Wrist Arthrodesis in Severe Wrist Arthritis in Rheumatoid Arthritis Patients: A Retrospective Study

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Authors’ contributions

This work was carried out in collaboration among all authors. Author AL designed the study, wrote the protocol and wrote the first draft of the manuscript. Author ES performed the statistical analysis and managed the analyses of the study. Author HM managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Objective: Osteoarthritis of wrist is an uncommon disorder but in rheumatoid arthritis (RA), wrist and metacarpophalangeal joint are involved in early stages. RA of wrist leads to severe pain and loss of function in a large number of patients. Conservative treatment is required in early stages, but in severe cases arthroplasty or total wrist arthrodesis is the treatment of choice. Problems in wrist arthroplasty include implant breakage, cystic erosion in the surrounding bone, and marked synovitis, which requires revision in most of cases. Total wrist arthrodesis is treatment of choice in severe wrist arthritis patient, who want to have good grip and wish to do heavy labour.

Material and Methods: A retrospective review of 15 patients of RA with severe wrist arthritis, managed by wrist arthrodesis using 3.5 mm reconstruction plate and iliac crest bone graft was done. Patients were evaluated for pain relief, functional improvement and radiographic analysis.

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Patient function measures included: Visual analog score (VAS), the Mayo wrist score, and Disabilities of Arm, Shoulder, and Hand (DASH) score.

Result: All 15 cases united well with marked improvement in wrist strength and diminished pain allowing improved function and heavy labor. Mayo wrist scores increased on an average of 37.5 Points (preoperative) 10 to 65 (postoperative). The average DASH score has decreased significantly up to 47 Points.

Conclusion: Wrist Arthrodesis provides pain relief and functional hand in sever wrist arthritis in RA cases.

Keywords: Wrist arthrodesis; arthroplasty; rheumatoid arthritis; VAS score; DASH score.

1. INTRODUCTION

Rheumatoid arthritis (RA) is a disease of chronic polyarticular inflammation that leads to joint swelling, deformity and loss of joint function. RA occurs in 1 to 3% of the adult population with women affected slightly more than men [1]. Wrist and metacarpophalangeal joints gets affected at earlier stage [2]. Rheumatoid hand deformities are bilateral and symmetrical in most of the cases. Due to bilateral involvement, these patients are worst affected as compared to post traumatic or degenerative arthritis patients. RA patients tend to have relatively poor bone stock, cystic erosions, reduced preoperative motion and major deformity. Initial managements are usually conservative which includes activity modification, analgesia, physiotherapy, splinting and corticosteroid injections [3]. Routine activity modification can be acceptable for older patients due to low demand and sedentary life style. Long term side effects of analgesics are well documented in literature. Physiotherapy and corticosteroid injections are temporary measure, even steroid injections can cause superficial or deep wound infections due to immune compromised status of these patients [4].

Surgical treatment is indicated for patients with no relief from non-operative measures. Various operative measures are wrist arthroscopy [5], denervation [6], excision arthroplasty [7], total wrist arthroplasty [8], wrist arthrodesis [8] and osteotomies [9]. Arthroscopic wrist synovectomy are useful in initial synovitis stage only. Denervation and excision arthroplasty has controversial results in various studies. Wrist arthroplasty is contraindicated in young and active population due to high chance of revision in future.

Wrist arthrodesis was first reported in 1900 by Ely for treatment of severe wrist arthritis due to tuberculosis. It is a procedure that relieves pain and maintains a powerful grip of hand. There are various techniques described in the literature for wrist arthrodesis since 1910 but the combination of rigid stabilization with a dorsal plate and autogenous cancellous bone grafting results in a higher fusion rate to relieve pain along with correction of the deformity and enables the patients to accomplish their routine activities. There are few studies on wrist arthrodesis in Rheumatoid arthritis patients. So here we present a retrospective study of 15 patients of RA with severe wrist arthritis, in which all conservative methods failed and then further they were managed with wrist arthrodesis.

1.1 Aims and Objective of the Study

To assess the role of total wrist arthrodesis in RA patients for

1. Pain relieve (VAS score)
2. Work and Quality of life (MAYO wrist score, DASH Score)
3. Patient satisfaction with the procedure was graded as highly satisfied, satisfied and disappointed.

1.2 Inclusion Criteria

1. Stage 3 and stage 4 arthritis [10]
2. Non-responsive to conservative management.

1.3 Exclusion Criteria

1. Fixed deformity of metacarpophalangeal and intercarpal joint
2. DRUJ arthritis
3. Ulna impaction.

2. MATERIALS AND METHODS

This study was conducted in department of orthopedics in Maharishi Markandeshwar Medical College and Hospital, Kumarhatti (solan) between the years of 2013 to 2016. The patients were reviewed with respect to pain relieve and improvement in daily activities. Surgeries were performed by one trained hand surgeon. Patients
were evaluated preoperatively and in follow-up. Outcomes were assessed with the Mayo krimmer wrist score, the Disability of Arm, Shoulder, and Hand (DASH) score and Visual analogue score (VAS). Full subjective data was assessed in all patients with no defaulter in this study.

15 patients (11 females and 4 males) of mean age 35 years (28 to 44 years) with marked pain and severe wrist arthritis (stage 3 and stage 4) were reviewed. Clinical information record included pre and postoperative wrist strength and routine activity modification. Pain was recorded on a visual analog scale (VAS) score of 1 to 100 and all relevant investigations including X-ray in AP and Lateral views were taken [Figs. 1,2]. Patients were explained about the procedure of wrist arthrodesis and proceedings.

![Fig. 1. AP view of wrist showing arthritic changes at radio scaphoid](image1)

![Fig. 2. Lateral view showing arthritic joint changes](image2)
Wrist arthrodesis was done on right side in twelve patients and left side in three. All cases were done on dominant side. DMARD (Disease-modifying anti-rheumatic Drugs) and steroids were stopped one to two week before surgery [11-14] to reduce risk of infection. Methotrexate (MTX) and hydroxichloroquine (HCQS) were suspended one week before surgery and resumed from the first postoperative day. Those are on Leflunamide (LEF) were stopped two weeks before and started after third postoperative day. One patient was on biologic agents’ etanercept (ETN). We did procedure after 2 months of last dose due to their prolonged half-life and side effects [15,16].

Surgical procedure- All surgical procedures were performed under axillary block anesthesia with sedation under tourniquet control. Wrist arthrodesis was done through a dorsal approach through 2nd and 3rd extensor compartment. Extensor retinaculum was excised and articular cartilage from lunate fossa, scaphoid, lunate and capitate was excised. The graft was harvested from the iliac crest and packed in the lunate fossa. The placement of graft must be at the level of radius to prevent graft impingement with extensor tendon. Fixation was done in 15 to 20 degree of dorsiflexion and neutral to 5 degrees of ulnar deviation with help of 3.5 mm reconstruction plate from radius to 3rd metacarpal [Figs. 3,4]. We kept no difference in the position of arthrodesis for right and left wrist. K wire was used to assist reduction. Radio–ulnar joint was kept undisturbed [Fig. 5]. The POP slab was given from above elbow to metacarpal joint with the finger in slight flexion. Postoperatively after 3 weeks stitches were removed and the POP cast was given below elbow for the next 6 weeks. Routine radiography at 6 and 12 weeks was done to check bony fusion [Fig. 6].
3. REHABILITATION

The postoperative rehabilitation was divided into the three phases. Phase 1 was of [0-6] weeks, Phase 2 [6-12] weeks and Phase 3 [12 weeks - till union].

Phase 1: Comprised of cryotherapy and ROM of fingers with POP SLAB and CAST.
Phase 2: Continuous wrist immobilizer with active ROM of fingers and elbow
Phase 3: Intermittent wrist immobilizer application till union is achieved.

4. PATIENTS WERE FOLLOWED REGULARLY AT THREE MONTHS INTERVAL AFTER 12 WEEKS

4.1 Observation and Results (Fig. 7)

Painless wrist with satisfactory strength was obtained in all cases. All cases united well between 12 to 16 weeks.

4.2 Vas Score

The pain was evaluated both pre and postoperatively using VAS score from 0 to 100. It improved from average 80-93 preoperatively to 10-25 postoperatively in a period of 4-6 months (Tab 1) with the mean of 86.5 preoperatively to 17.5 at follow-up with (p value<.05) making significant improvement in pain. Pain was improved in all patients with a successful wrist arthrodesis, N = 11, with no pain in and mild pain in, N=4.

Every patient had good range of motion (ROM) of fingers at MCP (metacarpophalangeal joint) and IP (interphalangeal joint) as compared to another side.

4.3 Mayo Wrist Score

For functional evaluation, Mayo and Krimmer wrist score (www.orthopaedicscore.com › score pages › mayo wrist) was used and it improved from 15 to 65 with an average increase of 40 points with (p value<.05).
Fig. 7. Results after wrist arthrodesis in 15 patients

4.4 Dash Score

Although not completed by every participant in the study, the Disability of Arm, Shoulder, and Hand score was analyzed. Initially average DASH score was 78, which decreases to 16 in 4 to 6 months with an average improvement of 37.5 ($p$ value<.05). No superficial or deep infection was seen in any case. But in one patient Implant irritation was observed so the plate was removed after 2 years.

With regard to satisfaction with the surgical result, out of the 15 patients twelve were highly satisfied and remaining three had intermittent pain but were also satisfied. All twelve highly satisfied patients returned to their previous professional and routine activities.

5. DISCUSSION

Rheumatoid arthritis (RA) is a chronic systemic autoimmune disease that affects the lining of the synovial joints and associated with progressive disability and socioeconomic burden. ACPAs (anti-citrullinated protein antibodies) can be detected in approximately 67% of RA patients and serve as a useful diagnostic reference for patients with early, undifferentiated arthritis and provide an indication of likely disease progression [17,18].

Hand and wrist deformities are common in RA [19,20]. Early changes in wrist include swelling on both dorsal and volar side due to synovitis, which is followed by the destruction of radiocarpal joint and flexion deformity due to strong action of flexor. It causes loss of grasping power of hand is due to slack flexors tendon from flexion deformity at wrist. Staging of wrist arthritis is described by the American society of surgery of hand [10]. We used arthrodesis in stage 3 and stage 4 of wrist arthritis.

Treatment starts from conservative and progress to surgical intervention in resistant cases. Synovectomy will suffice in early stages of disease when articular cartilages are not involved. In advance arthritis, replacement or arthrodesis are main treatment options. We did arthrodesis in our patients due to requirement of hard labor with hand after surgery. Other indications for wrist arthrodesis are symptomatic posttraumatic or degenerative arthritis of the radiocarpal and midcarpal joints which are severe and unresponsive to conservative non-operative
treatment and will not be improved by a motion-saving procedure.

Performing bilateral wrist arthrodesis in the patient with inflammatory arthritis is still a controversial concept. As patients with bilateral wrist arthrodesis will have very less dexterity and compromised functional state than those with arthrodesis of one extremity. However, there are various schools of thoughts concerning which extremity should be treated. We did arthrodesis of dominant extremity as per discussion with patient regarding hard labor with dominant hand and spare other for personal hygiene.

Despite having trends towards many reconstructive procedures wrist arthrodesis remains an important treatment procedure because of its promising results of improvement in hand grip and grasping power of the hand. 30 degree dorsiflexion of the wrist is an optimal position of the wrist in the upper extremity for proper functioning of hand flexors. This position is usually lost in RA due to joint destruction. We did arthrodesis in 20 to 30 degree of dorsiflexion to gain proper grip of hand.

During the initial postoperative period, the patient should be encouraged to work aggressively on his/her digital motion and pronation/supination of the wrist to optimize long-term functional recovery. But patients should be assessed for the presence of distal radioulnar joint arthritis, or ulnocarpal impaction syndrome, which may become or remain symptomatic after arthrodesis. Not recognizing concomitant DRUJ arthritis or ulnocarpal impaction are potential complications of this procedure. So careful clinical examination of wrist joint and radiography is essential for finding pain generating joints. In AP and lateral X-ray, we should carefully examine radioscapoid and radio-lunate joint with the head of capitate, which is the primary articulation of mid carpal joint. Subtle triquetral or lunate sclerosis point towards ulna impaction syndrome. All patients in our study had involvement of radiocarpal and midcarpal joint without ulna impaction, so it was decided to treat patients with total wrist arthrodesis only.

Regarding technique, Sorial et al. reported successful fusion in 18 patients with the use of a radial sliding graft fixed with a dynamic compression plate [21]. There are various studies in of wrist arthrodesis in the painful wrist with Synthes fusion plate [22,23] but due to patients financial constraint, 3.5 mm reconstruction plate was used. Rod or pin fixation is an established procedure for patients with inflammatory arthritis or a connective tissue disorder; however, plate fixation for these conditions is becoming a more acceptable alternative due to early mobilization and increased chances of the union.

In our study, wrist arthrodesis in 15 cases results in a high degree of patient satisfaction for pain relief and correction of the deformity. Patients were able to accomplish their routine tasks and activities. We observed retrospectively that VAS and DASH Score has shown significant trend towards decreasing Points, which goes with study by M. Sauerbier [24].

In India, 0.95% of the adult population is affected by RA [25]. As a result, many neglected cases with severe joint deformities are seen in Indian population [26]. 72% of Indian population mainly have profession from agriculture background [27] which require a painless wrist and strong hand, so wrist arthrodesis completes their professional demand.

Complications can be from minor transient problems to major problems, such as wound dehiscence, infection, extensor tendon adhesions, and plate tenderness, which may require implant removal [28,29]. In all 15 cases in follow up of 1 year, only one complication was experienced as implant irritation due to subcutaneous position of the implant. It was removed after two years postoperatively.

6. CONCLUSION

Rheumatoid arthritis with painful destruction of the wrist joint can be managed with wrist arthrodesis. There are multiple methods of joint fusion but plate fixation provides great stability in all directions and delivers a high union rate. Although the literature is rather consistent in showing an outstanding fusion rate with current technique, reports of the ability of total wrist arthrodesis to successfully relieve pain in RA patients are more variable [29]. But in study, we achieved favorable outcome in all operative cases. We strongly recommend this procedure for managing severe wrist arthritis in RA patients.

CONSENT

As per international standard or university standard, patients’ written consent has been collected and preserved by the authors.
ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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