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Rehabilitation of a Motec Prosthesis Revision due to Infection: A Case Report

Pascual C*, Arribas PD, Torres E and Garvín L

Department of Physical Medicine and Rehabilitation, Hospital Clínico San Carlos, Spain.

Case Report

***Corresponding author**

Celia Pascual Fidalgo, Department of Physical Medicine and Rehabilitation, Hospital Clínico San Carlos, Madrid, Spain, Tel: +34 638 838 743,

Email: celiapafi4@gmail.com

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Abstract

The Motec (Swemac Orthopaedics AB, Linköping, Sweden) cementless modular metal-on-metal ball-and-socket system total wrist arthroplasty is an implant with promising intermediate results. An alternative to primary wrist fusion, total wrist arthroplasty is an option for active patients, who wish to retain their wrist function. It is indicated in cases of degenerative osteoarthritis, post-traumatic arthritis and rheumatoid (inflammatory) arthritis. Similar to published studies, this series shows the Motec implant to be a good motion preserving alternative to total wrist fusion.

As any other surgical intervention, the Motec total wrist prosthesis can cause complications, including osteolysis (either around the radial implant or, less likely, the radial implant or both of them), dorsal or volar tilts, migration, synovitis and, less commonly, infection.

Our objective is to report a clinical case of this syndrome, verified clinically and microbiologically, and its treatment.

In conclusion, the infection of Motec total wrist arthroplasty should be included in the differential diagnosis in case of clumsy evolution in total wrist arthroplasty. Likewise, its early diagnosis will allow the establishment of the appropriate pharmacological and rehabilitative treatment, which will minimize the algesic component and the functional deficit, as well as the potential sequelae.

Keywords: Total wrist arthroplasty; Motec; Rehabilitation; Revision; Infection.

Introduction

Treatment of wrist pathology, whether acute or chronic, may be conservative; however, surgical intervention is sometimes required, followed by a structured rehabilitation program. Total wrist arthroplasty is typically reserved for chronic cases of osteoarthritis with severe pain, as well as for acute traumatic conditions that are not amenable to other surgical procedures. Candidates are generally selected among patients with significantly impaired quality of life (assessed by the Disabilities of the Arm, Shoulder and Hand [DASH] score [1,2], who wish to restore wrist function and possess adequate bone stock and good soft-tissue quality [1,3]. Given the low prevalence of indications for wrist arthroplasty and the relative simplicity and predictability of wrist arthrodesis, the development of total wrist arthroplasty has been slower compared with that of prostheses for larger joints with higher disease prevalence [3].

Consequently, several complications may occur after this procedure, including osteolysis [4], synovitis, prosthetic loosening, pain during pronation and supination at the distal

radioulnar joint, soft-tissue imbalance, and periprosthetic fractures, which are among the most common [3]. However, the reported prevalence of prosthetic infection following total wrist arthroplasty remains low. In particular, with second- and third-generation implants such as the Motec system, infection is rare and occurs far less frequently than osteolysis. Prosthesis survival rates range between 90 % and 100 % at five years in most published series, although they tend to decline between the fifth and eighth postoperative years [5,6]. The estimated survival rate after revision total wrist arthroplasty is approximately 69 % [7]. The cumulative probability of remaining free from revision at long-term follow-up has been reported between 70 % and 80 % [8].

In any case, total wrist arthroplasty has proven to be an effective alternative to primary arthrodesis for preserving wrist motor function.

Objectives

To present a clinical case of total wrist arthroplasty revision with a Motec prosthesis due to infection.

Case Report

A 53-year-old woman experienced an accidental fall at ground level, resulting in a fracture of the distal radius and right scaphoid, with a SNAC III wrist (Figure A). Both injuries were initially managed conservatively.

Figure A: Preoperative posteroanterior and lateral radiographs of the right wrist.

Due to poor pain progression, a wrist and midcarpal arthroscopy was performed, revealing scapholunate and lunotriquetral lesions (Geissler IV), chondral lesions of the scaphoid, the scaphoid fossa of the distal radius, lunate, capitate, and hamate, as well as a small ulnar ganglion requiring drainage. The procedure was completed with joint debridement (synovectomy). During post-arthroscopy rehabilitation follow-up, persistent pain was observed, and a hyaluronic acid injection was administered, which also failed to provide significant improvement. In this context of therapeutic failure, a total right wrist arthroplasty with a Motec prosthesis (Acumed) was performed six months after the arthroscopy with synovectomy (Figure B).

Through supervised, in-person rehabilitative treatment, improvements were achieved in both post-surgical edema and pain, which reached 0 points on the Visual Analog Scale (VAS) at rest, though remaining at 6 points during activity. Mild dysesthesias on scar palpation were also observed. Additionally, mild hypoesthesia on the palmar surface of the distal phalanx of the fourth finger of the right hand improved favorably. Active wrist mobility was initially limited for palmar flexion (40º vs. 80º in the contralateral healthy limb) and dorsal extension (45º vs. 70º contralateral), as well as for ulnar deviation (20º vs. 40º contralateral) and radial deviation (15º vs. 20º contralateral), while pronation and supination remained unaffected. After four weeks of kinesiotherapy, functional active wrist joint ranges and submaximal resistance strength (Medical Research Council [MRC] scale score 4+/5) were achieved globally. Subsequently, occupational therapy was implemented with the objectives of improving manual skills, dexterity, fine motor function, and adaptation to daily life activities.

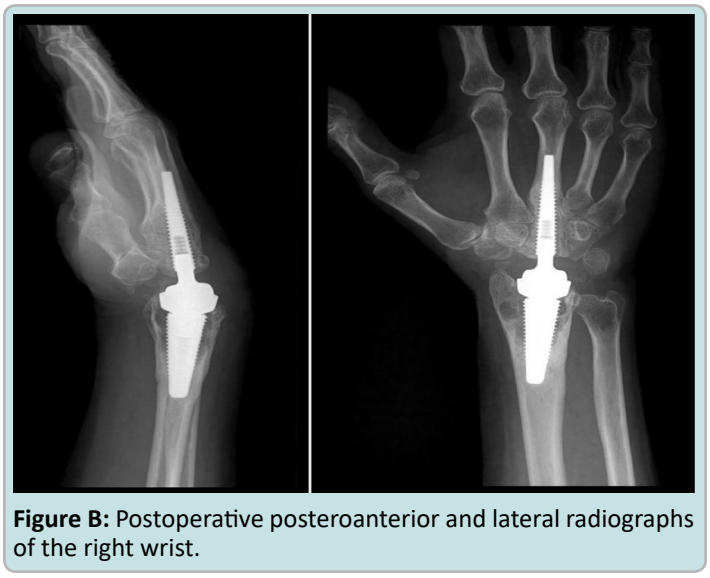

Figure B: Postoperative posteroanterior and lateral radiographs of the right wrist.

Systematic physical examinations were functional, and serial radiographic controls confirmed the absence of prosthetic complications. However, ten months post-arthroplasty, the patient experienced again recurrent pain, and a volar radiolucent image in the radial component was observed, prompting a Computed Tomography (CT) scan with triplanar reconstructions. The CT confirmed a radiolucent halo of up to 8 mm surrounding the radial component of the Motec prosthesis, as well as small

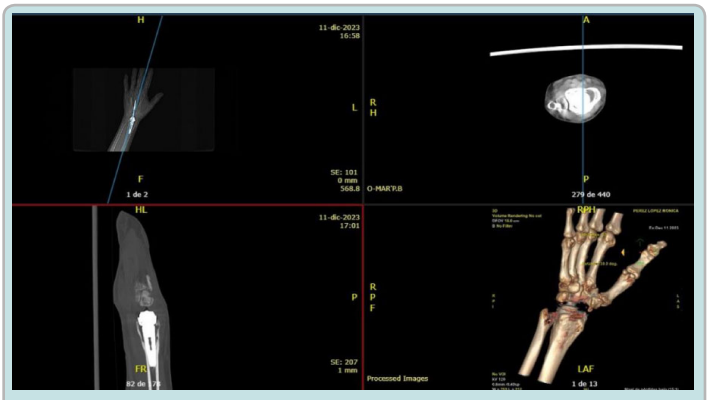

Figure C: CT scan of the right wrist due to suspected prosthetic infection.

bone fragments versus ossifications in the theoretical location of the first-row carpal bones and the carpometacarpal joint and rizarthrosis (Figure C).

Pain persisted until a gallium scintigraphy was performed to reinforce the suspicion of prosthetic infection, showing intense periprosthetic uptake of the radial component of the right wrist prosthesis, suggestive of an infectious or inflammatory process (Figure D). Consequently, revision of the right wrist Motec prosthesis was performed two years after the initial arthroplasty, initially placing a gentamicin-impregnated cement spacer (Figure E). Empirical oral treatment with levofloxacin was also initiated.

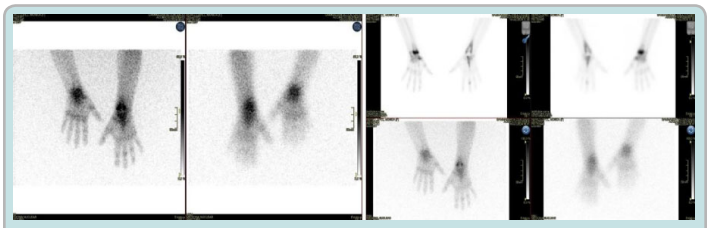

Figure D: Gallium bone scintigraphy of both wrists for suspected prosthetic infection.

Figure E: Posteroanterior and lateral radiographs of right wrist Motec prosthesis with cement spacer.

During postoperative follow-up, three cultures were positive for Dermacoccus nishinomiyaensis, Staphylococcus pettenkofen, and Streptococcus anginosus (sensitive to trimethoprim-sulfamethoxazole, resistant to levofloxacin), with the remaining cultures negative. Antibiotic therapy was switched to trimethoprim-sulfamethoxazole, which was discontinued due to intolerance after five weeks, and linezolid was administered for two weeks instead.

In a second surgical stage, prosthetic components were revised two months after spacer placement. At that time, there were no clinical signs of infection or acute phase reactants in serial laboratory tests without active antibiotic therapy. Intraoperative cultures were negative.

Figure F: Posteroanterior and lateral radiographs of right wrist Motec prosthesis after component revision.

Immobilization with an antebrachial splint (Figure F and Figure G) and levofloxacin therapy were maintained for 17 postoperative days. Immediately after splint removal, the surgical wound showed no signs of local complications, adhesions, or dysesthesias. There were no signs of complex regional pain syndrome, and hand joint ranges were unrestricted, although digital pinches and thumb opposition resisted submaximal force (MRC 4+/5). Wrist joint mobility included full pronation and supination but remained limited for dorsal extension (45º vs. 75º contralateral), palmar flexion (35º vs. 75º contralateral), radial deviation (5º vs. 25º contralateral), and ulnar deviation (20º vs. 30º contralateral). Overall wrist and upper limb muscle strength was preserved (MRC 5/5). No abnormalities were found on tactile-pain screening in any territory.

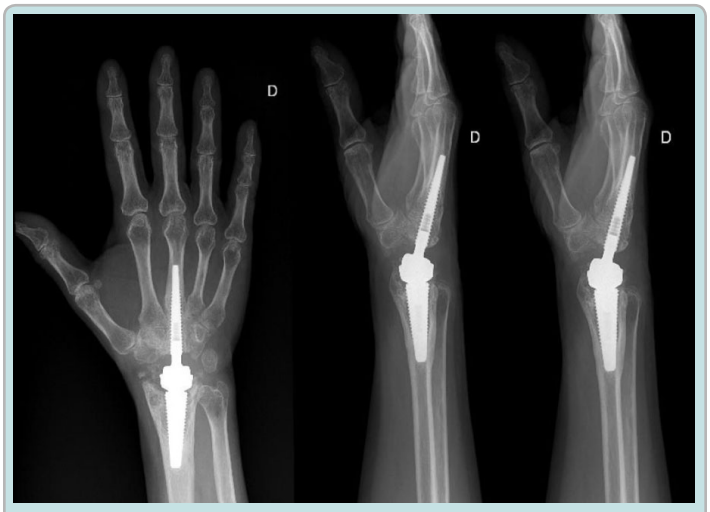

Figure G: Posteroanterior hand and oblique/lateral wrist radiographs with final Motec prosthesis.

Rehabilitation consisted of individualized, supervised, in-person kinesiotherapy in hospital physiotherapy rooms, combined with paraffin therapy as soon as the wound allowed it. The initial phase focused on regaining wrist joint range through passive and active-assisted mobilizations, guided by VAS ≤3, especially in palmar and dorsal flexion, as well as radial deviation. Fine motor tasks and hand-eye coordination were trained using terminal pinches, thumb opposition, and functional grasp patterns adapted to daily and work activities. Manual therapy on the surgical scar was emphasized.

At the end of directed rehabilitation, the patient achieved digital pinch and thumb opposition against maximal resistance (MRC 5/5) with a full Kapandji score (10/10), except for pinch with the fourth and fifth fingers, which remained submaximal (MRC 4+/5). Wrist joint range improved: dorsal extension 60º (75º contralateral), palmar flexion 60º (75º contralateral), radial deviation 15º (25º contralateral), ulnar deviation 25º (30º contralateral), with full pronosupination since splint removal. Fine motor dexterity was functional, and the patient reported no interference with daily or work activities.

Thus, the patient achieved functional objectives aligned with her expectations and was discharged from supervised rehabilitation, with recommendations and commitment to continue daily autonomous exercises learned during therapy [9-11].

Discussion

Total Wrist Arthroplasty (TWA) is an increasingly valued surgical option for patients with advanced wrist pathology seeking to preserve motion and improve overall hand function. Although arthrodesis remains the reference treatment due to its durability, it results in loss of motion, significantly affecting quality of life in active patients. In this context, TWA offers a functional alternative that balances pain relief with preservation of mobility [12-15].

The Motec wrist prosthesis has demonstrated favorable outcomes in selected patients, with high prosthetic survival rates and functional improvements [16]. However, complications such as osteolysis, component loosening, and periprosthetic infection—though infrequent—may compromise these benefits. In this case, after initially favorable recovery, the patient developed clinical and radiological signs compatible with prosthetic failure due to infection [17-21]. The estimated survival rate of wrist prosthesis revision is 69% [8].

Functionally, the patient initially experienced significant improvement in pain and daily activities. Following the two-stage revision, which included temporary placement of a cement spacer and subsequent reimplantation of a new Motec prosthesis, additional functional gains were observed. These included recovery of joint motion, resolution of preoperative hypoesthesia, and improvement in grip and pinch strength, especially after a structured rehabilitation program.

Preservation and subsequent recovery of wrist range of motion—particularly pronosupination and functional flexion-extension—enabled the patient to resume daily activities with minimal limitations [13,22].

Conclusion

This case illustrates that, even in the context of prosthetic infection, functionality of the affected limb segment can be restored through appropriate management strategies and a coordinated, interdisciplinary approach with continuous communication among the therapeutic team, avoiding definitive arthrodesis and its associated limitations.

Conflict of Interest

The authors declare no conflicts of interest regarding the research, authorship, and/or publication of this article.

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