CURRENT CONCEPTS REVIEW

Surgical management of carpometacarpal joint arthritis of the thumb: a current concepts review

John Myburgh,* **Steven Matshidza**

Department of Orthopaedic Surgery, School of Clinical Medicine, Faculty of Health Sciences, University of the Free State, Bloemfontein, South Africa

**Corresponding author: myburghjohn@gmail.com*

Citation: Myburgh J, Matshidza S. Surgical management of carpometacarpal joint arthritis of the thumb: a current concepts review. SA Orthop J. 2025;24(4):199-201. http://dx.doi.org/10.17159/2309-8309/2025/v24n4a7

Editor: Dr Ajmal Ikram, Stellenbosch University, Cape Town, South Africa

Received: June 2025

Accepted: September 2025

Published: November 2025

Copyright: © 2025 Myburgh J. This is an open-access article distributed under the terms of the Creative Commons Attribution Licence, which permits unrestricted use, distribution and reproduction in any medium, provided the original author and source are credited.

Funding: No funding was received for this study.

Conflict of interest: The authors declare they have no conflicts of interest that are directly or indirectly related to the research.

Abstract

The thumb carpometacarpal (CMC) joint is the hand joint second most affected by arthritis. It is significantly more prevalent in females, particularly post-menopausal women. Clinical assessment of the thumb CMC arthritis is enhanced by the arthritic quintet examination, which includes the following five elements: inspection for thenar atrophy, palpation for joint line tenderness, assessment of range of motion, grind test for crepitus and pain, and evaluation of grip and pinch strength. This structured approach improves diagnostic accuracy and ensures standardised evaluation. The diagnosis of CMC joint arthritis is based on a combination of history and clinical examination, supported by radiography. The Eaton and Littler classification and its modified versions remain widely adopted in staging thumb CMC arthritis. The surgical indications depend not solely on the radiological findings but on the clinical symptoms, such as functional deficits and pain. The primary indication for surgery is intolerable pain with minimal response to non-surgical management. Surgery aims to diminish pain and improve function without any complications. High-quality research is lacking, and a recent Cochrane review update failed to show that any operative procedure demonstrated superiority over another in terms of pain, function, patient global assessment, range of movement, or strength. Trapezium-sparing surgical strategies aim to preserve native anatomy while alleviating pain and restoring stability. Denervation of the CMC joint improves pain and function, but there is a lack of information in the literature on reliable long-term results. CMC joint arthroscopic-assisted techniques show improvement in pain, a smaller effect on grip strength, and no effect on pinch strength. A Wilson closing wedge osteotomy of the thumb metacarpal shows pain relief, patient satisfaction, and an increase in both grip and pinch strength. CMC joint arthrodesis indicated in younger patients who perform manual labour has a high non-union rate. Spacers have a high complication rate. The new generation arthroplasty implants have a ten-year survival rate in excess of 90%. Trapeziectomy, with or without tendon interposition, remains one of the most commonly performed operations. Variations include simple trapeziectomy, trapeziectomy with ligament reconstruction, and trapeziectomy with a suspension device (TightRope). Trapeziectomy alone had fewer complications than the other procedures.

Level of evidence: 5

Keywords: carpometacarpal joint, arthritis, surgery, trapeziectomy, denervation, arthroscopy, osteotomy, arthrodesis, spacers, implants

Introduction

Thumb carpometacarpal (CMC) joint arthritis is the second-most affected joint of the hand (after the distal interphalangeal joint of the index finger). It is significantly more prevalent in females, particularly post-menopausal women. Hormonal influences, such as decreased oestrogen levels, contribute to changes in ligament laxity and joint stability. In addition, anatomical differences, including shallower trapezial facets and smaller joint surfaces, predispose females to increased mechanical stress at the thumb base. These factors, combined with repetitive use in daily tasks, explain the higher incidence in women.[1,2]

The diagnosis of CMC joint arthritis is based on a combination of history and clinical examination, supported by radiography.[3] Clinical assessment of the thumb CMC arthritis is enhanced by the arthritic quintet examination, which includes the following five elements: inspection for thenar atrophy, palpation for joint line tenderness, assessment of range of motion, grind test for crepitus and pain, and evaluation of grip and pinch strength. This structured approach improves diagnostic accuracy and ensures standardised evaluation.[4] It should be differentiated from scaphotrapezial trapezoid (STT) joint arthritis, in which the joint margin focal tenderness is 1 cm proximal to the CMC joint.[5]

The Eaton and Littler classification and its modified versions remain widely adopted in staging thumb CMC arthritis. The modified system includes four stages:

- Stage I – articular contours normal; slight widening of joint space on X-ray
- Stage 2 – slight narrowing of joint space; osteophytes ≤ 2 mm; scaphotrapezial joint normal on X-ray
- Stage 3 – marked narrowing of joint space with cysts and

sclerosis; osteophytes > 2 mm; scaphotrapezial joint normal on X-ray
- Stage 4 – stage 3 changes with associated scaphotrapezial joint involvement[6]

It does not correlate with patient-reported symptom severity.[7] The surgical indications depend not only on the radiological findings but on the clinical symptoms, such as functional deficits and pain.[8] The primary indication for surgery is intolerable pain with minimal response to non-surgical management. Surgery aims to diminish pain and improve function without any complications.[1,3]

Operative management

High-quality research is lacking, and a Cochrane review update failed to show that any operative procedure demonstrated superiority over another in terms of pain, function, patient global assessment, range of movement or strength.[3]

Trapezium-sparing procedures

Trapezium-sparing surgical strategies aim to preserve native anatomy while alleviating pain and restoring stability. These include denervation of the thumb carpometacarpal joint (TCMJ), TCMJ arthroscopic-assisted techniques, first metacarpal extension osteotomy, TCMJ arthrodesis, spacers and implant arthroplasty.

Denervation of the thumb carpometacarpal joint

Denervation of the TMCJ with or without joint lavage and capsular imbrication promoted improvement in pain and function with an average complication rate of 11.4% (range 0–27.5%) for earlier stages of thumb CMC osteoarthritis (OA). However, the literature lacks information on reliable long-term results.[9-11]

TCMJ arthroscopic-assisted techniques

The various techniques include debridement with or without capsular shrinkage, partial trapeziectomy, and interposition of either a tendon or an implant. These techniques show improvement in pain, a smaller effect on grip strength, and no effect on pinch strength. The overall complication rate is reported to be 4%.[12,13] It is a reasonable option for younger patients with earlier stages of thumb CMC OA. STT joint arthritis was inconsistently considered a contraindication.[12]

First metacarpal extension osteotomy

A Wilson closing wedge osteotomy of the thumb metacarpal is a treatment option in younger patients with stages 1 and 2 OA. Studies showed 80% pain relief, 75–92% patient satisfaction, 8.5 kg increase in grip strength, and 3 kg in pinch strength.[3,14-16] The osteotomy changes the angle of the saddle-back structure of the joint. This reduces the load through the dorsal trapeziometacarpal joint and increases the stability of the dorsal CMC joint ligament.[14]

Possible complication includes non-union, persistent pain due to unrecognised CMC or pantrapezial disease, radial sensory nerve injury, persistent instability where there is severe longitudinal collapse, and/or global instability.

TCMJ arthrodesis

TCMJ arthrodesis with or without bone grafting is indicated in younger patients who perform manual labour and require good thumb column stability and long-lasting results. It is contraindicated in peritrapezial OA.[16] There is no significant difference in pain and patient satisfaction levels between trapeziectomy, arthrodesis and implant arthroplasty. Some of the side-effects are functional limitations, reduced mobility, a high non-union rate, and the possibility of patients developing STT or metacarpophalangeal (MCP) joint OA.[17]

Spacers

Silicon spacers have a high breakage rate and are associated with dislocation and silicone synovitis. Modern spacers dislocate, causing a foreign-body reaction and a high explantation rate.[2] A 12-month follow-up of two case series using acellular human dermal matrix had no adverse effects.[3]

Implant arthroplasty

With the new generation implants, which combine a cementless and modular ball-in-socket implant with a metal-on-polyethylene friction couple, a ten-year survival rate higher than 90% can be expected.[17-19] This comes close to the ten-year survival rate of 97% for uncemented primary total hip arthroplasty.[20]

The advantages of a thumb CMC total joint replacement are faster recovery, restoration of thumb length, alignment and cosmesis, prevention of midcarpal wrist instability, prevention of further degeneration of the STT joint, no need to harvest a donor tendon, and higher patient satisfaction. In addition, it preserves the option for a secondary trapeziectomy.[17]

The disadvantages include a technically demanding procedure, a higher complication rate, and increased cost. Most complications are the consequence of poor planning or poor surgical technique, and can be avoided. Some of the complications are fracture of the trapezium, dislocation, early loosening, polyethene wear, overlengthening, which may cause restricted motion, tendon imbalance, and persistent pain.[17]

Trapezium-resection procedures

Trapeziectomy, with or without tendon interposition, remains one of the most commonly performed operations. Variations include simple trapeziectomy, trapeziectomy with ligament reconstruction, and trapeziectomy with a suspension device (TightRope).

Simple trapeziectomy

A Cochrane review found that a simple trapeziectomy was as beneficial in terms of pain relief and function as trapeziectomy and tendon interposition, but with fewer complications. It is technically straightforward, quick, and inexpensive compared to alternative procedures.[3,21,22]

The main complication with this procedure is the deterioration of pinch strength due to the proximal migration of the first metacarpal.[21] Mechanical pain related to instability or bone impingement has been reported in two to three patients at least 20 years after the initial successful simple trapeziectomy.[3]

Trapeziectomy with ligament reconstruction and tendon interposition

Eaton and Littler used the flexor carpi radialis to reconstruct the ligament.[23] Froimson used it for tendon interposition,[24] and Burton and Pellegrini described a combined procedure with ligament reconstruction and tendon interposition (LRTI).[25] Thompson introduced trapeziectomy with an abductor pollicis longus tendon suspension arthroplasty.[26] The Weilby procedure consists of a trapeziectomy and suture suspensionplasty.[27]

The most common procedure used in the United States is a trapeziectomy with LRTI for trapeziometacarpal joint arthritis.[28,29] Various randomised controlled studies have failed to show that this procedure results in quicker recovery or improves either the short- or long-term outcome compared to a simple trapeziectomy.[3]

Complications with a trapeziectomy with ligament reconstruction procedures include a significantly weaker pinch strength, poorer functionality, and flexor carpi radialis tendinitis.[3,21,30] The Weilby procedure avoids the morbidity of tendon harvest, but studies have shown problems with residual pain and late complications.[31]

Trapeziectomy with suspension device

A newer variation of trapeziectomy involves the use of a suture-button suspension device, such as the TightRope system. This technique stabilises the first metacarpal to the second metacarpal following removal of the trapezium, thereby maintaining thumb column height and minimising subsidence. Recent studies have demonstrated favourable outcomes, including pain relief and preservation of pinch strength, with the added advantage of reduced donor-site morbidity compared to tendon harvest. However, complications such as implant failure or metacarpal fracture, though uncommon, remain considerations.[32,33]

Conclusion

Thumb CMC OA is a common condition. The primary indication for surgery is intolerable pain with minimal response to non-surgical management. Denervation of the TCMJ and first metacarpal extension osteotomy are surgical procedures used for early thumb carpometacarpal OA. TCMJ arthrodesis is indicated in young manual labourers but has a high non-union rate. A simple trapeziectomy has fewer complications. The most common procedure used in the United States is a trapeziectomy with LRTI. The new generation arthroplasty implants have a ten-year survival rate in excess of 90%.

Acknowledgements

Dr Daleen Struwig, medical writer/editor, Faculty of Health Sciences, University of the Free State, for technical and editorial preparation of the article.

Ethics statement

The authors declare that this submission is in accordance with the principles laid down by the Responsible Research Publication Position Statements as developed at the 2nd World Conference on Research Integrity in Singapore, 2010. As this is a literature review article, ethical approval was not required. No original procedures involving human participants were performed. Accordingly, informed consent from patients was not applicable. The work has been conducted in accordance with the ethical standards of responsible institutional and national committees, and with the principles outlined in the Helsinki Declaration of 1975, as revised in 2008.

Declaration

The authors declare authorship of this article and that they have followed sound scientific research practice. This research is original and does not transgress plagiarism policies.

Author contributions

JM: conducted the literature search, selected articles, drafted the manuscript, approved the final version of the manuscript

SM: critically reviewed the manuscript, suggested revisions, approved the final version of the manuscript

ORCID

Myburgh J https://orcid.org/0000-0003-1659-7924

Matshidza S https://orcid.org/0000-0003-0128-0385

References

1. Weiss AP, Goodman AD. Thumb basal joint arthritis. J Am Acad Orthop Surg. 2018;26(16):562-71. https://doi.org/10.5435/JAAOS-D-17-00374
2. Smeraglia F, Mariconda M, Balato G, et al. Dubious space for Artelon joint resurfacing for basal thumb (trapeziometacarpal joint) osteoarthritis: a systematic review. Br Med Bull. 2018;126(1):79-84. https://doi.org/10.1093/bmb/ldy012
3. Baker RHJ, Al-Shukri J, Davis TRC. Evidence-based medicine: thumb basal joint arthritis. Plast Reconstr Surg. 2017;139(1):256e-66e. https://doi.org/10.1097/PRS.0000000000002858
4. Choa RM, Parvizi N, Giele HP. A prospective case-control study to compare the sensitivity and specificity of the grind and traction-shift (subluxation-relocation) clinical tests in osteoarthritis of the thumb carpometacarpal joint. J Hand Surg Eur Vol. 2014;39(3):282-5. https://doi.org/10.1177/1753193413508714
5. Catalano LW 3rd, Ryan DJ, Barron OA, Glickel SZ. Surgical management of scaphotrapeziotrapezoid arthritis. J Am Acad Orthop Surg. 2020;28(6):221-8. https://doi.org/10.5435/JAAOS-D-19-00539
6. Shridhar V, Williams S. Basal thumb arthritis: treatment strategies for pain management. Aust J Gen Pract. 2020;49(11):702-7. https://doi.org/10.31128/AJGP-06-20-5504
7. Hoffler CE 2nd, Matzon JL, Lutsky KF, et al. Radiographic stage does not correlate with symptom severity in thumb basilar joint osteoarthritis. J Am Acad Orthop Surg. 2015;23(12):778-82. https://doi.org/10.5435/JAAOS-D-15-00329
8. Allieu Y. Anatomically based radiological classification of thumb basal joint arthritis. Hand Surg Rehabil. 2021;40(S):S15-20. https://doi.org/10.1016/j.hansur.2020.04.013
9. Giesen T, Klein HJ, Franchi A, et al. Thumb carpometacarpal joint denervation for primary osteoarthritis: a prospective study of 31 thumbs. Hand Surg Rehabil. 2017;36(3):192-7. https://doi.org/10.1016/j.hansur.2017.01.007
10. Wu EJ, Fossum BW, Vander Voort W, et al. Surgeon preferences in the treatment of thumb carpometacarpal osteoarthritis. World J Orthop. 2024;15(5):435-43. https://doi.org/10.5312/wjo.v15.i5.435
11. Ehrl D, Erne HC, Broer PN, et al. Outcomes of denervation, joint lavage and capsular imbrication for painful thumb carpometacarpal joint osteoarthritis. J Hand Surg Eur Vol. 2016;41(9):904-9. https://doi.org/10.1177/1753193416632149
12. Wilkens SC, Bargon CA, Mohamadi A, et al. A systematic review and meta-analysis of arthroscopic assisted techniques for thumb carpometacarpal joint osteoarthritis. J Hand Surg Eur Vol. 2018;43(10):1098-105. https://doi.org/10.1177/1753193418757122
13. Slutsky DJ. The role of arthroscopy in trapeziometacarpal arthritis. Clin Orthop Relat Res. 2014;472(4):1173-83. https://doi.org/10.1007/s11999-012-2673-0
14. Hazewinkel MHJ, Digiovanni P, Miyamura S, et al. Patient-reported outcomes after surgical treatment of early osteoarthritis of the first carpometacarpal joint. Hand (NY). 2023;18(8):1275-83. https://doi.org/10.1177/15589447221093669
15. Tomaino MM. Basal metacarpal osteotomy for osteoarthritis of the thumb. J Hand Surg. 2011;36(6):1076-9. https://doi.org/10.1016/j.jhsa.2011.03.035
16. Chou FH, Irrgang JJ, Goitz RJ. Long-term follow-up of first metacarpal extension osteotomy for early CMC arthritis. Hand (NY). 2014;9(4):478-83. https://doi.org/10.1007/s11552-014-9632-z
17. Amadei F. Trapeziometacarpal arthrodesis. Hand Surg Rehabil. 2021;40(S):S102-105. https://doi.org/10.1016/j.hansur.2020.09.010
18. Duerinckx J, Verstreken F. Total joint replacement for osteoarthritis of the carpometacarpal joint of the thumb: why and how? EFORT Open Rev. 2022;7(6):349-55. https://doi.org/10.1530/EOR-22-0027
19. Martin-Ferrero M, Simón-Pérez C, Coco-Martín MB, et al. Trapeziometacarpal total joint arthroplasty for osteoarthritis: 199 patients with a minimum of 10 years follow-up. J Hand Surg Eur Vol. 2020;45(5):443-51. https://doi.org/10.1177/1753193419871660
20. Tchurukdichian A, Guillier D, Moris V, et al. Results of 110 IVORY® prostheses for trapeziometacarpal osteoarthritis with a minimum follow-up of 10 years. J Hand Surg Eur Vol. 2020;45(5):458-64. https://doi.org/10.1177/1753193419899843
21. Chaudhry H, MacDonald SJ, Howard JL, et al. Clinical outcomes and midterm survivorship of an uncemented primary total hip arthroplasty system. J Arthroplasty. 2020;35(6):1662-66. https://doi.org/10.1016/j.arth.2020.01.063
22. Schmidt I. Treatment options for thumb carpometacarpal joint osteoarthritis with an update to the ArpeTM prosthesis. Recent Adv Arthroplasty. 2018;2(2):55-63. Available from: https://www.semanticscholar.org/paper/Treatment-Options-for-Thumb-Carpometacarpal-Joint-Schmidt/a3bf4c4026c6169f7041832e99fc9b5db76525bb (accessed 12 May 2025).
23. Eaton RG, Littler JW. Ligament reconstruction for the painful thumb carpometacarpal joint. J Bone Joint Surg Am. 1973;55(8):1655-66.
24. Froimson AI. Painful thumb–carpometacarpal joint: partial trapeziectomy with tendon interposition. Orthop Clin North Am. 1970;1(2):279-89.
25. Burton RI, Pellegrini VD Jr. Surgical management of basal joint arthritis of the thumb. Part II: Ligament reconstruction with tendon interposition arthroplasty. J Hand Surg Am. 1986;11(3):324-32.
26. Thompson JS. Suspensionplasty for the treatment of arthritis of the carpometacarpal joint of the thumb. J Hand Surg Am. 1986;11(6):820-24.
27. Weilby A. Tendon interposition arthroplasty of the first carpometacarpal joint. J Hand Surg Br. 1988;13(4):421-25.
28. Putnam MD, Meyer NJ, Baker D, et al. Trapezium excision and suture suspensionplasty (TESS) for the treatment of thumb carpometacarpal arthritis. Tech Hand Up Extrem Surg. 2014;18(2):102-108. https://doi.org/10.1097/BTH.0000000000000046
29. Wolf JM, Delaronde S. Current trends in nonoperative and operative treatment of trapeziometacarpal osteoarthritis: a survey of US hand surgeons. J Hand Surg Am. 2011;37(1):77-82. https://doi.org/10.1016/j.jhsa.2011.10.010
30. Teo I, Riley N. Thumb carpometacarpal joint osteoarthritis: is there a role for denervation? A systematic review. J Plast Reconstr Aesthet Surg. 2020;73(7):1208-20. https://doi.org/10.1016/j.bjps.2020.02.043
31. Wajon A, Carr E, Edmunds I, Ada L. Surgery for thumb (trapeziometacarpal joint) osteoarthritis. Cochrane Database Syst Rev. 2009;7(4):CD004631. https://doi.org/10.1002/14651858.CD004631.pub3
32. Kirchberger MC, Schnabl SM, Bruckner T, et al. Functionality of middle-aged women after resection-interposition arthroplasty of the trapeziometacarpal joint in comparison to a healthy control group. Arch Orthop Trauma Surg. 2014;134(5):735-39. https://doi.org/10.1007/s00402-014-1966-z
33. Roman PB, Linnell JD, Moore JB. Trapeziectomy arthroplasty with suture suspension: short- to medium-term outcomes from a single-surgeon experience. J Hand Surg Am. 2016;41(1):34-39.e1. https://doi.org/10.1016/j.jhsa.2015.10.010