SCIENTIFIC ARTICLE

Complications Following Partial and Total Wrist Arthroplasty: A Single-Center Retrospective Review

Michael P. Gaspar, MD,*† Jesse Lou, BA,* Patrick M. Kane, MD,*†
Sidney M. Jacoby, MD,*† A. Lee Osterman, MD,*† Randall W. Culp, MD*†

Purpose To describe our institution's experience with complications following partial and total wrist arthroplasty (TWA).

Methods We performed a retrospective review of 105 wrist surgeries in 100 patients who underwent surgery with prosthetic replacement of the distal radius, the proximal carpus, or both at a single institution. Patient factors including age, sex, body mass index, handedness, underlying disease, and previous injury were recorded. Outcomes focused particularly on postoperative complications and need for revision surgery.

Results Forty-seven TWAs, 52 distal radius hemiarthroplasties, and 6 proximal carpal hemiarthroplasties were reviewed with a mean follow-up duration of 35 ± 28 months. Overall complication and revision rates were 51% (53 of 105) and 39% (41 of 105), respectively. Postoperative contracture accounted for the largest number of complications needing additional surgery (20%), followed by component failure (15%). Deep infections occurred in 2 TWAs and 1 distal radius hemiarthroplasty and required removal of hardware, antibiotic spacer placement, and a prolonged course of intravenous antibiotics prior to a definitive operation. Of those patients requiring additional surgery, 41% (n = 10) underwent at least 2 procedures, and 10% (n = 4) underwent at least 6 additional surgeries.

Conclusions Although TWA and partial wrist arthroplasty are attractive treatment options for the painful arthritic wrist, there remains a noteworthy potential for complications requiring additional surgery. A detailed understanding of these risks is essential for surgeons so that patients may be counseled accordingly and that alternative treatment options may be considered. *(J Hand Surg Am. 2016;41(1):47–53. Copyright © 2016 by the American Society for Surgery of the Hand. All rights reserved.)*

Type of study/level of evidence Therapeutic IV.

Key words Complications, hemiarthroplasty, revision surgery, total wrist arthroplasty, TWA.

Additional material is available online.

HISTORICALLY, WRIST ARTHRODESIS HAS been the mainstay treatment for painful arthritis of the wrist.[1] Although improvement in wrist pain from arthrodesis is often predictable and reliable, it comes at a major functional cost, most notably in mobility. Partial wrist arthroplasty and total wrist arthroplasty (TWA) were developed with the intent of preserving motion while still providing pain relief.

*From the *Philadelphia Hand Center; and the †Department of Orthopedic Surgery, Thomas Jefferson University Hospital, Philadelphia, PA.*

Received for publication July 20, 2015; accepted in revised form October 28, 2015.

No benefits in any form have been received or will be received related directly or indirectly to the subject of this article.

Corresponding author: Michael P. Gaspar, MD, The Philadelphia Hand Center, PC, The Franklin, Suite G114, 834 Chestnut St., Philadelphia, PA 19107; e-mail: michaelpgaspar@gmail.com.

0363-5023/16/4101-0008$36.00/0
http://dx.doi.org/10.1016/j.jhsa.2015.10.021

Total wrist arthroplasty has been indicated mostly for patients with end-stage rheumatoid arthritis (RA).[2,3] However, the evolution of TWA designs in recent years has enabled clinicians to consider TWA for broader indications because later-generation TWA designs have allowed for minimal bone resection while better mimicking natural wrist anatomy and motion.[4,5] Similarly, with increasing public awareness of advancements in medical treatment options and technologies, more patients are likely to request the function-preserving option of arthroplasty.

Despite continued advances in implant design and surgical technique, complications following wrist arthroplasty are frequent and often devastating.[5–11] One meta-analysis of TWA showed a major complication incidence of 25%, as defined by those patients who required additional surgeries or closed reductions, and/or developed nerve symptoms, muscle imbalance, or nonunion.[6] When major complications such as chronic infections or component loosening do not resolve, arthrodesis is sometimes necessary.

Component loosening has been a major cause for revision arthroplasty. Although longer-term outcomes in more recent TWA implants remain unknown, the suggested factor involving loosening is generally related to the distal component of the TWA prosthesis due to changes in wrist kinematics and patient activity levels that exceed the capacity of the implants.[12]

As a means of avoiding complications stemming from the presence of a distal carpal implant, a newer procedure combining proximal row carpectomy (PRC) with distal radius hemiarthroplasty (DRH) has been proposed.[13] Theoretically, this would provide a motion-sparing alternative in patients with preserved articular surface of the distal carpal row when arthrosis at the lunate facet of the radius would preclude PRC alone.[13] This could be a particularly useful option in younger patients with higher activity levels and who would not be well-suited for TWA. In addition, DRH could possibly be converted to a TWA or arthrodesis if needed in the future.[13,14]

As a relatively new procedure, reports of DRH are limited. Culp et al[14] reported their early experience with DRH in 10 patients with a mean follow-up duration of 19 months. Overall results suggested that DRH was subject to the same set of complications as TWA, many of which required additional surgery. Eight patients in that series were treated using the radius component of the BioMet Maestro Wrist Reconstructive System (BioMet, Inc., Warsaw, IN), which included a polyethylene liner articulating with the distal carpus used in an "off-label" fashion. Owing to a large number of complications related to polyethylene disease, the authors modified their technique to instead use the radius component of the ReMotion Total Wrist Implant (Small Bone Innovations, Inc. [SBi], Morrisville, PA) later in the study period. This implant consists of a metal articulating component, and at the time of follow-up, neither of the 2 study patients implanted with the ReMotion system had developed complications. It is unclear if the use of implants with metal articulation in DRH would curtail the incidence of complications beyond the short term in a larger number of patients. With TWA implant design continuing to evolve, with wrist hemiarthroplasty still in its early stages, and with more patients possibly to be treated with these techniques, we hypothesized that complication incidences of both procedures were higher than what is currently reported.

The purpose of this study was to report midterm complications of wrist arthroplasty. In particular, we aimed to characterize the types of complications that occur and the subsequent unplanned or revision surgeries that were required. In addition, we planned to elucidate any differences in complication and revision incidences between total and hemiarthroplasties of the wrist and between implant types and designs. This information could benefit surgeons in selecting among wrist hemiarthroplasty, TWA, or partial wrist arthrodesis, particularly when the indications based on disease alone were inconclusive.

METHODS

This study was approved by our institutional review board. Using our departmental electronic billing database search for Current Procedural Terminology (American Medical Association, Chicago) codes 25441 and 25446, we identified all patients who underwent surgery with prosthetic replacement of the distal radius, the proximal carpus, or both at our institution from January 2005 through December 2014. All surgeries were performed by 1 of 2 senior fellowship-trained hand surgeons (A.L.O. and R.W.C.). Patients who had previously undergone TWA or arthrodesis on the same wrist were excluded from this study. In addition, patients with follow-up of less than 1 year (unless complications occurred within that time period) were also excluded.

Surgical technique, indications, and implant selection

Surgical technique was performed similarly to that previously described for TWA and carpal hemiarthropathy (CH),[12] or DRH.[14] Generally, the wrist was exposed through a dorsal ligament-splitting approach using an "inverted-T" capsular incision as described by Culp et al.[14] All surgeries used uncemented components, and carpal fixation for TWA and CH used