

Current European Practice in Wrist Arthroplasty



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KEYWORDS

• Wrist • Arthroplasty • Prosthesis • Replacement • Arthritis • Joint replacement

KEY POINTS

- Wrist arthroplasty provides functional mobility, improved strength and upper limb function, and reduced pain in carefully selected cases of severely destroyed wrist joints.
- Indications are severe wrist destruction due to rheumatoid arthritis (RA), idiopathic osteoarthritis (OA), scapholunate advanced collapse (SLAC) wrist, malunited intra-articular distal radius fractures, acute irreparable distal radius fractures in the elderly, and Kienböck disease.
- High physical demand, young age, poor bone stock, and spontaneously fused wrist in patients with RA are generally contraindications.
- Implant survival rates have improved with the latest designs but do not compare with the survival rates of hip and knee arthroplasties.

INTRODUCTION

Wrist arthroplasty is still a controversial issue but it has become a challenge to total—and sometimes also partial—wrist arthrodesis. The German physician and surgeon, Themistocles Gluck (1853–1942), is said to have performed the first total wrist arthroplasty (TWA) in 1891, using an ivory ball-and-socket device for tuberculosis.¹ At a follow-up of this patient for more than 1 year, the implant was still in place with a good range of motion, but a chronic fistula was present due to the original disease process. He made no further attempts and the idea of wrist arthroplasty using artificial materials was abandoned until John Niebauer² and Alfred Swanson³, during the 1960s, independently introduced the concept of a silicone interpositional spacer for joint replacement that could offer immediate stability and a

foundation around which fibrous tissue could grow without inhibiting motion. Swanson started using these silicone implants for the radiocarpal joint in 1967 and reported with his colleagues he reported the long term results in 1984.³ The results were generally favorable in low-demand rheumatoid patients in the short term,⁴ but the silicone spacers are no longer in use for wrist replacement due to problems with breakage, subsidence, and, less frequently, silicone synovitis.⁵

The second generation of implants, introduced in the 1970s, were hard bearing multicomponent implants.^{6–10} There is no consensus on the definition of second-generation implants but they generally consist of a radial component and a carpal component that is fixed into 1 or more of the metacarpal bones after wide bone resection. Many second-generation implants turned out

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to have unsatisfactory long-term results; they are no longer available. The published series are generally small and with short follow-up. The most well documented is the Biax (DePuy, Warsaw, Indiana), which was withdrawn from the market for commercial reasons.¹¹

The third generation of TWA (sometimes called the fourth generation) is the currently available implants; they are characterized by moderate bone resection and avoid fixation in the metacarpal bones, with the exception of an optional, short length of screw fixation in the index finger metacarpal (Fig. 1). They attempt to mimic the natural anatomy and biomechanics of the wrist and are largely unconstrained.^{12–14} The commonly used implants in Europe are the Universal2 (Integra, Plainsboro, New Jersey), the ReMotion (Stryker, Kalamazoo, Michigan), and the Maestro (Biomet, Warsaw, Indiana). In recent years, the French Amandys (Tornier [Bioprofile], Grenoble, France) was introduced as a single-component pyrocarbon interposition arthroplasty.¹⁵ Pyrocarbon can also be used to replace the head of the capitate combined with a proximal row carpectomy.¹⁶ Another recent European design is the Motec (Swemac, Linköping, Sweden), which differs from the other currently available implants by being metal-on-metal and fixed with large screws in the radius and the long (middle) finger metacarpal.¹⁷ Hemiarthroplasties, using the radial component of third-generation implants or special radial implants, are also used^{18–22} in the French Prosthelast (Agromédical, Cham, Switzerland)²³ and Roux (now: SOPHIA, Biotech, Paris, France)¹⁹ prostheses.



Fig. 1. ReMotion TWA in a rheumatoid patient. (Courtesy of Stryker, Kalamazoo, Michigan.)

INDICATIONS AND CONTRAINDICATIONS

In general, the indication for wrist replacement is a severely destroyed and painful wrist in which conservative means have not provided adequate pain relief and in which other motion-preserving procedures are impossible, hopeless, or have failed. For several decades, the main indication was RA. Since the turn of the century, however, other conditions have increasingly been of interest.¹¹ Today, the debate over indications is polarized between the rheumatoid wrist, generally in low-demand patients but with poorer bone stock, and idiopathic or posttraumatic OA—those patients generally have better bone stock but are also more physically active. There is no clear evidence about which indications lead to the best results and the fewest complications: it seems that carefully selected patients with RA or OA do equally well.²⁴ For patients with SLAC III wrist, other interventions may be considered, such as a 4-corner fusion. It is to some extent a subjective evaluation that can be influenced by previous experience with other motion-preserving procedures. In cases of an irreparable joint surface of the distal radius in elderly low-demand patients with an intra-articular distal radius fracture, hemiarthroplasty (HA) may be a solution.^{20,22}

Box 1 summarizes the authors' views on factors in favor of TWA versus a total wrist fusion when advising patients needing a surgical procedure for painful panarthritis of the wrist. These factors must be considered in combination with each other; none of them is decisive considered alone. Younger patients less than or equal to 50 year old—implying an active lifestyle and a long life expectancy—and severely osteoporotic or destroyed bone stock are the main contraindications to wrist arthroplasty. Wrists with very poor

Box 1 Factors in favor of wrist arthroplasty

- Functional wrist motion
- Elderly patient
- Low physical work load
- Low physical loading in leisure activities
- Poor function of the contralateral wrist (incl. wrist fusion)
- Poor shoulder, elbow, or finger function
- Good bone stock and quality
- No severe radiocarpal instability
- Expected good compliance with therapy and advice about care of the implant

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