EDITOR'S CHOICE

Five- to 10-Year Prospective Follow-Up of Wrist Arthroplasty in 56 Nonrheumatoid Patients

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Purpose The goal of the study was to evaluate the clinical and radiological outcomes of a cementless wrist arthroplasty with minimum 5-year follow-up in nonrheumatoid patients.

Methods Fifty-seven (40 male) patients with end-stage arthritis changes received an uncemented ball-and-socket total wrist arthroplasty (Motec Wrist). Function was evaluated before surgery and at yearly follow-ups. Visual analog scale at rest and activity, quick Disabilities of the Arm, Shoulder, and Hand (*Quick*DASH), active range of motion (AROM), and grip-strength were recorded. Standardized radiographs were taken to assess osteolysis, loosening, and subsidence.

Results Fifty-six patients were followed for a mean of 8 years (SD, 2 years). Eight wrists were reoperated with arthrodesis (4) or a new arthroplasty (4) owing to distal component loosening (3), infection (2), pain/fixed malposition (2), or proximal and distal component loosening (1). One radiocarpal dislocation was reduced closed and remained stable. Improved *Quick*DASH score and visual analog scale pain score both at rest and during activity were found at the last follow-up, as well as increased AROM (97° vs 126°) and grip strength (21 kg vs 24 kg). The radiological follow-up demonstrated loosening in 2 wrists. Thirty-five patients were working at surgery (17 manual labor) and 27 (11 manual labor) at follow-up. The 10-year Kaplan-Meyer survival of the implants was 86% for revision for any cause; 2 additional arthroplasties are loose (but not revised), giving a survival rate of 82% if these are revised prior to 10 years of observation.

Conclusions An uncemented total wrist arthroplasty can provide long-lasting unrestricted hand function in young and active patients. *(J Hand Surg Am. 2017;42(10):788–796. Copyright © 2017 by the American Society for Surgery of the Hand. All rights reserved.)*

Type of study/level of evidence Therapeutic IV.

Key words High-demand, osteoarthritis, nonrheumatoid, posttraumatic, total wrist arthroplasty.

THE ADVANCES IN HIP AND KNEE arthroplasty have stimulated the development of wrist prostheses with similar materials and fixation principles. A variety of articulations have been proposed including hinged, reverse, egg-shaped, cylindrical, and ball-and-socket designs. Early results were promising, but midterm follow-up was often disappointing.[1–4] The few reports on contemporary arthroplasties are mostly retrospective studies of patients with inflammatory arthritis.[5] The designs of the prostheses vary and few long-term results are reported.[6] Prospective short-term results with the Remotion (Stryker Medical, Kalamazoo, MI) and Motec (Swemac AB Orthopedics, Linkoping, Sweden) arthroplasties have been promising.[7,8] A registry-based multicenter study demonstrated a survival rate of 90% at 5 to 9 years follow-up with the Remotion prosthesis, which is comparable with total ankle and elbow replacements.[9] The Remotion and Motec prostheses have primarily been used in patients with inflammatory and posttraumatic arthritis, respectively. The purpose of our

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TABLE 1. Diagnoses

	n	%
SNAC wrist	16	28
SLAC wrist	14	25
Kienböck disease*	9	16
Distal radius fracture	7	12
Primary osteoarthritis	7	12
Other (eg, partial amputation [1], crush injury [1], prior infection [2])	4	7
Total	57	100

SLAC, scapholunate advanced collapse; SNAC, scaphoid nonunion advanced collapse.
*Four had Lichtman stage IIIB and 4 had Lichtman stage IV disease, 1 had a failed silicone lunate replacement.

TABLE 2. Wrist Surgery Prior to Arthroplasty

Fracture/nonunion surgery (radius/scaphoid-carpus)	21
Arthrodesis/resections (4CF, triscaph arthrodesis, lunate removal, stylodectomies, CMC1 interposition)	14
Miscellaneous procedures (arthroscopic procedures, tenosynovectomies, hardware removal, scapholunate (Brunelli) ligament reconstruction)	13
Distal ulna/Darrach	2
Total	50

4CF, 4-corner fusion.

prospective study was to assess the clinical and radiological results following cementless total wrist arthroplasty in nonrheumatoid patients with a minimum follow-up of 5 years.

MATERIAL AND METHODS

The study was approved by the Data Protection Officer at Oslo University Hospital (2006/10846 and 2011/20766), and all patients gave written informed consent to participate in the study.

Between 2006 and 2011, all patients with chronic wrist pain and degenerative (noninflammatory) arthritis of the wrist, eligible for wrist arthrodesis (68 patients altogether) were offered wrist arthroplasty. Fifty-seven patients (40 male) with a mean age of 52 years (SD, 11 years) preferred arthroplasty. There were 37 right wrists and 37 were operated on their dominant side. The cause of wrist degeneration is shown in Table 1. Osteoarthritis of the distal radioulnar joint was seen in 13 wrists at surgery (in addition to 2 patients with prior Darrach procedure).

Twenty-nine wrists had undergone a total of 50 surgeries prior to the arthroplasty (Table 2). Eleven bilateral wrist problems comprised primary osteoarthritis (4), scaphoid nonunion advanced collapse wrist (4), radius fracture (2), and scapholunate advanced collapse wrist (1). None of the patients underwent bilateral arthroplasty.

Fifty-seven total arthroplasties were performed with the modular screw-shaped uncemented Motec Wrist. The grit-blasted surfaces of the screws were coated with resorbable calcium phosphate Bonit (DOT Medical, Rostock, Germany). Three lengths of radius component (32, 38, and 44 mm) and 5 of capitate/third metacarpal (CMC3) component (45, 50, 55, 60, and 65 mm) screws were available, the latter in 2 thicknesses. The screws were intended for diaphyseal fixation in the radius and third metacarpal as well as fixation in the cancellous juxta-articular parts of the radius and CMC3. The CMC3 joint was fused (removing a wedge of the joint, extending the capitate, and transplanting cancellous bone) to create a one-bone CMC3 for fixation of the distal component. We used an 18-mm highly polished chrome-cobalt-vanadium metal-on-metal (MoM) ball-and-socket articulation (15 mm and metal-on-poly-ether-ether-ketone, a wear-resistant polymer are also available[10]) (Fig. 1).

The modular ball-and-socket taper-lock coupling has 3 neck lengths (giving a total of 5-mm difference) for tension adjustment. The metacarpal screws can be used for fixation in patients with a small radius and medullary canal. A detailed description of the implants and operative procedure has been reported by Reigstad et al.[8] At the start of the series, minimal bone resection was performed (limited to the lunate and proximal part of the scaphoid) to ease conversion to arthrodesis in cases for failure. Later, more bone (a proximal carpectomy and a radial styloidectomy) was removed during arthroplasty insertion to avoid the ulnar or radial impingement seen in some of the earlier cases. In 2 wrists, a simultaneous Darrach procedure was done. After 6 weeks of postoperative immobilization in a cast, formal hand therapy was initiated and a home exercise program was given. Unrestricted motion and load-bearing was permitted and encouraged.

The patients were evaluated before surgery as well as at 6 weeks, 6 months, 1 year, and yearly thereafter. They completed the quick Disabilities of the Arm, Shoulder, and Hand (*Quick*DASH) score[11] and graded radial- and ulnar-sided wrist pain at rest and during activity using a visual analog scale from 0 to 100 (0 indicating no pain). Active range of motion (AROM: flexion, extension, and radial and ulnar deviation) and active forearm rotation were measured using a