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Review Article

Rheumatoid arthritis and hand surgery- A systematic review

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ABSTRACT

0.5-1% of World Population is affected by Rheumatoid Arthritis (RA). The Prevalence of the disease in Indians is about 0.7%. Hand is the earliest and most common presentation in Rheumatoid Arthritis. Though there has been a lot of advancement in the medical management of RA patients with the advent of newer and safer drugs, hand surgery still plays an important role in the treatment of the patients. As with the medical field, there has been development in the surgical modalities too in the management of deformities and in the improvement of functional outcomes of Hand Surgery in RA patients. This review assesses the efficacy of operative management in Rheumatoid Hand.

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1. Introduction

The systemic inflammatory poly-arthropathy known as Rheumatoid Arthritis (RA) damages the body's joints' functionality and appearance. Autoantibody production, synovial inflammation and hyperplasia, bone and cartilage degeneration, and other systemic problems are all brought on in RA by an autoimmune-mediated process.¹ It is a painful autoimmune disease that affects 0.5-1% of the population.² The joints of the hand and wrist are frequently affected in the upper extremities. Within two years of diagnosis, up to 50% of patients get wrist involvement, and ten years after diagnosis, up to 90% of patients experience it.³ RA in the hands and wrists might make it difficult for the patient to the capacity to work and carry out regular tasks.^{4,5} Unfortunately, the lack of spontaneous remission that RA exhibits means that, in the absence of medical therapy, the condition typically results in a progressive decline in hand function.⁶

Surgery for RA aims to rectify and prevent deformity, restore function, and relieve pain.⁷ Surgery is often

indicated by persistent pain and refractory synovitis lasting 3–6 months, while the timing and criteria for surgery are still up for debate.^{8,9}

Prophylactic and therapeutic surgical treatments can be used to treat RA.¹⁰ In an effort to improve the condition, prophylactic surgeries (synovectomy or tenosynovectomy, respectively) remove inflammatory synovial or tenosynovial tissue to maintain joint health or avoid tendon rupture.^{11,12} Therapeutic operations concentrate on enhancing function and reducing pain in circumstances where tendon rupture and joint destruction are already present; such procedures include joint fusions and joint replacements.

In general, more proximal joints are treated during surgery before distal joints. In most cases, lower extremity treatment comes before hand or wrist surgery. Patients with quiescent disease are not excluded from surgery, but it is crucial to coordinate the patient's medication management throughout surgery and the recovery period with the rheumatologist. The use of disease-modifying drugs, especially those that suppress TNF-alpha, can impair healing and increase the chance of infection following surgery.^{13–16} Successful care in these circumstances

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depends on the collaboration between the surgeon and the rheumatologist.

Most patients with RA are sent to the surgeons late in the course of their disease. Joint destruction is frequently visible in patients with chronic illness; in such instances, many preventive operations are not possible. Lack of level I outcome studies to support surgical intervention over routine medicinal care and inadequate communication between rheumatologists and Orthopaedic/Hand Surgeons have both been blamed for the delay in surgical referrals.^{10,17,18} There is lack of standardization in the operative management of Rheumatoid Hand. There are very few published randomised studies of the various operative procedures and their outcomes. Hence there is also lack of operative guidelines. This review tries to look into the available literature on the various operative procedures and their efficacy.

2. Materials and Methods

According to the approach outlined in the Cochrane Handbook for Systematic Reviews of Interventions (Higgins Julian and Green, 2011a),¹⁹ this study was carried out and is presented in accordance with Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (Higgins et al., 2015).²⁰

2.1. Search strategy and study screening

Between January 2000 and October 2022, a thorough search of the Cochrane Central Register of Controlled Trials (CENTRAL) and PUBMED was conducted to identify all citations of original research studies related to hand surgery in rheumatoid arthritis. Rheumatoid Arthritis and Hand Surgery were the keywords used in search strategy. To find any pertinent articles that the initial search missed, a manual check of all eligible articles' references was conducted. Two reviewers separately screened the title, abstract, and complete text from the selected papers. Disagreements from the title and abstract screening stage were carried over to the following round for a more thorough examination. Any disputes were discussed among the reviewers, and any unresolved issues were then brought up with a senior author.

2.2. Inclusion and exclusion criteria

Observational or experimental studies with a minimum of a 12-month follow-up period reporting clinical and functional outcomes for RA patients following Hand Surgery. No limitations on disease classification were imposed, but all patients reported failing non-operative treatment. The exclusion standards included all non-surgical

forms of arthritis (including osteoarthritis, psoriatic, and postinfectious) that are not rheumatoid, revision techniques, non-human studies, case reports, narrative reviews, editorials, expert Opinions and works of basic science were not included.

2.3. Assessment of methodological quality

All the reviewers independently evaluated the included studies' methodology using the Methodological Index for Non-Randomized Studies (MINORS) instrument for non-randomized studies (Higgins et al., 2011).²¹

2.4. Data abstraction

Using piloted screening forms, all data were extracted in duplicate, and any discrepancies were resolved by discussion. Author, publication date, publication journal, participant count, study population description (e.g., age, significant comorbidities), study type, surgical procedure description, prosthetic of choice, surgical indications, measurement of pre- and postoperative wrist function, range of motion, grip strength, pain intensity, and adverse events or complications were all included in the information that was extracted. The Patient-Rated Wrist Evaluation (PRWE) and Disabilities of the Arm, Shoulder, and Hand (DASH) postoperative outcomes scores were also abstracted.

3. Results

In Divelbiss et al.,²² All range-of-motion values improved after surgery and The DASH scores improved significantly from before surgery at the 6-month and 1-year follow-up visits, with an average improvement of 14 points at 1 year (Table 1).

In Radmer et al.,²³ After a positive short-term result, the outcomes got worse over time. The following issues developed: 33 loosening or dislocations, 2 infections, 3 implant failures, and 2 prosthesis migrations. Revision surgery was performed on all patients (39 of 40), and in every case, substantial titanium wear in the soft tissues was discovered during surgery. Evidently, even in a non-weight-bearing when utilized as a bearing surface of the implant, titanium alloy may deteriorate and cause tissue metallosis in a joint like the wrist. All patients had an arthrodesis as a salvage treatment after the prosthesis was removed. According to the 18-month data, all patients showed an increase in ulnar wrist deviation, which clinically caused a significant malposition and a sharp decline in grip strength and range of motion (Table 1).

In Rauhaniemi et al.,²⁴ Preoperatively, the average pain score in the operated wrist was 3.6 (range, 1-4); at 6 weeks,

it was 1.9 (range, 1-4); and at 1 year, it was 1.3 (range, 1-4). At one year after the right wrist's fusion, the right hand's grip strength was 24% higher than it was on the left, which had not undergone surgery. At one year after the left wrist was fused, the left hand's grip strength was 20% stronger, but the right hand's grip strength was just 4% better (Table 1).

In Ward et al.,²⁵ At the time of the most recent follow-up, the average DASH score had decreased from 62 points preoperatively to 40 points. At the time of the most recent follow-up, the average wrist flexion and extension were 42° and 20°, respectively, for a mean improvement in the whole flexion-extension arc of 14°. At the time of the most recent follow-up, nine wrists (or 45%) in eight patients had revision surgery due to a loose carpal component. Due to repeated wrist instability, one patient had wrist arthrodesis. At the time of the most recent follow-up, two more wrists in two patients revealed radiographic evidence of carpal component subsidence. The original prosthetic components' implant survival rates at five and seven years were, respectively, 75% and 60% (Table 1).

In Harlingen et al.,²⁶ 7-year survival was 81% (95% CI: 64-91). There were 31 problems. Radiographs of 22 wrists revealed loosening. With the exception of pronation, all other range of motion were improved. The median postoperative pain score (from 0 to 10) was 0 (0-6) at rest and 0 (0-7) during activity, and the mean DASH score improved (Table 1).

In Herzberg et al.,²⁷ In rheumatoid and non-RA group, visual analogue scale (VAS) pain score improved by 48 and 54 points, respectively, and Quick DASH score improved by 20 and 21 points, respectively, with no statistical differences. There is an improvement in Post op grip strength by 40% (Table 1).

In Pfanner et al.,²⁸ Between 24 and 148 months, the mean follow-up lasted 82.3 months. The mean VAS score preoperatively was 9 and dropped to 0.82 after surgery in all patients, showing a considerable reduction in discomfort. All patients said they would have the operation again. In every patient, grip strength and hand dexterity improved; the mean grip strength postoperatively was 11 kg (Jamar Hydraulic Hand Dynamometer). ROM of radial-ulnar deviation was found to be 24.9 degrees (from 0 to 42 degrees) and the mean total postoperative flexion-extension ROM was 72.3 degrees (from 38 to 110 degrees). Quick DASH 49 and PRWHE 41.7 were recorded in the postoperative self-assessment for activities of daily life (Table 1).

In Philip et al.,²⁹ Overall, patient reported outcomes in the M-SACRAH questionnaire's functional, stiffness, and pain categories seem to be quite favorable across the spectrum of surgical treatments that can be carried out in the rheumatoid hand (Table 2).

In Ishikawa et al.,³⁰ Overall, there was a significant improvement in upper extremity function (DASH), physical function and QOL (J-HAQ), QOL (EQ-5D and GH), and depression/mental health (BDI-II) at 6 and 12 months following surgery compared to baseline. Following surgery, disease activity (DAS28-CRP (4) and SDAI) also decreased (Table 2).

In Okura et al.,³¹ According to their original patient-reported outcome assessment instrument, elbow, wrist, and hand surgery helped RA patients in the long run. Pain alleviation was the most beneficial result, despite the fact that effectiveness varied depending on the surgery site. The patient's perception of the results of the operation ten years later may have been modified by altered medical therapy (Table 2).

4. Discussion

The purpose of this review is to evaluate the effectiveness of surgery in the treatment of hand illness associated with RA. However, the majority of the studies that were found had methodological issues. The method of study (i.e., series of cases rather than randomized controlled trials), the patient recruitment (i.e., heterogeneity in terms of diagnosis), and the evaluation criteria. As a result, it has been challenging for us to come up with responses that are definitive to our original query. Even after taking into account all of these drawbacks, clinical efficacy for both total carpal arthrodesis and metacarpophalangeal arthroplasty can be seen as trending in the right direction. Both treatments have demonstrable short-term success in lessening pain and enhancing joint function.

It's interesting to note that the majority of the methodological challenges with these studies could be fixed in later research. Specifically, prospective studies with a control group should be planned to conclusively show if one operation is superior to another or to medical therapy alone (i.e. no surgery). In order to prevent the confusing effects of a heterogeneous patient population, patient recruitment should also be more uniform in terms of diagnosis, seriousness of disease, and kind and length of medical therapy. Additionally, the selection of outcome markers ought to emphasize clinical factors (such as pain reduction, functional progression, general patient comfort), rather than those with ambiguous therapeutic relevance (such as variations in joint arc motion). Similar to the existing markers of result for medical treatment, outcome markers for the surgical treatment of the RA-associated hand disease should be discovered and assessed.³² Last but not least, patients should undergo post-operative evaluations at regular intervals. This would make it possible to compare short- and long-term outcomes as well as keep track of issues when they arise.

Table 1: DASH (Disabilities of the Arm, Shoulder, and Hand), PRWE (Patient-Rated Wrist Evaluation) & Grip strength scores both pre- and postoperatively as reported in each study

S. No.	Author	Year of publication	Type of research paper	Surgical intervention	Research question addressed	DASH pre-op	DASH post op	PRWE preop	PRWE post-op	Preop Grip Strength	Postop grip strength
1	Divelbiss et al.	2002	Prospective Multicenter study	Arthroplasty	Outcome of Surgical Treatment	46	32.1	NS	NS	NS	NS
2	Radmer et al.	2003	Retroprospective study	Arthroplasty	Outcome of Surgical Treatment	NS	NS	NS	NS	0.32 kgf/cm2	0.11 kgf/cm2
3	Rauhaniemi et al.	2005	Retroprospective study	Arthrodesis	Outcome of Surgical Treatment	NS	NS	NS	NS	NS	24% when right wrist fused, 20% when left wrist fused
4	Ward et al.	2011	Prospective study	Arthroplasty	Outcome of Surgical Treatment	62	40	NS	NS	NS	NS
5	Harlingen et al.	2011	Review article	Arthroplasty	Outcome of Surgical Treatment	66	34	NS	NS	NS	13 kg
6	Herzberg et al.	2012	Prospective Multicenter study	Arthroplasty	Outcome of Surgical Treatment	NS	20	NS	NS	NS	40% stronger
7	Pfanner et al.	2017	Retroprospective non controlled cohort study	Arthroplasty	Outcome of Surgical Treatment	NS	49	Ns	42	NS	11 kg

Table 2: Study design, surgical intervention, research question addressed & measuring tool of retrieved study

S. No.	Author	Year of publication	Type of research paper	Surgical intervention	Research question addressed	Measuring Tool
1	Philip et al.	2016	Retroprospective study	Swanson's arthroplasty, finger joint or wrist arthrodesis, carpal tunnel decompression, posterior interosseous nerve denervation, RA nodule excision, synovectomy/tenosynovectomy and tendon repair/release	Outcome of Surgical Treatment	M-SACRAH, Satisfaction Questionnaire
2	Ishikawa et al.	2017	Prospective cohort study	Synovectomy and Darrach procedure, radio lunate arthrodesis, reconstruction of the extensor tendons, arthroplasty at the metacarpophalangeal (MP) using Swanson implant, fusion at the proximal interphalangeal (PIP) joint, suspensionplasty at the carpometacarpal (CM) joint of the thumb.	Outcome of Surgical Treatment	Japanese version of the Stanford Health Assessment Questionnaire (J-HAQ: physical function, QOL), EuroQoL-5 dimension (EQ-5D:QQL), Beck Depression Inventory-II (BDI-II: depression, mentality), Disease activity scored 28- C reactive protein 4 (DAS28-CRP (4)) mHAQ
3	Okura et al.	2018	Retroprospective questionnaire Survey	Non specific surgeries	Original questionnaire	

5. Conclusion

Even though the effectiveness of medicinal treatment for RA has decreased the need for surgery, there are still some cases of RA-related hand disease that need to be managed surgically. Future research should hopefully shed more light on the relative usefulness of the various surgical techniques, improving the clinical management of hand illness in RA patients.

6. Conflict of Interest

None.


7. Source of Funding

None.


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