Total Joint Arthroplasty of the Distal Radioulnar Joint for Rheumatoid Arthritis

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Purpose To evaluate the clinical and radiological results of primary total distal radioulnar joint (DRUJ) replacement as well as reconstruction following ulnar head excision in patients with rheumatoid arthritis (RA).

Methods Seventeen patients with RA underwent 19 total DRUJ replacement between 2005 and 2011. Mean age at the time of the surgery was 57 years. Mean follow-up was 39 months (range, 12–79 mo). Pain level was evaluated using a visual analog scale (VAS). Pronation and supination were recorded before and after surgery. A patient satisfaction survey was used, as well as postoperative Disabilities of the Arm, Shoulder, and Hand (DASH) and Patient-Related Wrist Evaluation (PRWE) scores. Ulnar translocation of the carpus was assessed radiographically, and the presence or absence of radiolucent zones around the implant were recorded.

Results The preoperative average VAS score for the 19 joints was 7.3. Pain decreased after surgery to 2.2. Pronation improved from 56° before surgery to 78° afterward, a 39% improvement. Supination improved from 57° before surgery to 71° afterward, a 27% improvement. Final scores were 24 for the DASH and 24 for the PRWE. Fifteen patients reported substantial pain relief. All patients were satisfied with their surgical result.

Conclusions The results of this study suggest that total replacement of the DRUJ is of benefit to the patient with RA. Pronation was significantly increased and supination was increased but did not approach significance. Improvement in VAS score suggests that pain was decreased. *(J Hand Surg Am. 2014;39(9):1699–1704. Copyright © 2014 by the American Society for Surgery of the Hand. All rights reserved.)*

Type of study/level of evidence Therapeutic IV.

Key words Distal radioulnar joint arthritis, implant, rheumatoid arthritis, wrist pain.

Surgery of the rheumatoid wrist is a challenge because the disease often results in inflammatory destruction not only to the radiocarpal joint but also to the distal radioulnar joint (DRUJ).[1] Successful treatment entails addressing stability, motion, and pain. Whether or not these goals are achieved is primarily dependent on how well the DRUJ functions.

Nearly 80% of patients with rheumatoid arthritis (RA) will manifest signs and symptoms of wrist degeneration.[2] Backdahl[3] coined the term *caput ulnae* syndrome to describe the anatomy and clinical picture of the DRUJ in RA. There are several pathoanatomical features of this syndrome: palmar subluxation and supination of the carpus (with the appearance of prominent ulnar head), palmar subluxation of the extensor carpi ulnaris (ECU), and ulnar translocation of the carpus. The end result is a painful wrist with limited motion.[4]

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Received for publication March 12, 2012; accepted in revised form March 27, 2014.

L.R.S. holds a patent and is co-owner of APTIS Medical.

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0363-5023/14/3909-0005$36.00/0
http://dx.doi.org/10.1016/j.jhsa.2014.03.043

Compromise of the DRUJ follows a predictable pattern. Inflammatory infiltrate and synovial proliferation affect the triangular fibrocartilage complex (TFCC), ulnocarpal ligaments, and ECU tendon sheath. Multiple factors contribute to instability of the DRUJ, including cartilage loss, bony erosion, ligament weakness, and tendon laxity.[5,6]

In addition to altering DRUJ kinematics, RA can precipitate tendon ruptures, termed the Vaughan-Jackson syndrome.[7] Many authors have noted these ruptures in patients with RA as a consequence of attrition or abrasion over the prominence in the ulna.[8,9] Poor nutrition and vascular disease may be contributing factors.[10]

Historically, operative procedures available for the deranged DRUJ include distal ulna resection (Darrach), DRUJ arthrodesis with ulnar pseudoarthrosis (Sauvé-Kapandji), and prosthetic reconstruction.[11–13] Traditionally, the most used and reported procedure is the Darrach technique. Potential complications of distal ulna resection include ulnar translocation of the carpus and radioulnar impingement syndrome.[14,15] This also applies to the Sauve-Kapandji procedure, a technique that, in theory, prevents carpal translocation.[12]

Biomechanical studies have shown the DRUJ to be a load-bearing joint;, and radioulnar convergence and instability reduce lifting capacity.[16,17] The development of prosthetic replacements has led to improved strength of the fingers, wrist, and forearm.[18] However, an ulnar head prosthesis or unipolar replacement requires the integrity of surrounding soft tissues to provide stability.[19] Damage to the wrist stabilizers secondary to inflammatory synovitis could, therefore, negatively affect the results of unipolar implant use.

Total replacement of the DRUJ overcomes these limitations. It does not require ligament reconstruction or the presence of the sigmoid notch. Clinical work has shown that a self-stabilizing total DRUJ prosthesis (APTIS Medical LLC, Louisville, KY) improves strength and provides stability.[20] This offers an additional treatment option, even for the individual with severe impairment from chronic disease. The following study was performed to evaluate clinical and radiological outcomes using a total joint arthroplasty of the DRUJ in patients with RA.

MATERIALS AND METHODS

After obtaining approval from our institutional review board, a retrospective chart review was performed of all RA patients undergoing DRUJ replacement with the APTIS total DRUJ prosthesis by the same surgeon (L.R.S.) between 2005 and 2011. There were 17 patients and 19 prostheses, 12 were on the right and 7 on the left. Six patients presented with bilateral disease, 2 of whom underwent surgery on both wrists. The dominant hand was affected in 10 individuals. Twelve of the subjects were women and 5 were men. The average age at the time of the surgery was 57 years (range, 38–85 y). Mean follow-up period was 39 months (range, 12–79 mo).

The preoperative range of pronation and supination was noted. Pain level was measured using a 10-point visual analog scale (VAS), where 0 was no pain and 10 was the worst possible pain. Any aggravating problems, previous surgeries, ancillary procedures, or modifications of the standardized technique were noted. Postoperative evaluation included a VAS pain rating and pronation and supination measurements.

Statistical analysis was carried out between continuous variables by performing a 2-sided Student *t* test with a threshold value of P of .05 or less. Unpaired data were analyzed to ensure equal variance of the data sets, and then an unpaired Student *t* test was performed. A threshold value of P of .05 or less was also used.

All patients completed a postoperative Disabilities of the Arm, Shoulder, and Hand (DASH) and Patient-Rated Wrist Evaluation (PRWE) questionnaire. Patient satisfaction was determined by self-assessment of general wrist function improvement and the need for analgesics (narcotic and non-narcotic) before and after surgery. Patients were asked on a survey questionnaire if they would have the same procedure on the opposite wrist if needed and if they would recommend the procedure to another patient. A standard grading scale of 1 to 5 was used for this questionnaire, (5 being strongly agree, and 1 being strongly disagree).

Lifting capacity was also determined by a presently nonvalidated test with the patient standing and with shoulder, elbow, and wrist in neutral position. While holding nothing or a counterweight of 1.9 or 3.9 kg in the hand, the patients flexed their elbows and lifted their hand against gravity.

All patients were evaluated before and after surgery with posteroanterior and lateral x-ray views. Postoperative wrist films were evaluated starting 2 weeks after surgery and were periodically studied up to a mean of 22 months. Ulnar translocation is defined as the position of the carpus relative to the radius. Three commonly used ratio techniques were used in the present study. These were the ratio of vertical line through the midaxis of the radius to the center of the capitate/the length of the third metacarpal (Chamay), the ratio of the radial styloid to the center of the capitate/the length of the third metacarpal (DiBenedetto), and the ratio of