



# Wrist Arthroplasty as a Solution to Posttraumatic Osteoarthritis or Failed Partial Arthrodesis: A Case Series\*

## *La artroplastia de muñeca como solución a la artrosis postraumática o fracaso de artrodesis parcial: Una serie de casos*

Pablo Nicolás López-Osornio de Vega<sup>1,2</sup> Giovanni Vilardo Cerqueira Guedes<sup>3,4</sup>

<sup>1</sup>Department of Traumatology and Orthopedic Surgery, Hospital Mutua Universal, Barcelona, Cataluña, Spain

<sup>2</sup>Trauma Unit, Hospital Quirón Teknon, Barcelona, Cataluña, Spain

<sup>3</sup>Department of Hand Surgery and Microsurgery, Instituto Nacional de Traumatologia e Ortopedia Jammil Haddad (INTO), Rio de Janeiro, RJ, Brazil

<sup>4</sup>Department of Traumatology and Orthopedic Surgery, Hospital São Vicente de Paulo, Rio de Janeiro, RJ, Brazil

Address for correspondence Giovanni Vilardo Cerqueira Guedes, MD, Departamento de Cirurgia de Mão e Microcirurgia, Instituto Nacional de Traumatologia e Ortopedia Jammil Haddad (INTO), Avenida Brasil 500, Caju, Rio de Janeiro, RJ, 20940-070, Brasil (e-mail: vcggiovanni@gmail.com).

Rev Iberam Cir Mano 2022;50(2):e110–e115.

### Abstract

**Introduction** Unlike arthrodesis, total wrist arthroplasty enables the preservation of a functional range of motion in patients operated on for osteoarthritis. The evolution of the implants made it possible to reach a higher success rate, reducing complications such as the loosening of components. The present study aims to demonstrate the functional results and complication rates in a series of cases operated on with the Motec (Swemac Orthopaedics AB, Linköping, Sweden) implant by a single surgeon.

**Materials and Methods** A retrospective study with 14 patients who underwent total wrist arthroplasty with the Motec system between 2017 and 2022, who were evaluated pre- and postoperatively using the Mayo Wrist Score and the Visual Analog Scale (VAS). The medical records were reviewed in June 2022, and the statistical analysis with the paired *t*-test considered values of  $p < 0.05$  statistically significant.

**Results** In total, 13 men and 1 woman, with a mean age of 64.8 (standard deviation [SD] = 7.5) years, underwent surgery, and the mean follow-up was of 25.1 (SD = 10.9) months. The mean preoperative Mayo Wrist Score was of 23.2 (SD = 8.9) points, and postoperatively, it was of 82.8 (SD = 7) points, while the mean preoperative VAS score was of 7.6 (SD = 1.1) points, and, postoperatively, it was of 1 (SD = 1.2) point. The differences regarding the pre- and postoperative results of the Mayo Wrist Score and the VAS were statistically significant ( $p < 0.001$ ).

### Keywords

- wrist arthroplasty
- wrist prosthesis
- Motec

\* This research was funded by IBRA (International Bone Research Association).

received  
August 17, 2022  
accepted  
October 7, 2022

DOI <https://doi.org/10.1055/s-0042-1758458>.  
ISSN 1698-8396.

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**Conclusion** As demonstrated in the present series, the improvements in terms of function and pain were significant, there were no major complications in the period evaluated, and the prosthesis was successfully replaced failed partial arthrodesis. Patients should be followed up for longer periods, but with the certainty that, in case of failure, a total wrist arthrodesis can still be performed.

## Resumen

**Introducción** Diferentemente de la artrodesis, la artroplastia total de muñeca permite mantener un rango de movimiento funcional en pacientes operados por artrosis de diferentes causas. La evolución de los implantes permitió llegar a una mayor tasa de éxito, con disminución de las complicaciones como el aflojamiento de componentes. Este estudio tiene como objetivo demostrar los resultados funcionales y las tasas de complicaciones en una serie de casos operados con el implante Motec (Swemac Orthopaedics AB, Linköping, Suecia) por un único cirujano.

**Materiales y Métodos** Se trata de un estudio retrospectivo con 14 pacientes intervenidos de artroplastia total de muñeca con el sistema Motec entre 2017 y 2022 y evaluados pre y posoperatoriamente por la Escala de Muñeca de la Clínica Mayo (Mayo Wrist Score, en inglés) y la Escala Visual Analógica (EVA). Se realizó revisión de historias clínicas en junio de 2022 y análisis estadístico con prueba *t* pareada considerando significativos valores de  $p < 0,05$ .

**Resultados** Fueron operados 13 hombres y 1 mujer, con una edad media de 64,8 (desviación estándar [DE] = 7,5) años, y el tiempo medio de seguimiento fue de 25,1 (DE = 10,9) meses. La puntuación en la Escala de Mayo presentó media preoperatoria de 23,2 (DE = 8,9) y posoperatoria de 82,8 (DE = 7), mientras la EVA preoperatoria tuvo una media de 7,6 (DE = 1,1), y la postoperatoria fue de 1 (DE = 1,2). Las diferencias en los resultados pre y posoperatorios de la Escala de Mayo y la EVA fueron estadísticamente significativas ( $p < 0,001$ ).

**Conclusión** Como se demuestra en esta serie, las mejoras funcionales y en el dolor fueron importantes, no hubo complicaciones mayores en el período de tiempo evaluado, y la prótesis fue capaz de reemplazar las artrodesis parciales que fallaron. Los pacientes deben ser seguidos durante más tiempo, pero con la certeza de que, en caso de fracaso, aún se puede realizar una artrodesis total de muñeca.

## Palabras clave

- ▶ artroplastia de muñeca
- ▶ prótesis de muñeca
- ▶ Motec

## Introduction

Wrist arthroplasty is a procedure that emerged as an alternative to wrist arthrodesis for cases of osteoarthritis of different causes. In several studies, results showing a great reduction in pain and a subtle improvement in grip strength have been obtained in both procedures, but with the possibility of maintaining a functional range of motion in patients with prostheses.<sup>1</sup> Furthermore, the results of the arthroplasties were similar regardless of the indication (scapholunate advanced collapse [SLAC], scaphoid non-union advanced collapse [SNAC], distal radius fractures).<sup>2</sup>

Over time, the implants evolved, and currently they are in the fourth generation, always with the aim of reducing the possibility of complications in relation to previous models. The models currently used aim to improve the biomechanics of the joint and minimize the amount of bone resection and the rate of carpal resection. In addition, one of the recent potential solutions to prevent component loosening involves

the use of materials with greater potential for integrative bone ingrowth, especially with respect to the distal component.<sup>3</sup>

The prostheses studied in previous works, such as Universal 2 (KMI, Carlsbad, CA, United States) and Re-Motion (Stryker, Kalamazoo, MI, United States) have high rates of complications and reported revisions, mainly due to causes such as loosening of components<sup>4,5</sup>. A study with 56 patients who underwent wrist arthroplasty with the Motec (Swemac Orthopaedics AB, Linköping, Sweden) prosthesis demonstrated an implant survival rate of 86% after 10 years, and these results were encouraging.<sup>6</sup>

Bearing in mind that the Motec prosthesis may be indicated for cases of degenerative osteoarthritis, (inflammatory) rheumatoid arthritis, and posttraumatic osteoarthritis as a consequence of scapholunate dissociation, Kienböck disease, wrist fracture-dislocation, intra-articular fractures of the distal radius, intercarpal fusions, and proximal carpal row resection,<sup>7</sup> the objective of the present study is to

describe the functional results and complication rates in a series of cases operated by a single surgeon.

## Materials and Methods

The present study involved 14 patients operated on between November 2018 and April 2022 at 2 hospitals in Barcelona by a single experienced hand surgeon. The patients answered the Mayo Wrist Score questionnaire and the Visual Analog Scale (VAS) in the preoperative period and six months after the procedure. One patient was excluded for having a follow-up of shorter than six months. The surgical technique (→**Figure 1**) used was that recommended by the manufacturer of the Motec.<sup>6</sup>

After the operation, the stitches were removed after 10 days, and after 2 weeks the immobilization was changed from a dorsal plaster splint to a Velcro splint, which was used up to 6 weeks postoperatively. Two weeks postoperatively, the patients were referred to a specialized hand therapist, and rehabilitation with active movements was started.

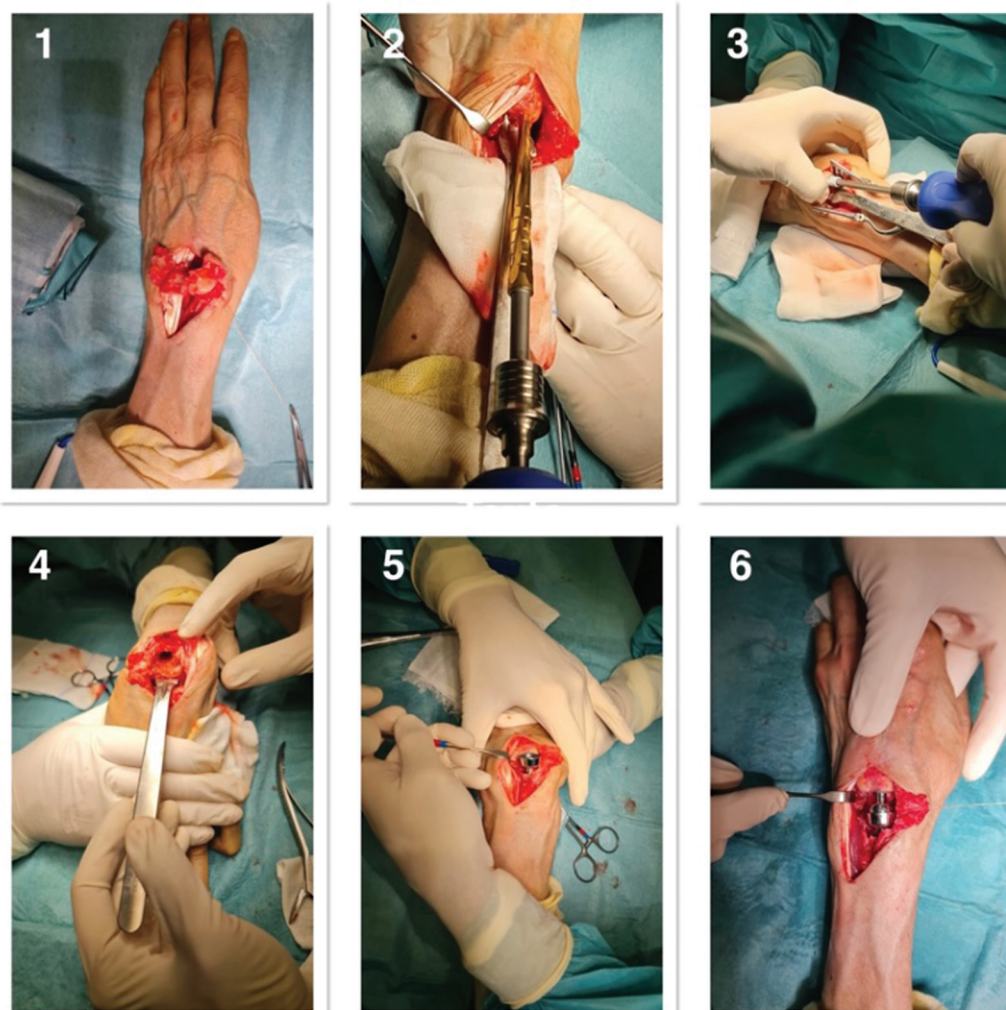
Follow-up was carried out through monthly face-to-face consultations with repeated radiographs to assess complications.

Data were collected from the medical records in June 2022, and we searched for the following variables: age, date of birth, gender, previous wrist pathology, duration of the follow-up, Mayo Wrist Score and VAS scores preoperatively and six months after surgery, and complications. Complications were defined as any sign of component loosening, impact generated by the prosthesis, infection or need for revision.

The data were analyzed by calculating means and standard deviations (SDs) and a paired sample *t*-test was used with the Statistical Package for the Social Sciences (IBM SPSS Statistics for Windows, IBM Corp., Armonk, NY, United States) software, version 26.0, to compare the pre- and postoperative results of the Mayo Wrist Score and VAS, considering values of  $p < 0.05$  statistically significant.

## Results

In total, 14 patients were evaluated, 13 men and 1 woman, with a mean age of 64.8 (SD = 7.5) years. The mean duration of the follow-up was of 25.1 (SD = 10.9) months, with a minimum of 6 and a maximum of 40 months.



**Fig. 1** (1) Resection of the proximal row of the carpus. (2,3) Preparation and introduction of the distal component. (4,5) Preparation and introduction of the proximal component. (6) Final clinical appearance.

**Table 1** Results of the present study

Patient	Age	Gender	Date of surgery	Previous situation of the joint	Follow-up (months)	MWS - pre	MWS - post	VAS - pre	VAS - post
1	53	M	11/2018	PRC	36	15	75	9	4
2	64	M	12/2018	Four-corner arthrodesis	40	20	80	7	2
3	71	M	02/2019	SLAC	36	25	90	9	0
4	58	M	05/2019	PRC	24	15	85	8	2
5	67	F	08/2019	Degenerative osteoarthritis	35	30	100	7	0
6	68	M	10/2019	Osteoarthritis – radius fracture	31	20	85	6	0
7	54	M	11/2019	Lunocapitate ARTHRODESIS	25	15	80	8	1
8	73	M	01/2020	Osteoarthritis – radius fracture	26	40	90	6	1
9	80	M	07/2020	SNAC	23	15	80	9	2
10	61	M	10/2020	PRC	19	20	85	6	0
11	68	M	01/2021	Four-corner arthrodesis	19	30	75	7	0
12	59	M	04/2021	Osteoarthritis – radius fracture	13	25	80	8	0
13	63	M	10/2021	Osteoarthritis – radius fracture	7	15	80	8	0
14	69	M	12/2021	SLAC	6	40	75	9	2

Abbreviations: F, female; M, male; MWS, Mayo Wrist Score; PRC, proximal row carpectomy; post, postoperative; pre, preoperative; SLAC, scapholunate advanced collapse; SNAC, scaphoid non-union advanced collapse; VAS, Visual Analog scale.

Regarding the Mayo Wrist Score, the preoperative mean was of 23.2 (SD = 8.9) points, and the postoperative mean was of 82.8 (SD = 7) points. The mean preoperative VAS score was of 7.6 (SD = 1.1) points, while the mean postoperative score was of 1 (SD = 1.2) point. The differences in the pre- and postoperative scores on both scales were statistically significant ( $p < 0.001$ ).

The variables of each patient are shown in ►Table 1. here were no intra- or postoperative complications during the follow-up.

## Discussion

The operated patients in our series had previous diagnoses of SLAC, SNAC, and posttraumatic and degenerative radiocarpal osteoarthritis. In addition, other patients had already undergone other surgeries, such as proximal carpectomy, lunocapitate arthrodesis or four-corner arthrodesis (►Figure 2). In accordance with the possible indications for the use of the Motec prosthesis, the present study did not include cases of Kienböck disease, total wrist arthrodesis (rearticulation),<sup>8</sup> and rheumatoid arthritis.<sup>9</sup>

There was a significant improvement in the Mayo Wrist Score and VAS score in our sample 6 months after the operation. Previous wrist arthroplasty case series studies with longer follow-ups<sup>10</sup> and a systematic review<sup>11</sup> also showed improvements in these parameters, although they were performed with the Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire instead of the Mayo Wrist Score.

No adverse events related to the prosthesis material, such as reactions to metal debris,<sup>12</sup> were observed in the period studied. Similarly, the patients did not present infection,

although some had risk factors such as posttraumatic osteoarthritis.<sup>13</sup>

To date, the loosening of components, a common failure factor,<sup>14</sup> has not been observed in our sample, thus eliminating the need for salvage surgeries, previously described as extremely complex and difficult to perform.<sup>15</sup> In this regard, we must emphasize that one of the advantages of the Motec system is the ease of reconversion to arthrodesis in case of failure, with results similar to those of primary arthrodesis.<sup>16</sup>

The present study has a number of obvious limitations, such as a small sample size, a median follow-up of just over 2 years (which was shorter than those of other studies, which had follow-ups of 5 or 10 years), and that there were no measures of strength or range of motion, even though they are clinically functional. However, it is a series of cases operated on and followed up by the same surgeon, which can provide greater uniformity to the results.

## Conclusion

Wrist arthroplasty is a surgical option to treat cases of posttraumatic osteoarthritis or as rescue from previous failed surgeries (proximal carpectomy or four-corner arthrodesis), helping the patient maintain a functional range of motion. As observed in the present series, the improvements in terms of function and pain were significant, with no major complications occurring in the period evaluated, and wrist arthroplasty was able to serve as a rescue for failed partial arthrodesis.

Obviously, to be able to draw firmer conclusions regarding the benefits or complications of this prosthesis model, we must increase the number of patients studied, as well as study them for longer periods.



**Fig. 2** (7) Fracture of the scaphoid with scapholunate dissociation in a 56-year-old patient (8) operated on 6 weeks later by another surgeon, and evolution with nonunion of the scaphoid and DISI (Dorsal intercalated segment instability). (9) The patient arrived at our department after undergoing four-corner arthrodesis that evolved with material failure. (10) We opted for revision of the arthrodesis with screws, but the patient still presented pain 12 months after the last intervention. (11 and 12) We performed wrist arthroplasty, and the patient is asymptomatic after one year of follow-up

## References

- Berber O, Garagnani L, Gidwani S. Systematic Review of Total Wrist Arthroplasty and Arthrodesis in Wrist Arthritis. *J Wrist Surg* 2018;7(05):424–440. Doi: 10.1055/s-0038-1646956
- Holzbauer M, Mihalic JA, Pollak M, Froschauer SM. Total Wrist Arthroplasty for Posttraumatic Wrist Osteoarthritis: A Cohort Study Comparing Three Indications. *Life (Basel)*. 2022 Apr 21;12(05):617. doi: 10.3390/life12050617. PMID: 35629285; PMCID: PMC9145948
- Srncic JJ, Wagner ER, Rizzo M. Total Wrist Arthroplasty. *JBJS Rev* 2018;6(06):e9. Doi: 10.2106/JBJS.RVW.17.00123
- Kennedy JW, Ross A, Wright J, Martin DJ, Bransby-Zachary M, MacDonald DJ. Universal 2 total wrist arthroplasty: high satisfaction but high complication rates. *J Hand Surg Eur Vol* 2018;43(04):375–379. Doi: 10.1177/1753193418761513
- Froschauer SM, Zaussinger M, Hager D, Behawy M, Kwasny O, Duscher D. Re-motion total wrist arthroplasty: 39 non-rheumatoid cases with a mean follow-up of 7 years. *J Hand Surg Eur Vol* 2019;44(09):946–950. Doi: 10.1177/1753193419866117
- Reigstad O, Holm-Glad T, Bolstad B, Grimsgaard C, Thorkildsen R, Røkkum M. Five- to 10-Year Prospective Follow-Up of Wrist Arthroplasty in 56 Nonrheumatoid Patients. *J Hand Surg Am* 2017;42(10):788–796. Doi: 10.1016/j.jhssa.2017.06.097
- Giwa L, Siddiqui A, Packer G. Motec Wrist Arthroplasty: 4 Years of Promising Results. *J Hand Surg Asian Pac Vol* 2018;23(03):364–368. Doi: 10.1142/S2424835518500388
- Reigstad O, Røkkum M. Wrist arthroplasty using prosthesis as an alternative to arthrodesis: design, outcomes and future. *J Hand Surg Eur Vol* 2018;43(07):689–699. Doi: 10.1177/1753193418784707
- Zhu XM, Perera E, Gohal C, Dennis B, Khan M, Alolabi B. A systematic review of outcomes of wrist arthrodesis and wrist arthroplasty in patients with rheumatoid arthritis. *J Hand Surg Eur Vol* 2021;46(03):297–303. Doi: 10.1177/1753193420953683
- Fischer P, Sagerfors M, Jakobsson H, Pettersson K. Total Wrist Arthroplasty: A 10-Year Follow-Up. *J Hand Surg Am* 2020;45(08):780.e1–780.e10. Doi: 10.1016/j.jhssa.2020.02.006
- Eschweiler J, Li J, Quack V, Rath B, Baroncini A, Hildebrand F, Migliorini F. Total Wrist Arthroplasty—A Systematic Review of the Outcome, and an Introduction of FreeMove-An Approach to Improve TWA. *Life (Basel)*. 2022 Mar 11;12(03):411. doi: 10.3390/life12030411. PMID: 35330163; PMCID: PMC8951379
- Karjalainen T, Pamilo K, Reito A. Implant Failure After Motec Wrist Joint Prosthesis Due to Failure of Ball and Socket-Type Articulation—Two Patients With Adverse Reaction to Metal Debris and Polyether Ether Ketone. *J Hand Surg Am* 2018;43(11):1044.e1–1044.e4. Doi: 10.1016/j.jhssa.2018.03.010

- 13 Althoff AD, Reeves RA, Traven SA, Slone HS, Deal DN, Werner BC. Risk Factors for Infection Following Total Wrist Arthroplasty and Arthrodesis: An Analysis of 6641 Patients. *Hand (N Y)* 2021;16(05):657–663. Doi: 10.1177/1558944719890036
- 14 Pong TM, van Leeuwen WF, Oflazoglu K, Blazar PE, Chen N. Unplanned Reoperation and Implant Revision After Total Wrist Arthroplasty. *Hand (N Y)* 2022;17(01):114–118. Doi: 10.1177/1558944719898817
- 15 Berber O, Gidwani S, Garagnani L, et al. Salvage of the Failed Total Wrist Arthroplasty: A Systematic Review. *J Wrist Surg* 2020;9(05):446–456. Doi: 10.1055/s-0040-1713728
- 16 Reigstad O, Holm-Glad T, Thorkildsen R, Grimsgaard C, Røkkum M. Successful conversion of wrist prosthesis to arthrodesis in 11 patients. *J Hand Surg Eur Vol* 2017;42(01):84–89. Doi: 10.1177/1753193416674929