SURGICAL TREATMENT FOR RHIZARTHROSIS: A SYSTEMATIC REVIEW OF THE LAST 10 YEARS

ABSTRACT

Introduction: Comparison of different surgical techniques to treat patients with rhizarthrosis or carpometacarpal osteoarthritis of the thumb. Materials and Methods: A systematic review was conducted using three electronic databases. Randomized, controlled trials in patients who underwent surgery for the treatment of rhizarthrosis were included. The literature review followed the PRISMA protocol. Results: A total of 15 articles involving a total population of 958 patients were selected. Seven different surgical techniques were compared. Conclusions: We conclude that no procedure is superior to another in terms of pain, physical function, overall patient assessment, range of motion, or strength. Outcome measurements should be standardized to enable better comparison between surgical techniques. Level of evidence II, Systematic Review.

Keywords: Rhizarthrosis. Thumb osteoarthritis. Trapeziometacarpal joint.

INTRODUCTION

Rhizarthrosis or thumb carpometacarpal osteoarthritis (CMC OA) is a common condition of pain and functional limitation in the hand. CMC OA affects 66% of women older than 55 years and an estimated 22% of the general population aged 50 years and over are symptomatic. Typically, patients have pain in the base of the thumb and with the progression of the disease: atrophy of thenar muscles, subluxation of the first carpometacarpal joint, loss of pinch and grip strength. Eaton et al. describes 4 stages of thumb joint OA, based on radiological criteria with the end stage involving CMC and scaphotrapezial-trapezoid (STT) joints. In the early stages, patients can be treated with splinting of the thumb, along with anti-inflammatory drugs, steroid injections, and thumb-strengthening exercise. Orthosis may reduce pain, however it does not improve function, dexterity and strength.

For those who fail nonsurgical treatment, surgery must be considered. Several surgical techniques have been performed, and include: trapezial excision with or without ligament reconstruction and tendon interposition (LRTI), arthroscopy and debridement, arthroplasty, trapeziometacarpal arthrodesis (TMA). In 2010, Vermeulen et al published a systematic review including 35 articles, 9 of which not included in previous reviews. This study aimed to conduct a systematic review of randomized controlled studies on different kinds of surgical treatment in rhizarthrosis from the last 10 years.

MATERIALS AND METHODS

This review followed the PRISMA protocol. The search was carried out in the PUBMED, EMBASE, and Cochrane databases using the following terms (PICOS method): Patient: rhizarthrosis (Eaton et al. 2010)
stages II-IV; Intervention: Surgery; Comparison: Different kinds of surgical treatment; Outcomes: Pain, function, grip and pinch strength; Study design: randomised controlled trials.

The review was conducted in October 2019 and repeated in April 2020, and included studies from the last ten years (between 2011 to 2019) (Figure 1). Search terms included “rhizarthrosis”, “thumb carpometacarpal joint” and “thumb osteoarthritis”. There was no restriction on publication language. First of all, a list was created with the titles and abstracts of studies potentially relevant and two independent reviewers (R.L.C.S and B.A.S.V) applied the search. If the abstract suggested inclusion in our study, the full manuscript was retrieved and reviewed. Conflicts could be solved by a third researcher, however it was not necessary.

The same two reviewers, in an independent manner, extracted the data, which included: participants, intervention, comparison between techniques, scores, results and conclusion.

Figure 1. Publications per year.

RESULTS

A total of 29 articles contained titles and abstracts relevant to the study and were selected for a complete reading of the text. After this stage, 15 articles were included, of which 958 patients were selected. Five studies compared different techniques of trapezial excision with ligament reconstruction and tendon interposition (LRTI). Esenwein et al. (2011), compared T + LRTI using abductor pollicis longus (APL) or flexor carpi radialis (FCR). Similar results can be obtained using the technically less demanding APL-procedure when compared with the FCR-technique 8 months postoperatively. Vermeulen et al. (2014), compared T + LRTI (FCR) with or without bone tunnel, and obtained faster recovery in tunnel group, however, 12 months after surgery, the functional outcome was similar. Spekreijse et al. (2015), comparing T + LRTI (FCR) with or without bone tunnel, showed that improved function, strength, and satisfaction obtained at 1 year after, was maintained after 5 years. Zajonc et al. (2016), in al. (2015), comparing T + LRTI (FCR) with or without bone tunnel, and obtained faster recovery in tunnel group, however, 12 months after surgery, however fewer moderate and severe complications were related after trapeziectomy with ligament reconstruction and tendon interposition. A second study was published by Hippensteel et al. (2017), comparing 52 patients. There were no significant differences in the amount of change in grip or pinch strength, patient-reported outcomes, or functional hand testing between groups.

Another study compared arthroplasty versus trapeziectomy and LRTI (Thorkildsen et al. 2019), in 40 patients. The results in the early rehabilitation were significantly better in the joint replacement group, as well as the range of motion in abduction and extension was better at the final follow-up. Patient satisfaction was high in both groups despite more complications after joint replacement. Trapeziectomy with ligament reconstruction and tendon interposition proved to be a safe and effective treatment with few complications in this trial.

DISCUSSION

The aim of the study was to provide an updated review of the current literature (last 10 years), according to most used surgical procedures. We did not perform a statistical analysis because of the great heterogeneity between the included articles. Our search strategy identified 15 articles, none of them includes in previous systematic reviews.

First, we reviewed five studies comparing different techniques of trapeziectomy with ligament reconstruction and tendon interposition. No evidence of superiority between techniques was demonstrated. The second group of studies, compared trapeziectomy alone and trapeziectomy with or without LRTI. Similar objective and subjective outcomes were obtained between groups, moreover trapezium
excision isolated requires a smaller incision, a shorter surgical time, an easier and a less painful recovery.

The third group, including three studies, compared trapezial excision with or without LRTI versus trapeziometacarpal arthrodesis (TMA). Complications and repeat surgeries are more frequent following TMA compared to trapeziectomy with or without LRTI. One author suggested that arthrodesis displayed better pinch strength, while arthroplasty displayed better motor function.

When evaluating the study on arthroplasty versus trapezial excision with LRTI, we conclude that the results in the early rehabilitation were significantly better in the joint replacement group, as well as the range of motion in the final follow-up, by the other hand more complications were associated to the joint replacement group. The study comparing cemented and uncemented arthroplasty, showed similar good results with both techniques.

Another study compared trapezial excision versus trapezial denervation and concluded that 30% of patients undergone trapezial denervation, needed a second surgical procedure.

Finally, an article comparing trapezial excision with LRTI versus trapezial excision and allograft, conclude that allograft should be used only in cases of severe instability, due to associated complications with the technique (Tables 1 and 2).

Table 1. Studies conclusions.

| Authors                  | Study         | Nº of patients per group | Procedure                  | Author’s conclusion                                                                 |
|--------------------------|---------------|--------------------------|----------------------------|-------------------------------------------------------------------------------------|
| Hippensteel et al. 8 (2017) | RCT           | 27                       | CMC arthrodesis            | There were no significant differences in the amount of change in grip or pinch strength, patient-reported outcomes, or functional hand testing between TMA and LRTI. The TMA group had significantly increased thumb tip opposition distance. The TMA group was complicated by a 26% overall nonunion rate of which 8% were symptomatic. The LRTI group (Wagner incision) had a significantly increased incidence of superficial branch of the radial nerve paresthesia. The incidence of complications was similar between operative groups, but revision surgery was more common after TMA. |
| Esenwein et al. 9 (2011) | RCT           | 25                       | LRTI                       | Similar results can be obtained using the technically less demanding APL-procedure when compared with the FCR-technique 6 months postoperatively. |
| Vermeulen et al. 10 (2014) | RCT           | 30                       | T + LRTI(APL)              | After the bone tunnel technique, patients have better function and less pain 3 months after surgery than do those in the nonebone tunnel group, which indicates faster recovery. However, 12 months after surgery, the functional outcome was similar. |
| Spekreijse et al. 11 (2015) | RCT           | 36                       | T + LRTI(FCR) with tunnel  | This study showed that improved function, strength, and satisfaction obtained at 1 year after trapeziectomy with LRTI with or without the use of a bone tunnel for stage IV TMC thumb osteoarthritis was maintained after 5 years. |
| Zajonc et al. 12 (2016)  | RCT           | 19                       | T + LRTI(APL) Lundborg     | Both resection-suspension arthroplasty procedures led to a statically significant postoperative reduction of pain, a significant improvement in radial and palmar abduction, a significant gain in quality of life and significant asymptomatic proximalisation of the first metacarpal bone. There was no significant difference in postoperative strength. |
| Nanno et al. 13 (2019)   | RCT           | 10                       | T +LRTI (APL original)     | There were no statically significant differences in the thumb palmar abduction angle, pinch power, grip strength, Quick DASH score, or VAS score between groups. Patients in group 2 had a significantly better range of motion of radial abduction. |
| Salem et al. 14 (2011)   | RCT           | 59                       | T                         | There were no significant differences between the two treatments in any subjective or objective outcome measure at 6-year follow-up Eighty-two percent of the thumbs were painless or only ached after use. The DASH and Patient Evaluation Measure scores were significantly better than preoperatively. |
| Gangopadhyay et al. 15 (2012) | RCT        | 53                       | T + LRTI (FCR)             | The outcomes of these 3 variations of trapeziectomy were similar after a minimum follow-up of 5 years. There appears to be no benefit to tendon interposition or ligament reconstruction in the longer term. |

Figure 2. The Disabilities of the Arm, Shoulder and Hand; VAS = Visual Analogue Scale; MHQ = Michigan Hand Outcome Questionnaire; PRWHE = Patient rate wrist/hand.
**CONCLUSION**

We conclude that no procedure is superior to another in terms of pain, physical function, patient global assessment, range of motion, or strength. Furthermore, because differences between the various techniques are small, researchers should focus on developing more sensitive outcome measures that are indicative of the specific changes in hand function after CMC OA. We suggest that outcomes measures be standardized. The Disabilities of the Arm, Shoulder and Hand (DASH) perhaps the most indicated like a Patient Report Outcomes (PRO), in association with Visual Analogue Scale (VAS), grip and pinch strengths.

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| Authors | Eaton stage | Most reported complications |
|---------|-------------|----------------------------|
| Vermeulen et al.17 (2014) | T + LRTI (FCR) | Sensory disturbances in the radial nerve territory |
| Hansen et al.19 (2013) | Cemented prostheses | FCR tendinitis |
| Corain et al.18 (2016) | Arthrodesis | Numbness in the radial nerve territory |
| Marks et al.22 (2017) | T + allograft | Superficial radial nerve dysfunction |
| CMCJ denervation | | |

RCT = Randomized controlled trials; T = Trapezeotomy; LRTI = Ligament reconstruction and tendon interposition; APL = Abductor Pollicis Longus; FCR = Flexor Carpi Radialis; CMC = Carpometacarpal.
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