In 1890, Themistocles Gluck performed the first total wrist replacement, implanting an ivory ball-and-socket prosthesis in a 19-year-old male patient with tuberculosis. Although Gluck’s first patients suffered from persistent infection, his subsequent patients demonstrated good long-term results. Despite initial successes, the use of wrist arthroplasty has made slow progress within the orthopaedic arena and, unlike other total joint replacements, remains relatively uncommon. This discrepancy is multifactorial and most likely relates to the complexity of the wrist joint, the difficulty with previous implants, and the success of alternative treatments.

**Indications and Pathophysiology**

The primary indication for total wrist arthroplasty, today, is rheumatoid arthritis (RA). The choice is influenced by several patient factors. Patients with RA frequently have bilateral wrist involvement. In addition, these patients are severely impaired by their disease process. Last, patients with RA tend to place relatively low demands on their prostheses.

RA is the most common type of inflammatory arthritis. The disorder can involve any of the synovial joints and frequently involves the wrist. The synovial lining is affected first. As the disease progresses, the enzymatic tissue progressively erodes the bones and soft tissue. The wrist may become unstable with resulting deformity. Evans and associates demonstrated, in vivo, kinematics of the rheumatoid wrist are significantly different from the normal wrist in both flexion-extension and radioulnar deviation. The rheumatoid wrist behaves more like a hinge joint, with axes located close to the capitate. Nonoperative treatment of symptomatic RA of the wrist includes the use of systemic drugs, steroid injections, and splints. Indications for surgery are progressive pain, deformity, and loss of function. Viable surgical options include: synovectomy, intercarpal fusion, interposition arthroplasty, silicone spacers, joint arthroplasty, and arthrodesis.

Although multiple surgical procedures have been proposed in the past for treatment of the pain and deformity of RA, wrist arthrodesis has proven to be the most successful. However, patients with RA have multiple joint involvement, which leads to difficulty with decision-making during attempts to provide pain relief and maintain function. Total wrist arthroplasty, thus, has emerged as a viable option to maintain a functional range of motion in patients with degenerative disease of the wrist.

**Total Wrist Implants**

In 1967, Swanson began using silicone implants in the radiocarpal joint as an adjunct to resection arthroplasty (Fig. 1). The purpose of the implant was to maintain joint space and alignment while providing some stability and pain relief. In time, fibrous tissue would form around the wrist joint. The implant consisted of a proximal stem that fit into the medullary canal of the radius while the distal stem passed through a hole in the capitate into the third metacarpal. A Dacron reinforcement in the core provided axial stability and resistance to torque. The original silicone rubber was converted to a high performance elastomer in 1974. Additional modifications included widening of the original barrel-shaped midsection and distal stem as well as shortening of both component stems.

In 1984, Swanson and coworkers reported on the early
results of 181 implants in 139 patients. At a mean follow-up of four years, 90% of the patients had complete pain relief, 7% had mild pain, and 3% had moderate pain after prolonged activity. Twenty-five wrists were revised, nine for fracture, four for tendon imbalance, and five for recurrent synovitis. Three wrists were converted to arthrodesis. In 1980, Goodman and colleagues reported the initial results of 37 silicone arthroplasties in patients with RA. All patients had a minimum of six-month follow-up. Thirty-one of 37 patients had pain relief, and the average postoperative range of motion increased from 50° to 64°. Three wrists sustained a periprosthetic fracture (8%). In 1986, Brase and Millender reported follow-up on this same group of patients. They reviewed 71 arthroplasties, revealing a 20% fracture rate and an additional 5% that were revised for pain or deformity. Prosthetic fractures have been found to be associated with excessive stress, excessive motion, tendon imbalance, and preoperative radiographs that demonstrated advanced destruction. Additional early reports of patients receiving the Swanson implant for arthroplasty revealed a high incidence of complete pain relief and a significant increase in their ability to perform activities of daily living. While prosthetic fractures continued to be of concern, no clinical correlation was observed.

In 1991, Fatti and associates demonstrated deterioration in patient function over time with the Swanson implant; 58 implantations were performed in 47 patients and followed for an average of 5.8 years. At a follow-up of less than 2.5 years, 75% of patients had relief of pain. After 4.8 years of follow-up, 67% had pain relief and at an average of 5.8 years of follow-up, only 51% had relief of pain. Additionally, radiographic changes were apparent in 100% of patients at an average follow-up of 5.8 years.

Complications associated with the Swanson implant include fracture, silicone synovitis, persistent pain, and extensor tendon imbalance. Prosthetic fracture usually occurs at the junction of the distal stem and barrel, though incidence has decreased with the addition of metal grommets. Silicone synovitis has been reported in 30% of patients. Retrieval studies demonstrated small silicone particles embedded in the synovium, which then lead to synovial hypertrophy and eventual invasion into adjacent carpal bones and radius. Despite the complications noted, the implant has a good clinical history and perhaps still has a role in the elderly, low-demand patient.

**Wrist Arthroplasty Design**

The use of metal implants began in 1969 with Gschwend and Scheier. The simple ball-and-socket design had a single center of rotation with three degrees of freedom. It provided little resistance to axial load and torque between the articular surfaces and minimal ability to transmit forces from the hand to the forearm. The prosthesis had little application outside of Germany.

**Meuli Wrist Prosthesis**

In 1972, Meuli introduced his original prosthesis, a three-part, nonhinged ball-and-socket implant. This cemented, unconstrained prosthesis had no axial offset, and the ball was composed of polyester. Six of the first 41 patients developed problems with the polyester. Additionally, the center of rotation was too far radial, resulting in significant ulnar deviation. The prosthetic design was then modified with a slightly volar and ulnar offset to the axis and a polyethylene ball.

In 1974, clinical trials were initiated at the Mayo Clinic with the Meuli arthroplasty. During the first three years, 101 Meuli wrist arthroplasties were implanted at the Mayo Clinic. At an average of two years’ follow-up, Beckenbaugh reported pain relief in 96% of patients, with 85% of patients reporting significant improvement after surgery. The most common postoperative problem noted was ulnar deviation of the wrist and difficulty with balancing of the prosthesis. Cooney and colleagues published the longest follow-up of the Meuli prosthesis in 1984. The Mayo Clinic experience of 140 implants demonstrated a reoperation rate of 33% including an 8.6% dislocation rate, prosthetic loosening in 2.9%, and soft-tissue deformity or contracture in 12.1%. To adjust for problems with stability and imbalance, the Meuli 3rd generation prosthesis (MWP III) was released in 1986. The prosthesis was made from a titanium alloy with a corundum rough-blasted surface for implantation using either a cement or press-fit technique. The nitride coated ball was fixed to the proximal component and articulated with a relatively deep UHMWPE (ultrahigh molecular weight polyethylene) socket distally. The anchoring prongs of the carpal component were angled 15° dorsal to the median axis. In 1997, Meuli published his own results of 40 MWP III implants. At an average of 5.5 years, 32 patients were satisfied with their prosthesis; 86% of patients noted an improvement with functional activities. Postoperative range of motion averaged 30° flexion, 40° extension, 10° abduction, and 85° of median axis.
radial deviation, and 10° ulnar deviation. Grip strength was measured pre- and postoperatively, demonstrating a minimal increase in patients with rheumatic arthritis (2 kg to 5 kg) and moderate improvement in those with posttraumatic arthritis (10 kg).31

**Volz Prosthesis**

At the same time that Meuli was introducing the ball-and-socket prosthesis, Volz developed an implant to recreate the biaxial motion of the wrist. The Volz prosthesis is a semiconstrained hemispherical configuration with a toroidal section. A toroidal articulation contains two different radii of curvature, one allowing flexion-extension and the second radial-ulnar deviation. In this way, no rotation or translation is allowed.2,32 The implant allowed a maximum of 90° of flexion-extension and 50° of radial-ulnar deviation. In 1976, Volz published his initial results of 17 implants in 14 patients. All but two patients developed significant increases in range of motion and functional ability. Patients with RA demonstrated 50° of flexion-extension and 35° radial-ulnar deviation.33 A multicenter review of 50 patients, in 1977, confirmed superior clinical results; however, 33% demonstrated postoperative ulnar deviation.32

In an effort to decrease the incidence of ulnar deviation, the design was modified to a single-pronged distal component in 1977. Good or excellent results were reported by 15 of 22 patients in a preliminary report by Lamberta and associates.34 In 1984, Volz reported on 25 wrist arthroplasties performed with the new component design. Superior patient functional results were obtained at an average follow-up of 3.2 years. More encouraging, however, was the lack of radioulnar imbalance that had been prevalent in the initial studies.35 Dennis and coworkers presented a long-term review of the Volz arthroplasty in 1986. All patients were followed for an average of 69 months, and 86% reported improvement after the surgery. With the extended follow-up, loosening and bone resorption became apparent. Seventy-nine percent of implants had radiographic signs of bone resorption beneath the collar of the radial component.36 The longest follow-up of the Volz prosthesis was reported by Bosco and colleagues in 1994.37 Eighteen consecutive Volz implants were followed for an average of 8.6 years. Fifteen patients demonstrated mild to no pain with good functional motion. At an average of 8.6 years, 22% of the metacarpal and 6% of the radial components were loose. Wrist implants for 10 years or longer demonstrated a 30% loss of carpal height.

In 1988, the original Volz prosthesis was redesigned to address previously noted complications associated with cement usage and problems with radioulnar imbalance.37 The new Clayton-Ferlic-Volz (CFV) device was a modular titanium prosthesis with an elliptical articular surface offset to facilitate wrist balance.2,25 In 1995, Ferlic and Clayton reported the results of 15 implants. Six failures were noted: two for infection, three for distal component loosening, and one for radioulnar imbalance.38 In 1993, the prosthesis was discontinued.

**Trispherical Prosthesis**

The trispherical prosthesis is a new configuration of the ball-and-socket articulation. Developed at the Hospital for Special Surgery, it is a semiconstrained implant with a ball-and-socket articulation traversed by a fixed axle. The components are made of titanium with an UHMWPE bearing surface. The metacarpal component has a large central stem designed for fixation into the third metacarpal and an offset stem for the second metacarpal base and scaphoid to provide resistance to torque.2,39 The plastic bearing fits into the metacarpal component and provides a moving center of rotation. It is designed to provide 15° of radial and ulnar deviation, 90° of flexion, 80° of extension, and 10° of axial rotation.3,25,40

In 1990, Figgie and associates published results for 35 trispherical implants at an average follow-up of nine years.41 Their results demonstrated little change from previously published results of five-year follow-up.39 Pain relief was excellent in 30 of 35 wrists. Two patients required revision, one for implant loosening and one for persistent pain, both secondary to component malpositioning. There were six cases of postoperative extensor tendon attrition, all in patients who had had preoperative tendon ruptures that were reconstructed with tendon transfers.40 Postoperative range of motion increased from a 30° flexion-extension arc to 50°. In 1995, Kraay and Figgie calculated a 97% survivorship at five years and 93% survivorship at 10 and 12 years in 67 consecutive trispherical total wrist procedures.42 All procedures were performed for inflammatory arthritis. Neither gender nor age was found to be statistically significant covariates for implant failure.

A report from the Hospital for Special Surgery, in 1997, reported a 9% (8 implants) revision rate at an average of 8.7 years in 87 trispherical total wrist implants.43 Five implants were revised for mechanical failure, with loosening of the metacarpal component and perforation of the metacarpal shaft in three, radial component loosening and fracture in another, and fractures of both the metacarpal and radius in a third. Two patients developed attritional rupture of extensor tendons, and one developed late sepsis. Five patients were treated with implant removal and arthrodesis, two with revision arthroplasty and one with resection arthroplasty.

**GUEPAR Prosthesis**

The GUEPAR prosthesis, introduced in 1979, was unique in three ways. First, the radial component was composed entirely of polyethylene. Second, the carpal component was anchored into the second and third metacarpal, using screw fixation in an attempt to address the problem of distal component loosening.3,44 Finally, the GUEPAR prosthesis was the first to use a minimally constrained elliptical geometry to mimic the radiocarpal articulation.25
In 1988, a review of 32 implants in 28 patients with an average follow-up of 2.5 years demonstrated nine poor results. Five patients developed postoperative stiffness, and four were either loose or dislocated. Two cases were revised for progressive subsidence of the carpal component, and 18 (56%) had radiographic evidence of loosening. In 1996, Fourastier and associates reported on 72 GUEPAR arthroplasties in 64 patients, with an average follow-up of four years. Postoperatively, 86% of patients had minimal to no pain, and 96% had improved function. Eleven wrists (15%) were revised secondary to radial component loosening and bone resorption.

Biaxial Prosthesis

Developed at the Mayo clinic between 1978 and 1982, the biaxial prosthesis was designed to solve the problem of loosening associated with ball-and-socket implants. The distal component was created with a long, porous-coated stem for metacarpal fixation and an ellipsoid shaped head. The polyethylene bearing surface is attached to the porous-coated radial component. The nonconstrained, ellipsoidal articulation is offset ulnarly and palmarly and designed to duplicate flexion-extension and radial-ulnar deviation of the native wrist.

Lirette and Kinnard first reported on the biaxial prosthesis in 13 patients with RA. All patients reported outcomes as good or excellent at an average follow-up of 54 months. Four patients demonstrated mild radiolucent lines, with one postoperative dislocation. In 1996, the Mayo Clinic first reported on their results of 57 implants followed for a minimum of five years. Ninety-seven percent of patients demonstrated minimal or no pain at last follow-up exam. The mean range of motion increased minimally, however the arc of motion was noted to be translated into a more functional range. Failure occurred in 11 cases: eight because of carpal component loosening, one due to infection, one from dislocation, and one from soft tissue imbalance. This was manifest radiologically with distal implant subsidence greater than 3 mm at one year. The overall survival rate at five years was 82%.

Due to the significant concern of loosening in patients with poor bone stock, a custom multi-pronged distal component was designed. The distal component was modified to include a longer third metacarpal stem to bypass the weakened bone and an additional stem component to obtain fixation in the second metacarpal. Early results of 10 patients demonstrated two failures, one at one year and one at 3.5 years. Both patients went on to receive arthrodeses. At an average follow-up of 3.8 years, the eight remaining patients had functional wrists, with three demonstrating asymmetric radiolucent lines. In 2003, Rizzo and Beckenbaugh published the results of the revised biaxial implant, with a single long metacarpal stem. Seventeen patients were preoperatively identified as having poor bone stock and received the long-stem primary prosthesis. At an average of 73.9 months postoperatively, no patient had required reoperation or had demonstrated a failed prosthesis. At most recent follow-up, all patients reported minimal to no pain. Radiographic evidence of lucency was demonstrated in four of 17 patients, though no clinical evidence was demonstrated.

Menon Prosthesis

The Menon prosthesis, also known as the Universal Wrist Implant, was designed, in 1980, to address various factors that led to failures of the earlier designs. The implant is a nonconstrained joint consisting of a cobalt chrome radial component and titanium carpal component. The concave articular surface of the radial component has 20° of radial inclination and a Y-shaped tie mesh stem for fixation. The carpal component is ovoid with three holes in the carpal plate for screw fixation. The surgical technique includes an intercarpal fusion that, when combined with minimal resection of the capitate, provides support for the first and fifth ray, preventing migration. Additionally, the radial component is cut parallel to the existing articular surface. This prevents an increase in lever arm advantage for wrist flexor and ulnar deviators, leading to fewer problems with soft tissue balancing.

In a report by Menon, in 1998, 31 patients received the Universal Wrist Implant, with an average follow-up of 6.7 years. One patient developed an infection, and two required arthrodesis. Of the remaining 34 wrists, 30 (88%) were pain free. The average arc of flexion-extension increased from 56° to 78°. The overall complication rate was 32% (12 patients) with volar dislocation occurring in five. Nine complications were resolved with appropriate treatment, and a second operation was required in three patients. Divelbiss and coworkers presented an additional report of 22 arthroplasties performed in patients with long-standing RA in 2002. All patients demonstrated an increase in range of motion in all planes. DASH (Disabilities of the Arm, Shoulder and Hand) scores improved significantly, 14 points from before surgery to the one-year follow-up and 24 points to the two-year follow-up. Three prostheses (14%) were unstable and required further treatment for recurrent dislocation. A further multicenter study of 82 patients showed good results at one to five year follow-up, with equivalent outcomes of motion and patient satisfaction achieved by all surgeons. Dislocation continued to occur with a 9% overall incidence.

The Universal 2 implant is a modification of the Menon prosthesis. The inclination has been reduced to 14°, and a beaded porous coating has been applied to radial and carpal components for fixation by possible osseous integration. Additional biomechanical alterations address the issue of instability and dislocation. Using computer modeling techniques and laboratory testing, an ellipsoidal design of the carpal component demonstrated a more consistent contact area with the radial component throughout range of motion when compared with the original toroid shape. The radial
component width was then increased to provide greater capture of the carpal component thus conferring greater rotational stability. Early results with the Universal 2 prosthesis in 25 patients have been encouraging. All implants were noncemented. Pain relief was rated as good in all patients, with some complaints of ulnar-sided discomfort. Average DASH scores improved 20%. No dislocations, implant loosening or revisions have occurred.

A comparison chart of the various implants demonstrates comparable range of motion in all implants except the Swan silicone arthroplasty and the Volz implant. The latter have more substantial limitations of extension and radial deviation (Table 1).

### Table 1 Range of Motion

<table>
<thead>
<tr>
<th></th>
<th>Flexion (°)</th>
<th>Extension (°)</th>
<th>Radial Deviation (°)</th>
<th>Ulnar Deviation (°)</th>
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<tbody>
<tr>
<td>Wrist Normal ROM</td>
<td>76</td>
<td>75</td>
<td>22</td>
<td>36</td>
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<tr>
<td>Wrist Functional ROM</td>
<td>5</td>
<td>30</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>(Palmer, 1984)</td>
<td>10</td>
<td>35</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>(Brumfeld, 1985)</td>
<td>40</td>
<td>40</td>
<td>12</td>
<td>28</td>
</tr>
<tr>
<td>Swanson implant</td>
<td>39</td>
<td>6</td>
<td>2</td>
<td>21</td>
</tr>
<tr>
<td>Volz</td>
<td>37</td>
<td>17</td>
<td>2</td>
<td>23</td>
</tr>
<tr>
<td>Meuli</td>
<td>30</td>
<td>40</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Trispherical</td>
<td>50 (total) flex + ext</td>
<td>—</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>GUEPAR</td>
<td>39 (total) flex + ext</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Universal</td>
<td>41</td>
<td>36</td>
<td>7</td>
<td>13</td>
</tr>
<tr>
<td>Biaxial</td>
<td>29</td>
<td>36</td>
<td>10</td>
<td>20</td>
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</tbody>
</table>

Anatomic Physiologic Wrist Prosthesis

The anatomic physiologic wrist prosthesis is a noncemented design of cobalt-chrome with a hydroxyapatite coating. The articulation is elliptical with titanium nitrite-coated metal-to-metal surfaces. The radial component’s articular surface has a 10° slope towards the ulna, and the carpal component is anchored with its tip in the third metacarpal bone and distal carpal bones. This shape and inclination adapts the adjustment of the proximal carpal bones in the normal range of motion.

In 2003, the results of 40 noncemented anatomic physiologic wrist prostheses were reported, with an average follow-up of 52 months. At the 18-month follow-up, no signs of loosening were seen; however, after an average of 52 months, 30 of 36 patients demonstrated radiolucent lines greater than 2 mm. Migration of the carpal component was seen in 33 of 36 patients, and 19 patients demonstrated subsidence greater than 2 mm. After 18 months, 87% of patients rated their pain as “None”; however, with further follow-up, results deteriorated significantly. After an average of 52 months, 36 of 37 prostheses had been removed, with 32 cases of loosening with dislocation. The main cause of loosening was bone resorption secondary to the histiocytic reaction to titanium debris in the soft tissues of the joint. This prosthesis has been discontinued.

RWS Prosthesis

The RWS prosthesis is a semiconstrained device with three components: a radial component consisting of UHMWPE that sits in a Vitallium® tray and a Vitallium® metacarpal component. The radial articular surface is offset in a volar and ulnar direction. This configuration encourages preservation of the radial styloid and the radioscapohamate ligament. The distal component has a single stem that is fixed into the third metacarpal and an additional screw that passes into the second metacarpal. The mechanics of the implant are similar to the Volz implant and other biaxial implants in that a narrow convex element moves within a crescentic concave element. Additional stability is conferred because of a higher contact surface area. The implant allows for almost 100° of flexion-extension, 40° of radial-ulnar deviation, and minimal axial rotation.

Rahimotoola and Rozing reported on 27 implants with an average follow-up of four years. Seventeen patients were pain free at final follow-up, with a significant reduction in pain demonstrated in all patients. All patients demonstrated improved range of motion and 24 of 27 patients felt the operation had markedly improved their daily lives. Frank loosening was noted in three of 27 prostheses, with possible loosening in another 11 wrists.

Total Modular Wrist

Rahimotoola and Hubach developed the total modular wrist implant, which is available as either a constrained or unconstrained device consisting of four components. A titanium radial component articulates with a titanium carpal plate with an interposed polyethylene insert of variable thickness. The fourth component is an optional replacement of the distal radioulnar joint (DRUJ) with a ball-and-socket articulation. The carpal plate is fixed to the second, third, and fourth metacarpals by titanium screws of variable length. The polyethylene tray fits onto this carpal element and is concave. The radial component is offset and has a metal convex articulation that matches the carpal element. Initial clinical and radiographic results of 32 implants in 30
patients were presented, in 2004, with an average follow-up of 20 months. Postoperative range of motion averaged 31° of extension and 32° of flexion. Five wrists were noted to have radiographic evidence of loosening, and five patients were noted to have progressive ulnar deviation.

Complications

The complications associated with total wrist arthroplasty are related to surgical technique and progression of disease. Surgical challenges include centering of the prosthesis, fixation of the prosthesis, and soft-tissue balancing. Centering the prosthesis can prove to be the most difficult surgical task, as the bony architecture of the rheumatoid hand and wrist is altered. In addition, carpal collapse can result in muscle shortening, tendon rupture, or soft tissue contracture, leading to an ulnar deviation or flexion deformity. The center of rotation is frequently displaced, thus, requiring vigilant placement of the implant. The prosthesis should be aligned distally with the third metacarpal and proximally with the ulnar border of the radius. Some of the newer designs have single or double offset stems to facilitate alignment of the components.

Prosthetic loosening, especially of the distal component, continues to be problematic in total wrist arthroplasty. Original difficulties with the flexible wrist spacer were related to silicone synovitis; however, polyethylene wear and debris have not been shown to result in aseptic loosening, as is seen in the lower extremity. Implant loosening relates to the quality of host bone, the implant construct, the orientation of the implant at the time of fixation, and the fixation interface. As disease progression occurs, the remaining carpus may shift, leading to the development of motion and loosening at the cement-bone interface. Additionally, repetitive stress on the components may lead to microfractures, which initiate bone resorption and subsidence. Recognition of motion in the preserved carpus and carpometacarpal (CMC) joints have led to recommendations of intercarpal or CMC fusion.

Soft-tissue imbalance is a frequent postoperative complication of wrist arthroplasty. Preoperatively, patients with RA have soft tissue pathology secondary to tendon subluxation, carpal collapse, and volar capsule contraction. All or some of the soft tissue may be contracted, attenuated, or absent at the time of surgery. Multiple surgical techniques have been described to address soft-tissue balancing, including: flexor carpi ulnaris (FCU) tenotomy, FCU transfer, palmaris longus tenotomy, and postoperative splinting.

Contraindications

Absolute contraindications have been described based on previous failures and basic orthopaedic principles. These include patients with active infection, uncooperative personalities, a neurologically nonfunctioning hand, and rupture of the radial wrist extensors. Relative contraindications include multiple extensor digitorum communis (EDC) ruptures, immunosuppression, poor bone stock, young patients and manual laborers.

Arthrodesis versus Arthroplasty

Wrist arthrodesis is the most common surgical treatment for advanced symptomatic arthritis of the rheumatoid wrist. Wrist arthrodesis has well-documented predictability and a good long-term functional outcome. A 97% good or excellent result in 87 patients receiving arthrodesis at an average follow-up of six years was reported. Arthrodesis, however, does have its complications and limitations. Clendenin and Green have reported on many of the complications and shortcomings associated with wrist fusion. These include nonunions, fractures, hardware irritation, and wound dehiscence. Additional investigators have cited complication rates from 8% to 79%. Functional limitations have also been noted, as patients with a wrist arthrodesis most commonly complain of difficulty with personal hygiene tasks. One reason to consider arthroplasty in patients with RA is because of multiple joint involvement. The adverse effect of lost wrist motion has been shown to be greater in patients with arthritis involving other joints of the upper extremity.

In patients with RA, the functional limitations of bilateral wrist arthrodeses may be severe. Although good results have been reported, even with bilateral wrist arthrodeses, patients who have had both procedures generally prefer the arthroplasty to the arthrodesis. In addition, Kobus and Turner reported that all of their patients who were unsatisfied with an arthrodesis received an arthroplasty on the other side.

In 2003, Murphy retrospectively reviewed 46 patients with 51 operated wrists to compare functional outcomes of patients undergoing total wrist arthroplasty to those receiving arthrodesis. There were no statistically significant differences between the arthroplasty and arthrodesis group in either the DASH or PRWE (Patient-Rated Wrist Evaluation) scores. The arthroplasty group demonstrated a trend toward significantly better performance of personal hygiene tasks (p < .10) and fastening buttons (p < .09). Additionally, the majority of patients were satisfied with their operative treatment; however, 44% of patients in the arthrodesis group compared to 21% in the arthroplasty group reported limitations in daily activities due to loss of motion.

Conclusion

Despite advances in the field of arthroplasty, wrist replacement significantly lags behind its lower extremity counterparts. The complexity of wrist motion and the utilization of proven alternative treatments have not hastened the success of total wrist implants. Multiple implants with varying designs indicate a lack of universal acceptance for wrist anatomy and biomechanics. Regardless, wrist arthroplasty does exist as a surgical alternative to advanced, symptomatic radiocarpal arthritis, especially in the rheumatoid patient. With newer computer modeling techniques and improved...
biologic fixation, the success of wrist arthroplasty can only be expected to improve.

References