The American Journal of Medical Sciences and Pharmaceutical Research
ISSN 2689-1026 | Open Access

TYPE Original Research
PAGE NO. 157-164
DOI 10.37547/tajmspr/Volume07Issue03-16A

Check for updates

Surgical treatment for correction of rhizarthrosis: Systematic review with meta-analysis

Bianca Gabriella de Oliveira
Médica pela Universidade Salvador-UNIFACS, Salvador, BA, Brasil.

Andrey Santana Silva
Resident Doctor of Orthopedics and Traumatology at the Orthopedic Hospital of the State of Bahia, Salvador, BA, Brazil.

Marina Lopes Cançado Campos
Orthopedic Surgeon and Traumatologist at Hospital Felício Rocho, Belo Horizonte, MG, Brazil.

Flávio Henrique Loyola Santos
Orthopedic Surgeon and Traumatologist at the Royal Portuguese Hospital of Pernambuco, Pernambuco, PE.

Arthur Vieira de Moraes Won-Held
Orthopedic Surgeon and Traumatologist at Hospital Santa Teresa, Petrópolis, RJ, Brazil.

OPEN ACCESS

SUBMITED 22 January 2025
ACCEPTED 29 February 2025
PUBLISHED 25 March 2025
VOLUME Vol.07 Issue03 2025

CITATION

Bianca Gabriella de Oliveira, Andrey Santana Silva, Marina Lopes Cançado Campos, Flávio Henrique Loyola Santos, & Arthur Vieira de Moraes Won-Held. (2025). Surgical treatment for correction of rhizarthrosis: Systematic review with meta-analysis. The American Journal of Medical Sciences and PharmaceuticalResearch,7(03),157–164. https://doi.org/10.37547/tajmspr/Volume07Issue03-16A

This study presents no conflicts of interest.

This study did not receive any financial support from public, commercial, or non-profit sources.

Abstract:

Objectives: to evaluate the results obtained from the arthroplasty, arthrodesis and trapeziectomy with tendon interposition techniques used to treat rhizarthrosis.

Methodology: This is a systematic review with meta-analysis carried out by searching the electronic databases PubMed/MEDLINE and Cochrane Library without language restriction for publications up to June 2024 to analyze the surgical treatment of arthritis of the first carpometacarpal joint.

Results: 289 patients were included, of whom 63 underwent trapeziectomy with tendon interposition, 70 underwent arthrodesis and 156 underwent arthroplasty. Arthroplasty showed good long-term

results when compared to the most commonly used techniques for correcting rhizarthrosis. Trapeziectomy showed no significant improvement in strength or functionality when compared to arthrodesis, and was also more associated with cases of joint reduction failure and consequent re-intervention.

Conclusion: No surgical technique is superior to another in terms of pain, physical function and the patient's overall assessment.

Keywords: Osteoarthritis; Hand; Metacarpal Bones; Orthopedic Procedures

INTRODUCTION:

The inflammatory process of the first carpometacarpal joint (between the trapezium and the first metacarpal), called rhizarthrosis, is common in patients over 60 years of age, and its incidence and diagnosis have increased with the aging population. It results from the degeneration of the articular cartilage, mainly in women due to hormonal factors, but it is also prevalent in the male population and has diverse etiologies, depending on the range of motion and the load to which this joint is subjected in daily activities. [1]

The diagnosis is predominantly clinical and, when necessary, evaluation and submission to complementary exams such as radiography, tomography and MRI. Regarding treatment, it is based on the patient's response to conservative intervention, since initially it is the majority of choice. However, in patient's refractory to this approach, several surgical procedure techniques are described in the literature and bring effectiveness: trapeziectomy with or without interposition, arthroplasty with interposition implant or resurfacing, fusion (arthrodesis) and replacement arthroplasty (prosthesis). [2]

Compared to invasive options, trapeziectomy is considered the gold standard and provides good pain response, functionality and loss of residual strength. Regarding the trapeziometacarpal prosthesis, the durability of the implant is one of the main concerns, however, performing it does not compromise any other future surgical option. Secondary trapeziectomy after arthroplasty generally does not differ from the results of primary trapeziectomy and survival is 95.6% at four years in a first prosthesis model tested, 93% and 85% in two other models and 68% after five years in a fourth model evaluated. 2,3,4,5,6,7

Arthroplasty has proven to be an effective alternative if correctly indicated and performed. It can be concluded that no procedure is superior in the long term in terms of pain, physical function, assessment, range of motion or strength. In other words, the superiority of arthroplasty over other surgical procedures has not yet been confirmed to date. 2,3,4 Therefore, the objective of this study is to evaluate the results obtained through the techniques of arthroplasty, trapeziometacarpal arthrodesis (TMA) and trapeziectomy with tendon interposition (LRTI) used for the treatment of rhizarthrosis.

METHODOLOGY

Systematic review under registration in the prosperous CRD42024538614 carried out according to the recommendations of Khan et al considering: framing the questions for a literature review; identifying relevant research; assessing the quality of the studies; summarizing the evidence and interpreting the results. The research questions were defined by the PICOS model according to the PRISMA guidelines, as follows:

1.Population: Patients with arthritis of the first carpometacarpal joint (Rhizarthrosis)

2.Intervention: Surgical treatment

3.Comparator: Comparison between surgical techniques for correction of arthritis of the first carpometacarpal joint .

4.Results: There was no superiority between the techniques in terms of pain, physical function, or overall patient assessment.

5.Study design: Randomized controlled designs, counterbalanced crossovers, or repeated measures designs that investigated the effects of recovery interval.

Database research carried out from March to May 2024, records from 3 electronic databases were analyzed (Pubmed, Virtual Health Library BVS, Ebsco Sportdiscus). The keywords were obtained using the PubMed "mesh terms" query. The search was conducted with the terms in English for: arthritis of the first carpometacarpal joint with combination "AND" orthopedic procedures.

Study selection

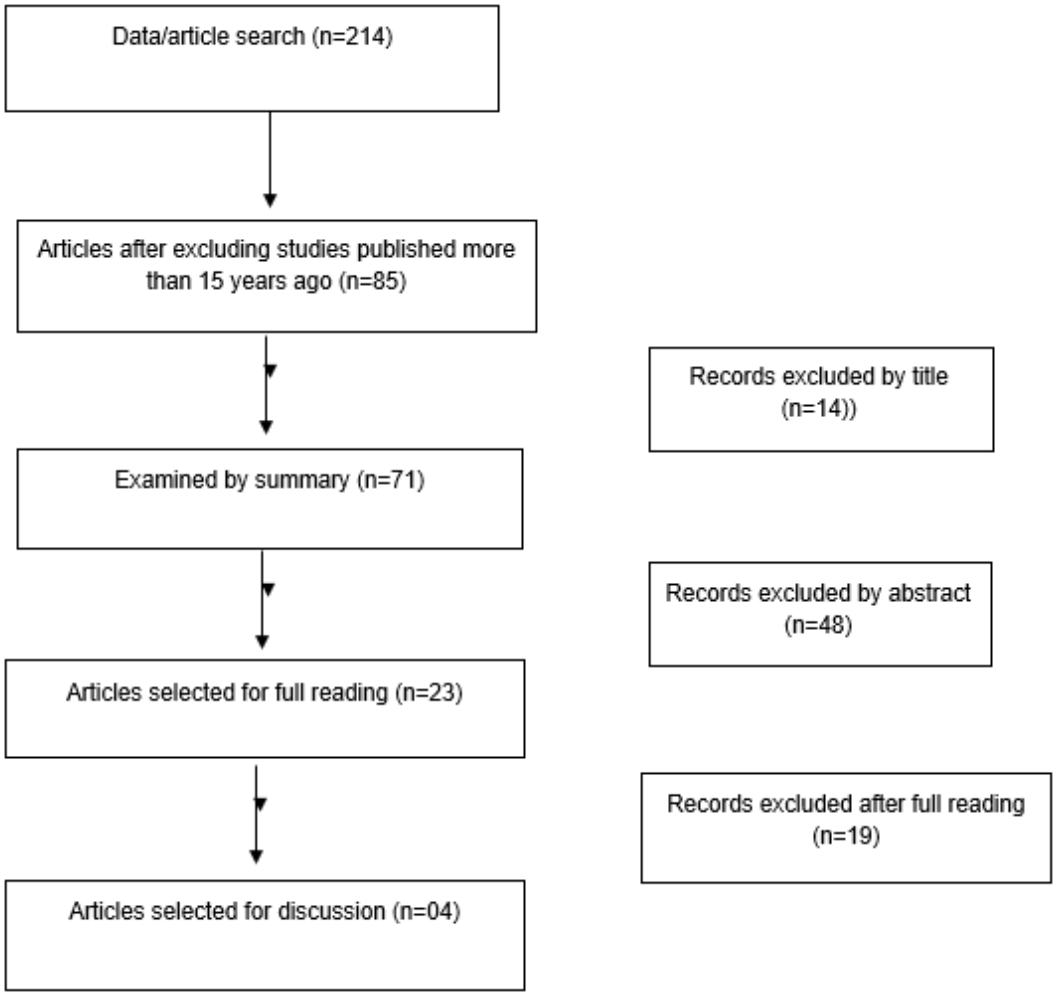
We included peer-reviewed, published, randomized placebo-controlled clinical trials (RCTs) with full articles investigating the efficacy of surgical techniques in the treatment of rhizarthrosis. Taking into account the diagnosis of osteoarthritis of the first carpometacarpal joint with one of the following criteria: (1) studies analyzing arthrodesis, arthroplasty, and/or trapeziectomy techniques with tendon interposition (2) patients over 18 years of age (3) clinically and/or

radiologically confirmed. Clinical trials were required to report at least one of the following primary outcomes: pain or physical function. Secondary outcomes included adverse events (AEs), radiographic joint space width/narrowing, stiffness, analgesic use, and quality of life.

RESULTS

A total of 214 articles were superficially selected, and after excluding those published more than 15 years ago, 85 remained. Analysis of the titles and abstracts resulted in the removal of 62 more studies, leaving 23 for full reading. After analyzing the articles, those that evaluated other types of treatment, such as conservative treatment, for rhizarthrosis were excluded. In the end, four articles that fit the proposed methodology were selected for construction of the work (Figure 1).

Figure 1- PRISMA protocol and study selection



Source: Own authorship (2024)

The four articles analyzed correspond to patients diagnosed with trapeziometacarpal osteoarthritis (rhizarthrosis) who underwent surgical treatment. Two articles compared the techniques of arthrodesis and trapeziectomy with tendon interposition, one analyzed arthroplasty, and the other article compared the techniques of arthrodesis, arthroplasty, and trapeziectomy with tendon interposition. A total of 289 patients were included, of whom 63 underwent trapeziectomy with tendon interposition, 70 underwent arthrodesis, and 156 underwent arthroplasty.

Figure 2 shows the Eaton and Littler Classification. 10,11,12,13

Figure 2- Eaton and Littler classification.

Stage 1 - Normal radiograph or slight increase in space
Stage 2 - Flattening of the articular cartilage, osteophytes or free body smaller than 2 mm. Normal scaphotrapezoid joint.
Stage 3 - Joint impingement, subchondral sclerosis, osteophytes larger than 2 mm. Normal scaphotrapezoid joint.
Stage 4 - Involvement of both trapeziometacarpal and scaphotrapezoid joints

Table 1 represents the Eaton and Littler classification of the patients included in the study. 10,11,12,13

Table 1- Eaton and Littler classification of patients included in the study.

Study	Stage I	Stage II	Stage III	Stage IV	Unknown
Vermeulen et al.	0	34.2%	65%	0	0
Pritchett et al.	0	50%	50%	0	0
Hippensteel et al.	0	14%	64%	7.4%	14.6%
Raven et al.	5.2%	47.3%	36.5%	11%	0

Table 2 presents the postoperative DASH score of surgical procedures for the treatment of osteoarthritis of the trapeziometacarpal joint. 10,11,12,13

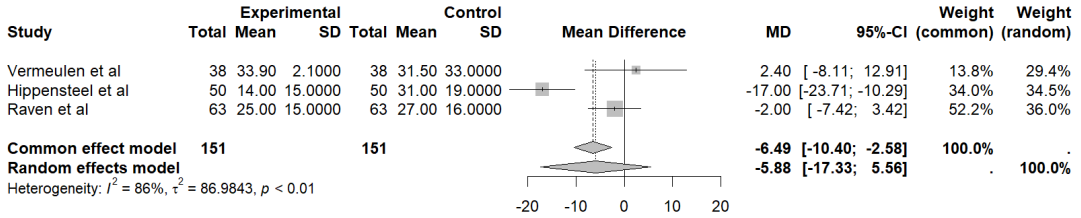
Table 2- DASH score (Disabilities of the Arm, Shoulder and Hand) and pain analogue scale (VAS) postoperative period of surgical procedures for the treatment of osteoarthritis of the trapeziometacarpal joint

Study	Sample	Arthrodesis	Trapeziectomy LRTI	Arthroplasty	Scale
Vermeulen et al.	38 patients	33.9+-2.1	31.5+-33	-	DASH SCORE
Vermeulen et al.	38 patient	19.9+-3.9	16+-2.7	-	Analogue pain scale (VAS)
Hippensteel et al.	50 patients	14+-15	31+-19	-	DASH SCORE

Hippensteel et al.	50 patients	29+-24	38+-20	-	Analogue pain scale (VAS)
Raven et al.	63 patients	25+-15	27+-16	26+-15	DASH SCORE
Raven et al.	63 patient	23+-10	10+-10	4+-10	Analogue pain scale (VAS)

Figure 3 shows the Forest plot with the DASH score (Disabilities of the Arm, Shoulder and Hand) of the selected studies. 10,11,12,13

Figure 3- Forest graph with the DASH score (Disabilities of the Arm, Shoulder and Hand) of the selected studies.



The randomized study by Vermeulen et al evaluated the use of arthrodesis using plate and screw compared to trapeziectomy with ligament reconstruction and tendon interposition (LRTI) in the treatment of osteoarthritis of the trapeziometacarpal joint. Twenty-one patients underwent trapeziectomy and LRTI and another 17 underwent arthrodesis. Of these, 13 were in the Eaton Littler stage II classification and 25 in stage III. The PRWE (Patient-Rated Wrist Evaluation Score) for assessing pain and functionality showed a preoperative value of 33.9 ± 2.1 versus 21 ± 2.5 and 16 ± 2.7 after 03 and 12 months, respectively, after trapeziectomy and LRTI. For the arthrodesis group, the baseline value was 39.5 +/- 1.7 versus 19.7 +/- 3.7 and 19.9 +/- 3.9 after 03 and 12 months of the procedure. The DASH score of group 1, submitted to trapeziectomy and LRTI, was 44.3 +/- 3.3 before the procedure and 31.5 +/- 3.3 and 20.6 +/- 3.0 after 03 and 12 months. In the arthrodesis group, the preoperative DASH values were 33.9 +/- 2.1 versus 33.9 +/- 2.2 after 03 months; this value was maintained during the year of study. The range of motion was also analyzed preoperatively, after 03 and 12 months of the procedures, such values were: trapeziectomy and LRTI group, preoperative flexion of the metacarpophalangeal joint 45.3º + -3.8 versus 34.0 ° + -2.4 and 37.9 ° + -2.3 during the period. While the extension of the same joint was -6.7 ° + - 3.1 versus -15.6 + -2.9 and -16.1 ++ 2.8. The arthrodesis group presented preoperative flexion of the metacarpophalangeal joint of 50.1 ° + -2.4, 41.3 ° + -1.9 and 42.4 ° 4.2 during the study period. The extension of the same joint -7.2 + -4.1 before the procedure and -16.7 ° + -2.8 and -19.3 ° + -4.1 after it. Regarding the complications reported, 06 were associated with trapeziectomy in the LRTI group (three mild and three moderate), such as sensory disturbances and tendonitis, compared to 15 complications (six mild, six moderate and three severe) in the arthrodesis group. 10

The study by Pritchett et al evaluated the use of

hemiarthroplasty in the treatment of osteoarthritis of the trapezometacarpal joint. All 138 patients (159 arthroplasties) in the study underwent the procedure and presented Eaton Littler stages II and III alterations. According to the Buck Gramcko score, used for functional evaluation, 57 thumbs performed more than 40° of palmar abduction, 75 with abduction between 30º-39º and 11 of 20º-29º, no data were recorded for limitation of movement at a value less than 20º. For radial abduction, 54 thumbs performed abduction greater than 40°, 80 between 30° and 39°, 9 between 20° and 29º. In the pinch movement performed compared to the contralateral side, only one thumb performed 100% of the function, 35 performed between 80%-99%, 106 performed between 60-79% and only one performed less than 60%. Some subjective results were evaluated, 66 patients reported never feeling pain after the procedure, 75 felt it sometimes and only two reported feeling it constantly. And, in relation to the execution of daily functions, 107 performed it without difficulty and only 36 presented some type of difficulty. 139 reported that they would do the procedure again and only four reported that they would not do it again. The complications associated with the procedure were an intraoperative fracture, a painful neuroma and one case of infection. One patient had numbness in the region of the radial nerve and one case of arthritis in another part of the hand. 11

The study by Hippensteel et al evaluated the use of trapeziometacarpal arthrodesis (TMA) compared to trapeziectomy with ligament reconstruction and tendon interposition (LRTI). A total of 50 patients were evaluated, of which 25 underwent TMA and the other 25 LRTI. In the TMA group, 22% of the patients were in stage II of the Eaton Littler classification, 66% in stage III and 3.7% in stage IV. The LRTI group had 8% in group II, 64% in group III and 12% in group IV. The preoperative DASH, an upper limb functional assessment scale, was 36±15° in the TMA group and 14±15° after the procedure, in the LRTI group the initial value was 52±19° versus 31±19° postoperatively. The preoperative Sollerman functional test in the TMA group was 72±7 and 77±7 after the procedure, for LRTI the values were 68±9 before surgery and 74±9 after. The VAS score for pain assessment was 50±24 preoperatively and 29±24 after the procedure in the TMA group, for the LRTI group, the preoperative value was 56±20 and 38±20 postoperatively. When comparing thumb movement between the two groups, TMA was related to a significantly greater improvement than LRTI (P<0.05). Regarding complications, they were similar between the groups, however, revision surgeries were frequent after TMA. The most frequent complication associated with LRTI was paresthesia, while TMA was associated with more cases of failure in joint reduction. 12

In the study by Ravel et al, 63 patients diagnosed with osteoarthritis of the trapezometacarpal joint were treated surgically, 18 were treated with resection arthroplasty, 17 with trapeziectomy and tendon interposition, and 28 with trapezometacarpal arthrodesis. In group one, which underwent resection arthroplasty, 44% of patients reported never feeling pain after the procedure and only 6% reported feeling pain daily. When compared to preoperative pain, 89% reported feeling significantly better. The VAS scale for pain, in the same group, was 4 (p=0.02), the DASH score was 26, and the postoperative radial abduction was 45°. In group two, in which patients underwent trapeziectomy, 59% of patients reported never feeling postoperative pain, 94% reported significantly improved preoperative symptoms, the VAS scale was 10 (p=0.02), the DASH score was 27 and the postoperative radial abduction was 64°. Finally, in group 3, which underwent arthrodesis, only 29% reported never having felt postoperative pain, 71% stated that they were significantly improved, the VAS score was 23, the DASH score was 25, and the postoperative radial abduction was 50°. Regarding the complications found in each group, in the group undergoing trapeziectomy, four (24%) thumbs had sensory alterations resulting from damage to the terminal branches of the radial nerve. One patient had Sudeck's dystrophy and there were no reoperations due to complications. The group undergoing resection arthroplasty was associated with a sensory deficit due to damage to the terminal branches of the radial nerve in two thumbs (11%). 13

DISCUSSION

Several surgical procedures have been described for the treatment of rhizarthrosis and include: arthroplasty, arthrodesis and trapeziectomy with tendon interposition. If conservative treatment fails, surgical intervention usually yields good results and leads to patient satisfaction, regardless of the technique used. 13, 14

Arthroplasty is a simpler procedure that has also shown good long-term results when compared to the most commonly used techniques of trapeziectomy combined with tendon interposition and arthrodesis. When compared to LRTI, TMA did not show significant improvement in strength or functionality, and is also more associated with cases of joint reduction failure

and consequent reintervention. 10,11,12,13

For the surgical technique of resection arthroplasty, the joint is approached through a straight radial incision over the first metacarpal and the trapezium up to the wrist. Then, after the joint is exposed, the articular surfaces of the trapezium and the metacarpal bone are removed, taking care to resect all osteophytes. The postoperative period consists of two weeks of immobilization with a splint on the forearm followed by functional treatment. 13

Arthrodesis of the trapeziometacarpal joint has been shown to be a reliable procedure with good long-term results. This technique is approached in a manner similar to arthroplasty, and the articular cartilage and adjacent sclerotic subchondral bone are removed. A small laminar spreader is placed to achieve lengthening and correction of adduction. However, this surgery often results in complaints of pain due to the thin skin overlying the hardware, resulting in a high rate of reintervention. 13

Trapeziectomy is a quick and easy procedure that is usually the one chosen for the treatment of rhizarthrosis. Briefly, trapeziectomy is performed by removing the trapezium through a dorsoradial incision, releasing the first extensor compartment. Then, a strip of the distal base of the abductor pollicis longus is passed through a slit in the flexor carpi radialis and then sutured to itself to form a suspensory support. In this way, the rest of the tendon is placed in the trapeziectomy space. Therefore, in this technique, to overcome problems of instability and shortening, the interposition of a flexor carpi radialis tendon rolled into the space of the removed trapezium was introduced. This surgery leads to better pain reduction and functional outcome. 13, 14, 15

Research shows that no evidence of superiority between the techniques has been demonstrated, despite some differences in terms of complications. Arthroplasty has good long-term results when compared to trapeziectomy and arthrodesis, and it also has fewer complications and interventions compared to arthrodesis. In contrast to trapeziectomy, arthrodesis has a higher frequency of problems and surgical reintervention. Even though the procedures have small differences in terms of complications, no surgical technique is superior to the other in terms of pain, physical function, patient global assessment, strength or range of motion. 13, 14

CONCLUSION

Trapeziectomy is the most commonly used procedure for treating rhizarthrosis. However, the studies analyzed also demonstrated good results with arthroplasty as the intervention of choice, which is also associated with lower rates of complications and surgical reinterventions. Although the procedures presented some differences in terms of complications, no surgical technique is superior to another in terms of pain, physical function, and overall patient assessment.

REFERENCES

Bæk Hansen T. Joint replacement for trapeziometacarpal osteoarthritis: implants and outcomes. J Hand Surg Eur Vol 2021;46(2):115-119. doi:10.1177/1753193420917582

Brauns A, Caekebeke P, Duerinckx J. The effect of cup orientation on stability of trapeziometacarpal total joint arthroplasty: a biomechanical cadaver study. J Hand Surg Eur Vol 2019;44(7):708-713. doi:10.1177/1753193419851775

Caekebeke P, Duerinckx J. Can surgical guidelines minimize complications after Maïa® trapeziometacarpal joint arthroplasty with unconstrained cups?. J Hand Surg Eur Vol 2018;43(4):420-425. doi:10.1177/1753193417741237

Challoumas D, Murray E, Ng N, Putti A, Millar N. A Meta-analysis of Surgical Interventions for Base of Thumb Arthritis. J Wrist Surg. 2022;11(6):550-560. Published 2022 Feb 23. doi:10.1055/s-0042-1743117

de Jong TR, Bonhof-Jansen EEDJ, Brink SM, de Wildt RP, van Uchelen JH, Werker PMN. Total joint arthroplasty versus trapeziectomy in the treatment of trapeziometacarpal joint arthritis: a randomized controlled trial. J Hand Surg Eur Vol 2023;48(9):884-894. doi:10.1177/17531934231185245

Corain M, Zampieri N, Mugnai R, Adani R. Interposition Arthroplasty Versus Hematoma and Distraction for the Treatment of Osteoarthritis of the Trapeziometacarpal Joint. J Hand Surg Asian Pac Vol 2016;21(1):85-91. doi:10.1142/S2424835516500132

Zajonc H, Grill B, Simunovic F, Lampert F, Stark GB, Penna V. Vergleich der Ergebnisse der Resektions-Suspensionsarthroplasty nach Lundborg und Sirotakova zur Behandlung der Rhizarthrose [Comparison of the Results of Lundborg's and Sirotakova's Resection-Suspension Arthroplasty for the Treatment of Trapeziometacarpal Joint Osteoarthritis]. Handchir Mikrochir Plast Chir. 2016;48(3):161-167. doi:10.1055/s-0042-104057

van Laarhoven CMCA, Tong MCY, van Heijl M, Schuurman AH, van der Heijden BEPA. Effect of Tendon

Strip (FCR vs APL) on Outcome of CMC Thumb Joint Arthroplasty With Pyrocarbon Disk Interposition. Hand (NY). 2023;18(2_suppl):87S-95S. doi:10.1177/15589447211040879

Prosser R, Hancock MJ, Nicholson L, Merry C, Thorley F, Wheen D. Rigid versus semi-rigid orthotic use following TMC arthroplasty: a randomized controlled trial. J Hand Ther. 2014;27(4):265-271. doi:10.1016/j.jht.2014.06.002

Vermeulen GM, Brink SM, Slijper H, Feitz R, Moojen TM, Hovius SE, Selles RW. Trapeziometacarpal arthrodesis or trapeziectomy with ligament reconstruction in primary trapeziometacarpal osteoarthritis: a randomized controlled trial. J Bone Joint Surg Am. 2014 May 7;96(9):726-33. PMID: 24806009.

Pritchett JW, Habryl LS. A promising thumb Basal joint hemiarthroplasty for treatment of trapeziometacarpal osteoarthritis. Clin Orthop Relat Res. 2012 Oct;470(10):2756-63. doi: 10.1007/s11999-012-2367-7. Epub 2012 May 15. PMID: 22585348; PMCID: PMC3442003.

Hippensteel KJ, Calfee R, Dardas AZ, Gelberman R, Osei D, Wall L. Functional Outcomes of Thumb Trapeziometacarpal Arthrodesis With a Locked Plate Versus Ligament Reconstruction and Tendon Interposition. J Hand Surg Am. 2017;42(9):685-692. doi:10.1016/j.jhsa.2017.05.018

Raven EE, Kerkhoffs GM, Rutten S, Marsman AJ, Marti RK, Albers GH. Long-term results of surgical intervention for osteoarthritis of the trapeziometacarpal joint: comparison of resection arthroplasty, trapeziectomy with tendon interposition and trapezio-metacarpal arthrodesis. Int Orthop. 2007;31(4):547-554. doi:10.1007/s00264-006-0217-5

Saheb RLC, Vaz BAS, Soeira TP, Shimaoka FJ, Herrero CFPDS, Mazzer N. SURGICAL TREATMENT FOR RHIZARTHROSIS: A SYSTEMATIC REVIEW OF THE LAST 10 YEARS. Acta Ortop Bras . 2022;30(1):e246704. Published 2022 Jan 28. doi:10.1590/1413-785220223001e246704

Wolf JM, Turkiewicz A, Englund M, Karlsson J, Arner M, Atroshi I. What Are the Patient-Reported Outcomes of Trapeziectomy and Tendon Suspension at Long-term Follow-up?. Clin Orthop Relat Res . 2021;479(9):2009-2018. doi:10.1097/CORR.0000000000001795