

Case Report

Surgical Treatment of Wrist Joint Dysfunction in Rheumatoid Arthritis: A Report of Two Cases

Running title: Surgical management of wrist joint dysfunction in RA

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Abstract

In rheumatoid arthritis (RA), it is important to actively treat wrist dysfunction to improve patient outcomes. Herein, we report two cases of wrist dysfunction in RA patients who required partial wrist fusion soon after drug initiation.

[Case 1] A 38-year-old woman was referred to our hospital because of left wrist joint pain. At the time of examination, swelling and tenderness of the left wrist joint were observed. After 6 months of medication, no improvement in symptoms was noted; therefore, partial wrist fusion was performed.

[Case 2] A 38-year-old woman was referred to our hospital because of right wrist joint pain. A plain X-ray image showed fusion of the carpal bones. Due to previous failure of drug treatment, the patient opted for arthrodesis.

The postoperative course was good in both cases, and the pain improved.

In these cases of monoarthritic RA, synovitis and bone destruction were observed, but blood tests showed no features of active disease, and drug treatment was ineffective. In such cases, early surgical treatment should be considered, rather than continuing conservative treatment, to ensure the best outcomes.

Keywords: arthrodesis, carpal bones, rheumatoid arthritis, synovitis, wrist joint.

Introduction

In recent years, significant progress has been made in terms of drug treatment options for rheumatoid arthritis (RA). New treatment alternatives, including biological disease-modifying anti-rheumatic drugs (bioDMARDs), have diversified. In the past, a combination of non-steroidal anti-inflammatory drugs, steroids, and conventional DMARDs was used to treat RA, depending on the individual patient and disease condition. However, the advent of methotrexate (MTX) and bioDMARDs have made clinical remission of RA viable.

For the past 20 years, these drugs have revolutionized RA treatment due to their enhanced activity against the disease and joint-protecting properties. Over this period, the following guidelines have been developed: new RA classification criteria in 2010 [1], new RA remission criteria in 2011 [2], the European League Against Rheumatism treatment recommendations in 2013/2016/2019 [3-5], the JCR-RA practice guidelines in 2014/2020 [6, 7], and the American College of Rheumatology treatment recommendations in 2015 [8]. Both MTX and bioDMARDs are at the forefront of RA treatment and are recommended during early phase. The control of disease activity has dramatically improved with these drugs. Furthermore, these drugs have been found to suppress joint destruction [9, 10]. Due to the improved effectiveness of these drugs, the need for RA orthopaedic surgery is predicted to decrease; indeed, artificial joint replacement of large joints in RA patients is decreasing [11-15]. The number of operations for RA have reportedly decreased in Europe and the United States since the year 2000. Recently, Jansen et al. [13] reported that artificial joint surgery for RA, between 1995 and 2010, showed a downward trend for total hip, knee, shoulder, and elbow arthroplasties in Finland. This downward trend was closely correlated with a corresponding upward trend in the increased use of MTX for RA. Kievit et al. [14] noted similar findings in a Dutch cohort between 1989 to 2008. In the Japanese IORRA cohort

of RA patients, between 2001 and 2012, Momohara et al. [15] noted that the total number of joint surgeries for RA declined from 2003 and reached a plateau in 2007; nevertheless, the number of operations on fingers, wrists, toes, and ankles has been persistently increasing since 2009. Although advances in drug treatment have made it easier to achieve a tighter control over RA, residual arthritis in one or two areas is sometimes noted, and surgery is frequently indicated for such cases. Here, we report two cases in which monoarthritis of the wrist joint persisted despite the drug therapy, and surgical treatment had to be performed soon after the therapeutic intervention.

Case presentations

[Case 1] A 38-year-old woman consulted her general practitioner for left ulnar wrist pain. She was suspected of having a triangular fibrocartilage complex injury and underwent conservative treatment for approximately 6 months, but her symptoms did not improve, and she was referred to our hospital. She had swelling and tenderness in her left wrist joint at the time of examination. She also experienced pain while resting, which was exacerbated by moving her hand down. In addition, she tested positive for fovea sign [16, 17], handshake test, and synergy test [18]. However, no instability of the distal radioulnar joint was observed.

Plain X-ray imaging showed a displacement of the carpal bone to the ulnar side toward the centre of the lunate (Figure 1a). Magnetic resonance imaging (MRI) revealed diffuse synovitis of the wrist joint and extensive oedema of the carpal bones (Figure 1b). Although the inflammatory response was low, based on blood test results, the patient was diagnosed with RA as she tested positive for anti-cyclic citrullinated peptide antibody and rheumatoid factor (Table 1).

[Figure 1 near here]

[Table 1 near here]

We immediately administered MTX 6 mg/week orally, but her symptoms did not improve over the following 3 months. Therefore, we increased the dose of MTX to 8 mg/week and initiated bioDMARD. After loading 400 mg of certolizumab pegol (CZP), 200 mg was subcutaneously injected every 2 weeks. However, after 6 months of CZP therapy, she still did not show any symptom improvement. According to the Japanese College of Rheumatology (JCR) RA practice guidelines 2020 [7], the patient was explained the risks and benefits of a second bioDMARD and the Janus kinase inhibitor. However, after considering various treatment

methods, we determined that improvement in wrist synovitis would be difficult with only pharmacotherapy. Moreover, the blood test showed no inflammatory response, and hence we expected that the patient could discontinue drug treatments by undergoing surgery for monoarthritis. Therefore, we opted for surgical treatment.

During the surgery, synovectomy of the wrist joint was performed under arthroscopy. Arthroscopy findings showed cartilage damage to the lunate fossa on the radial joint surface and the lunate bone but no obvious damage to the distal radial joint. Further, there was no obvious damage in TFCC. In addition, marked synovitis was observed in the midcarpal area. However, pain on motion remained postoperatively. We considered radiolunate arthritis to be the cause of the pain. Therefore, six months after the first surgery, partial wrist fusion was additionally performed. Her radial lunate joint surface was freshened, iliac bone was grafted onto the joint, and the joint was fixed with a distal radial locking plate (Synthes Locking. DRP; Synthes, West Chester, PA, USA) (Figure 2). The wrist joint was fixed with a splint for 2 weeks after surgery, and the splint was then replaced with a wrist joint orthosis, which was removed 3 months after surgery. Postoperatively, any resting pain in the left wrist joint disappeared, and pain on movement was improved to the extent that it was slight during passive exercise. Before these operations, her left wrist ROM was 10° dorsiflexion and 10° palmar flexion (80°/80° on the unaffected side). Further, forearm supination was 20°, and pronation was 10° (90°/90° on the unaffected side). However, due to partial joint fixation, supination restriction was reduced to approximately -10° in passive movement. The quick DASH score showed a significant improvement from 72.7 (disability/symptom) / 62.5 (work) / 87.5 (sports/music) points before surgery to 20.5 / 18.8 / 25 points after surgery. Since her symptoms improved and she requested a medical expense reduction, the CZP treatment was withdrawn, and the dose of MTX was reduced to 4 mg/weekly.

[Figure 2 near here]

[Case 2] A 38-year-old woman first presented with right wrist joint pain. She had been diagnosed at another rheumatology hospital with seronegative RA for 13 years (Table 1) and was treated with salazosulfapyridine and MTX, but her symptoms did not improve. She temporarily discontinued her treatment due to pregnancy, but her pain persisted despite being on this medication before pregnancy, and she was referred to our hospital for surgical treatment.

At her first visit, the range of motion (ROM) of the right wrist joint was restricted. The ROM was 0° dorsiflexion and 20° palmar flexion (80°/80° on the unaffected side). Diffuse swelling was observed from the

right wrist joint to the carpal region. Plain X-ray imaging showed destruction of the right carpal joint and confirmed partial fusion (Figure 3a). Computed tomography revealed carpal bone ankylosis in all carpal bones, except the lunate and triquetrum (Figure 3b). T2-weighted MRI showed enhanced brightness centred on the mid-carpal joint. Furthermore, bone erosion was also observed in the carpometacarpal joint (Figure 3c). Since she had interrupted her treatment, we first discussed the enhancement of drug treatment. However, she preferred wrist arthrodesis because her previous treatments did not improve her symptoms, and she was breastfeeding at the time.

[Figure 3 near here]

The surgical findings showed marked synovial hyperplasia between the carpal bones and fusion of some carpal bones. However, there was almost no cartilage damage to the wrist joints. Therefore, we chose to fuse the carpal bones only. The lunate and scaphoid bones were transfixed, and the triquetrum and hamate bones were fixed using Acutrak mini-screws (Acumed, Hillsboro, OR, USA). The scaphoid and capitate bones were then fixed using the Acutrak standard screw (Acumed, Hillsboro, OR, USA) (Figure 4). The wrist joint was fixed with a splint postoperatively, and at four weeks, this was replaced with a wrist brace. The brace was removed at 3 months postoperatively. At the time of examination, 6 months postoperatively, the right wrist joint pain had disappeared, and the ROM of the right wrist joint was 10° dorsiflexion / 10° palmar flexion. The quick DASH score also showed a significant improvement from 86.4 / 75.0 / 75.0 points before surgery to 36.0 / 18.8 / 18.8 points after surgery. At the time of writing this manuscript, the patient was still under observation without medication.

[Figure 4 near here]

Discussion

In this report, we described two cases where although the inflammatory reaction was negative at the initial visit, drug therapy was ineffective, and the monoarthritis of the wrist failed to improve. Both patients remained in remission for RA after undergoing surgical treatment. In addition, in cases of RA with low disease activity based on blood test results, joint-conserving surgery, such as synovectomy and partial wrist fusion, should be considered if the patient has residual wrist arthritis or is refractory to drug treatment. In 1984, Ishihara et al.

reported good outcomes after synovectomy or arthrodesis of wrist joint in RA patients [19], consistent with a case of arthroplasty for the MP joint of the foot reported by Zaid et al. in 2020 [20]. By actively performing the surgery mentioned above to prevent joint destruction, advanced wrist joint destruction can be prevented, and the need for total joint fusion in the future can be avoided.

As mentioned in the introduction, with an improvement in the effectiveness of drugs, the indication for RA treatment has changed from meager pain relief to the suppression of inflammation as well as the prevention of joint and bone destruction. Therefore, especially for large joint diseases, it has become possible to achieve relief, including suppression of joint destruction, only by drug treatment (conventional combination therapy). While drug treatment can alleviate inflammation, functional recovery may still require surgical treatment. A physician can easily recognize the destruction of a large joint in the lower limbs based on pain while walking, and the patient can be referred to a surgeon if appropriate. However, problems in small joints of the upper limbs, such as fingers and wrists, can be easily overlooked, especially if the disease appears to be in good control as assessed by blood tests. Such patients should be informed that surgery could improve their hand and wrist joint pain and dysfunction. The treat-to-target (T2T) strategy aims at remission or reduction of disease activity, in addition to the prevention of joint destruction [21]. Joint destruction can be prevented, even if surgical treatment is required, in agreement with the aims of the T2T strategy. In addition, since there is a possibility that joints may be repaired by drug treatment, it is necessary to consider a surgical method that preserves joints [22, 23]. First, achieving systemic disease control and subsequently planning surgery for local residual symptoms may lead to a better prognosis. Orthopedic surgeons/collagen disease specialists and rheumatologists should work together to achieve a favorable outcome in such cases.

In some cases of monoarthritic RA, wherein synovitis and bony destruction are observed clinically, but an inflammatory response is not confirmed biochemically, drug treatment using MTX may be ineffective. In such cases, early surgical treatment should be considered rather than indiscriminately continuing conservative treatment.

Patient Consent

Written informed consent was obtained from the patients for the publication of their clinical details and images.

Ethical Statement

The present study adhered to the principles of the Declaration of Helsinki and was approved by the Shiga University of Medical Science Hospital Ethical Committee.

Funding details

None.

Conflicts of interest

None.

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Table 1. Biochemical blood examination results at the first visit to our hospital.

	Case 1	Case 2
CRP (mg/dL; 0–0.3)	0.16	0.06
ESR (mm/h; 3–15)	11.0	12.0
MMP-3 (ng/mL; 17.3–59.7)	82.2	43.0
RF (IU/mL; 0–15)	181	2
ACPA (U/mL; 0–4.5)	171	0.6

One patient was seropositive for RA, and the other was seronegative. However, both patients showed negative inflammatory responses on the blood test results.

CRP, C-reactive protein; ESR, erythrocyte sedimentation rate; MMP-3, matrix metalloproteinase-3; RF, rheumatoid factor; ACPA, anti-cyclic citrullinated peptide antibody

Figure legends

Figure 1. Preoperative plain X-ray and MRI of left wrist.

1a) Plain X-ray shows negative ulnar variance and displacement of the carpal bones to the ulnar side toward the centre of the lunate.

1b) MRI showing proliferative synovial changes in the left wrist joint. Bone marrow oedema was observed in the distal radius, scaphoid, triquetrum, and pisiform bones. No abnormalities were found in the TFCC.

MRI, magnetic resonance imaging; FS, fat suppression, stir, short TI inversion recovery; TFCC, Triangular Fibrocartilage Complex.



ACCEPTED

Figure 2. Postoperative plain X-ray of the left wrist.

The radial lunate joint is fused with a distal radial locking plate.

Left panel; anteroposterior view. Right panel; lateral view.



Figure 3. Preoperative plain X-ray, CT, and MRI of right wrist.

3a) Plain X-ray imaging showing destruction and partial fusion of the right carpal joint.

3b) CT showing bony ankylosis in the trapezoid, capitate and hamate bones.

3c) T1-weighted MRI showing low intensity and T2-weighted MRI showing increased brightness centring on the mid-carpal joint but no obvious bone destruction in the carpometacarpal joint.

CT, computed tomography; MRI, magnetic resonance imaging

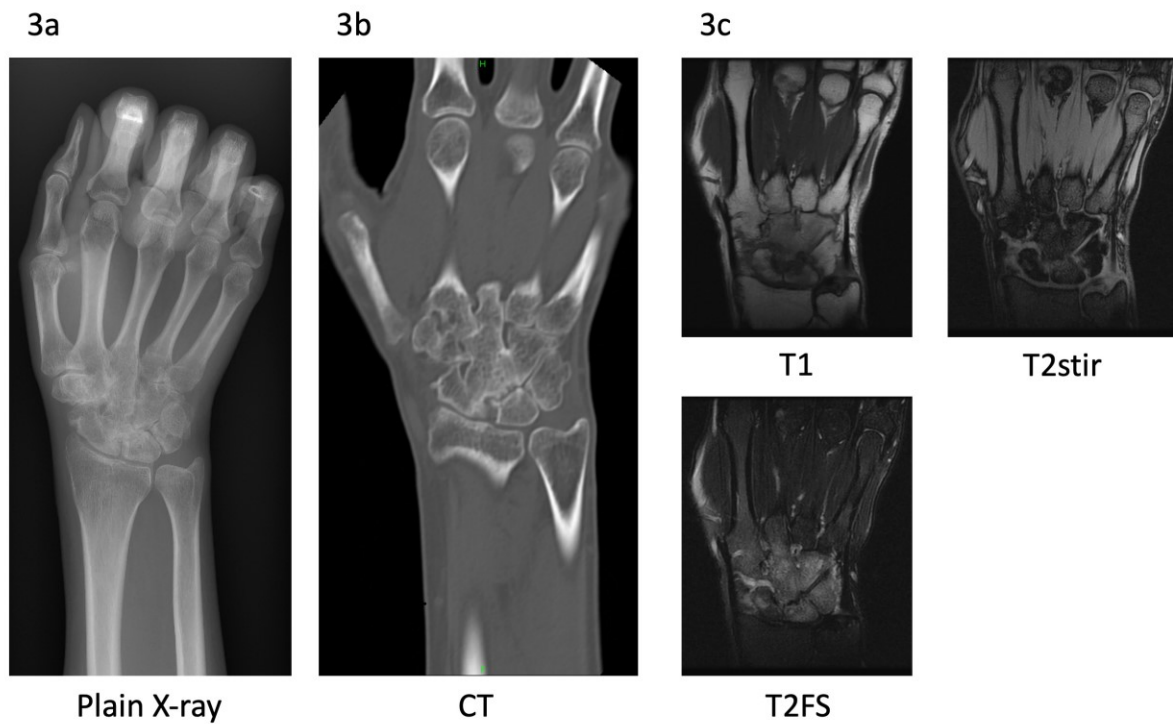


Figure 4. Postoperative plain X-ray of left wrist.

The lunate and scaphoid bones, and the triquetrum and hamate bones, were fixed with Acutrak mini screws, whereas the scaphoid and capitate bones were fixed using the Acutrak standard screw (Acumed, Hillsboro, OR, USA).

Left panel; anteroposterior view. Right panel; lateral view.

