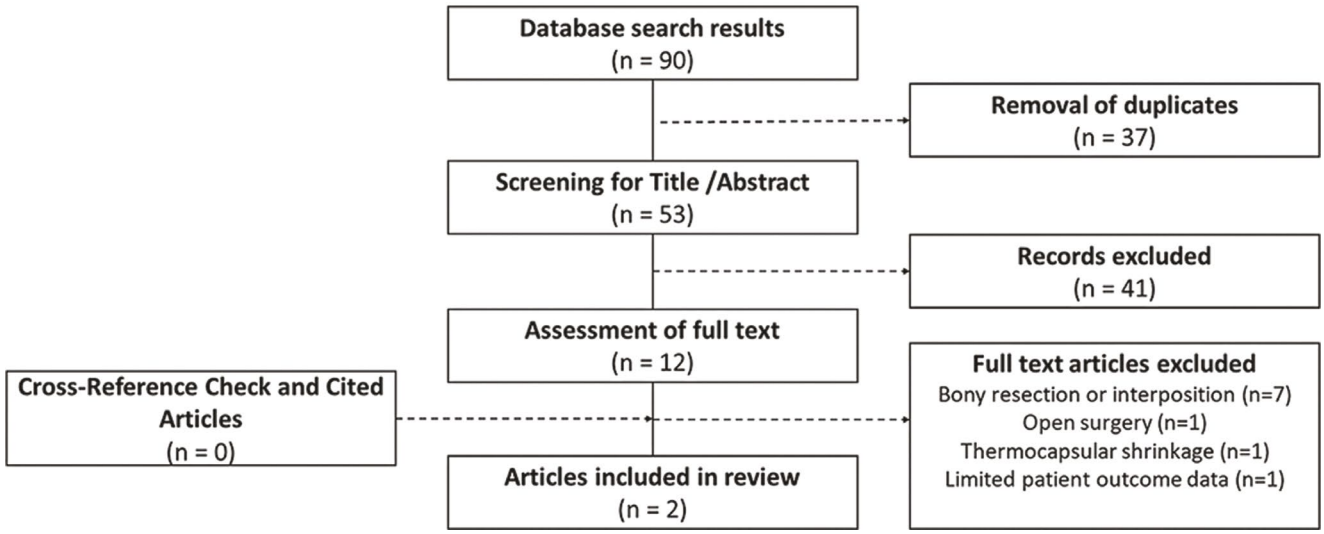

Fig. 1. The PRISMA flowchart detailing search process.

Table 1. Characteristics of Included Studies

Year	Author	Study design	Patients (*n*)	Stage CMC OA*	Arthroscopic techniques	Outcome measurements
2010	Furia[6]	R	23	I, II	D + S	VAS, DASH, pinch strength
2019	Rog et al.[2]	R	11	II, III	D + S + C + M + K	VAS, DASH, grip strength

*According to Eaton classification.

R: Retrospective design; CMC: Carpometacarpal; OA: Osteoarthritis; D: Debridement; S: Synovectomy; C: Cartilage debridement; M: Microfracture; K: Kirschner-wire joint immobilisation; VAS: Visual analogue pain scale; DASH: Disability of Arm, Shoulder and Hand.

Table 2. Complications and Re-operation

Study	Complication	Re-operation
Furia[6] (*n* = 23)	Transient numbness near portal (*n* = 1) Slight erythema and pruritus of the portal (*n* = 1)	0
Rog et al.[2] (*n* = 11)	Pin site infection (*n* = 1)	8*

*Six patients underwent trapeziectomy with LRTI; two patients underwent arthrodesis.

DISCUSSION

Arthroscopic debridement has been historically utilised in arthritic joints, aiming to alleviate pain and improve function. However, recent evidence suggesting a lack of benefit has resulted in arthroscopic debridement being discarded as a therapeutic modality in large joint surgery.[13,14] Despite this, it continues to be utilised in the management of early stage FCMCJ arthritis. Thus, the aim of this study was to assess the efficacy of arthroscopic debridement in this setting, reporting on outcomes and adverse events.

This study finds that there is limited evidence to support the use of arthroscopic debridement in FCMCJ arthritis. Only two studies were eligible for inclusion in this review. One article was excluded due to incomplete data reporting and inconsistent operative technique. In this article, Wong and Ho reported on 76 thumbs treated via arthroscopic debridement and synovectomy, with a small number of patients receiving thermocapsular shrinkage.[15] At the mean follow-up of 4.9 years, she reported improvement in VAS pain scores in a majority of patients, with no improvement in pinch or grip strength and no reported complications. Twenty-four percent of patients went on to undergo further operative intervention.

The current review finds significant improvement in mean VAS by four units and pinch strength by 2 kg (with non-significant improvements in DASH and grip

strength) at a mean follow-up of 18 months. Interpretation of these results is tempered by the fact that a minimal clinically important difference (MCID) for VAS pain scales in thumb pathology has not been calculated. MCIDs for musculoskeletal pain vary between 0.9 (lower back pain) and 3.7 (knee osteoarthritis)[16]; thus, it is likely that the 4-point difference noted in this review is clinically meaningful. The MCID for the DASH questionnaire has been previously calculated at 15 points[17] – thus, if a properly powered study was able to reflect the 22-point difference noted in this review, it would be of clinical relevance.

The calculated complication rate of 8.8% compares favourably with those reported for other surgical interventions in FCMCJ arthritis – 19% for volar beak ligament reconstruction,[18] 28% for first metacarpal extension osteotomy,[19] 7% in simple trapeziectomy[20]; 9%–13% when trapeziectomy is combined with LRTI or suspension[20,21]; 16% for total joint arthroplasty[21] and between 33% and 73% for arthrodesis.[22,23] Additionally, all reported complications were mild in nature, and resulted in no long-term impairment.

The calculated re-operation rate was 23.5% but varied greatly between the two included studies. Furia reported on patients with Eaton stage 1 and 2 arthritis undergoing arthroscopic debridement, finding that none required further intervention. Meanwhile, Rog et al. found that 8 of 11 patients with Eaton stage 2 and 3 arthritis underwent a secondary procedure. Thus, radiographic arthritis stage may affect success and the need for further intervention, and appropriate patient selection is likely key in retaining long-term benefit. An earlier systematic review of all arthroscopic techniques (including interposition) for FCMCJ arthritis reported a pooled re-operation rate of 12% ($n = 106$, 5 studies, mean follow-up 2.5 years).[10]

This review has several limitations. A small patient cohort, with a lack of randomisation and blinding in the underlying studies, limits interpretation of cause and effect. There was some variation between the techniques of debridement utilised. Furia performed a simple debridement and synovectomy, while the patients reported on by Rog et al. underwent a more extensive debridement of diseased trapezial cartilage down to subchondral bone, with microfracture to generate fibrocartilage. These technical variations may have resulted in differences in outcomes – however, both were considered arthroscopic debridement (as opposed to bony resection), and, having satisfied the inclusion criteria, were included in this review. Length of follow-up was limited to the medium term, which in turn limited the assessment of re-operation requirements. Additionally, outcomes reporting was inconsistent, and some measures (such as range of motion) were not reported altogether.

However, this review finds that though the evidence is limited, there may be some short to medium term benefit when utilising arthroscopic debridement for early FCMCJ arthritis. Patient selection is likely key, and further large scale prospective and randomised studies (ideally compared to sham surgery) with long-term follow-up would be beneficial in allowing the formation of firm recommendations.

DECLARATIONS

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