Wrist arthroplasty in nonrheumatoid patients: a case series

SUMMARY

-Introduction: Total wrist arthroplasty, different from arthrodesis, allows to maintain a functional range of motion in patients operated on for osteoarthritis of different causes. The evolution of the implants allowed to reach a higher success rate reducing complications such as the loosening of components. That study aims to demonstrate functional outcomes and complication rates in a series of cases operated with the Motec® implant by a single surgeon.
-Material and method: This is a retrospective study of 14 patients operated on for total wrist arthroplasty with the Motec® system between 2017 and 2022 and evaluated pre and postoperative with the Mayo Wrist Score and pain VAS. A review of medical records was carried out in June of 2022 and statistical analysis with paired t-test considering a significant value of $p < 0.05$.
-Results: Thirteen men and one woman were operated on, with a mean age of 64.8 years (SD=7.5) and the mean follow-up time was 25.1 months (SD=10.9). The Mayo Wrist Score presented a preoperative mean of 23.2 (SD=8.9) and postoperative of 82.8 (SD=7) while preoperative VAS had a mean of 7.6 (SD=1.1) and postoperative was 1 (SD=1.2). The differences in the pre and postoperative results of the Mayo Wrist Score and EVA were statistically significant ($p< 0.001$).
-Conclusion: As demonstrated in our series, functional improvements and pain were important, there were no major complications in the time period evaluated and the prosthesis was able to replace the partial arthrodesis that have failed . Patients should be followed for longer, but with the certainty that, in case of failure, a total wrist arthrodesis can still be performed.

INTRODUCTION

Wrist arthroplasty is a procedure that has emerged as an alternative to wrist arthrodesis for cases of osteoarthritis of this joint generated by different causes. A large reduction in pain and a subtle improvement in grip strength outcomes were reported in both procedures, but with the possibility of maintaining a functional range of motion in patients with prostheses[1] . In addition, the results of arthroplasties were similar regardless of indication (SLAC, SNAC, distal radius fractures) [2].

Over time, implants evolved and reached the fourth generation today, always with the aim of reducing the possibility of complications in relation to previous models. The models currently used aim to improve joint biomechanics and minimize the amount of bone resection and carpal resection rate. In addition, one of the recent potential solutions so that it does not loosening the components involves the use of materials with greater potential for internal bone growth, especially with respect to the distal component [3].

Prostheses studied in previous works such as Universal 2 ® (KMI, Carlsbad, California, USA) and Re-Motion ® (Stryker, Kalamazoo, MI, USA) have high rates of complications and reported revisions, due to causes such as loosening of components [4,5] . A study with 56 patients who underwent wrist arthroplasty with the Motec ® prosthesis (Swemac AB Orthopedics, Linkoping, Sweden) demonstrated an implant survival rate of 86% after 10 years, and these results were encouraging [6].

Taking into account that the Motec ® prosthesis may be indicated for cases of degenerative osteoarthritis, rheumatoid (inflammatory) arthritis and post-traumatic osteoarthritis as a result of scapholunate dissociation, Kienböck's disease, wrist fracture-dislocation, intra-articular fractures of distal radius, intercarpal fusions and resection of the proximal row of the carpus [7] , the aim of this study is to demonstrate functional outcomes and complication rates in a series of cases operated on by a single surgeon.

MATERIAL AND METHOD

The study involved 15 patients operated between March 2017 and April 2022 in 2 Hospitals of Barcelona by a single experienced hand surgeon. Patients answered the Mayo Wrist Score questionnaire and the EVA scale in the pre-operative period and 6 months after the procedure. One patient was excluded for having follow up of less than 6 months. The surgical technique used (figures 1 to 5) was guided by the manufacturer of the material Motec ® [6].

After the operation, the stitches were removed after 10 days and after 2 weeks the immobilization was changed from a dorsal cast splint to a lighter splint, which remained up to 6 weeks. From 2 weeks postoperatively, patients were referred to a hand therapist and began rehabilitation with active movements. Follow-up was carried out through monthly consultations and repeated radiographs to assess complications.

Data were collected from medical records in June of 2022, looking for the following variables: age, date of birth, sex, previous wrist pathology, follow-up time, scores on the Mayo Wrist Score and pain VAS (visual analogue scale) preoperative and

6 months after surgery and complications. It was defined as complications: loosening of components, impact generated by the prosthesis, infection or need for revision.

The data were analyzed with calculation of means and standard deviations (SD) and a sample T test paired with the SPSS 26.0 software was used to compare the results of the Mayo Wrist Score and EVA scale in the pre and postoperative periods considering a significant value of $p < 0.05$.

RESULTS

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

As for the Mayo Wrist Score, the preoperative mean was 23.2 (SD=8.9) and the postoperative mean was 82.8 (SD=7). The preoperative VAS scale had a mean of 7.6 (SD=1.1) while the postoperative mean was 1 (SD=1.2). The differences in the pre- and postoperative results of the Mayo Wrist Score and EVA were significant ($p< 0.001$).

The variables of each patient are assigned in Table 1. There were no intra or postoperative complications in the follow-up period studied.

TABLE 1: RESULTS

Patient	Age	Gender	Surgery	Previous situation of the joint	Follow up (months)	MWS PRE	MWS POS	VAS PRE	VAS POS
1	53	M	03/2017	PRC	36	15	75	9	4
2	64	M	09/2017	4 corner arthrodesis	40	20	80	7	2
3	71	M	11/2017	SLAC	36	25	90	9	0
4	58	M	05/2018	PRC	24	15	85	8	2
5	67	F	06/2018	Osteoarthritis	35	30	100	7	0
6	68	M	10/2018	Osteoarthritis – radius fracture	34	20	85	6	0

7	54	M	11/2018	Lunocapitate arthrodesis	25	15	80	8	1
8	73	M	11/2018	Osteoarthritis – radius fracture	31	40	90	6	1
9	80	M	04/2019	SNAC	23	15	80	9	2
10	61	M	05/2019	PRC	23	20	85	6	0
11	68	M	11/2019	4 corner arthrodesis	19	30	75	7	0
12	59	M	01/2020	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

Subtitles: MWS PRE (Preoperatory Mayo Wrist Score), MWS POS (Postoperatory Mayo Wrist Score), VAS PRE (Preoperatory Visual Analogic Scale), VAS POS (Postoperatory Visual analogic Scale), PRC (proximal row carpectomy)

DISCUSSION

The patients operated on in our series had as previous diagnoses SLAC, SNAC, post-traumatic and degenerative radiocarpal osteoarthritis. In addition, other patients had already undergone surgery with carpetectomy, lunocapitate arthrodesis or 4 corner arthrodesis. According to the possible indications for the use of the Motec prosthesis, the study did not include cases of Kienbock, total wrist arthrodesis (rearticulation) [8] and rheumatoid arthritis [9].

There was a significant improvement in the Mayo Wrist Score and EVA scale in our sample 6 months after the operation. Previous wrist arthroplasty case series studies with increased follow-up [10] and a systematic review [11] also showed improvements in these parameters, although they were performed with the DASH questionnaire (Disabilities of the Arm, Hand and Shoulder) instead of Mayo Wrist Score.

No adverse events related to the prosthesis material were observed as reactions to metal waste[12] in the period. Similarly, the patients in our series did not present infection, although some had risk factors such as post-traumatic osteoarthritis[13].

The loosening of components, a common cause of failure [factor,14] has also not been observed in our sample so far, thus avoiding the need for salvage surgeries, described above as extremely complex and difficult to execute[15]. However, one of the advantages of the Motec ® system is the ease of converting arthrodesis in the event of failure, with results similar to those of primary arthrodesis [16].

The study presents some limitations such as a small sample, a mean follow-up of just over 2 years (below other studies that have a follow-up 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 and followed by the same surgeon, which can give greater uniformity to the results.

CONCLUSION

Wrist arthroplasty is a surgical option for treating cases of post-traumatic osteoarthritis and can maintain a functional range of motion for the patient. As demonstrated in our series, functional improvements and pain were significant, there were no major complications in the period of time assessed, and the prosthesis was able to replace the partial arthrodesis that failed. Patients should be followed for longer, but with the certainty that, in case of failure, a total wrist arthrodesis can still be performed.

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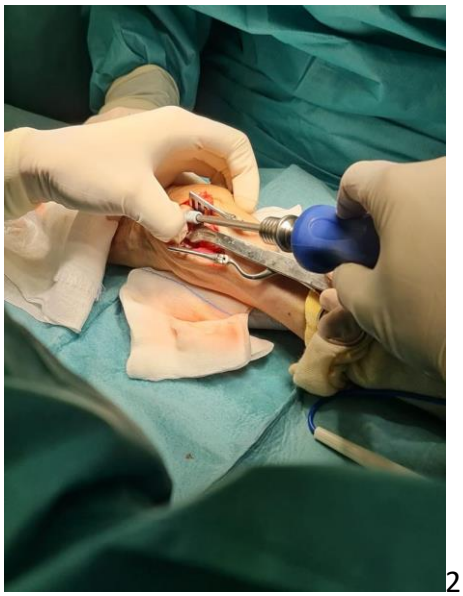
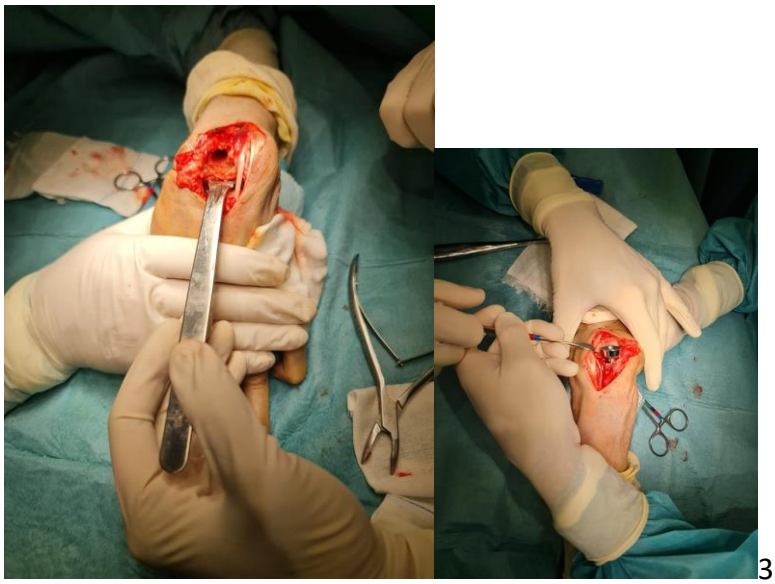
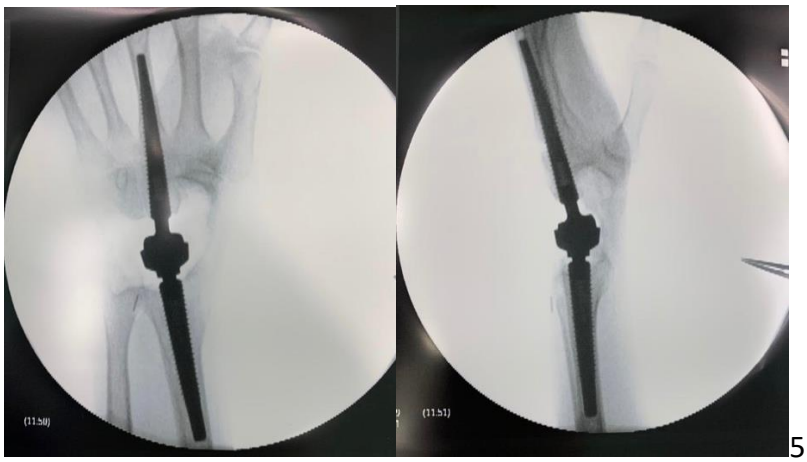
FIGURES:

1. Proximal carpal row resection

 2. Preparation and introduction of the distal component

 3. Preparation and introduction of the proximal component


4. Final clinical aspect


5. Final radiographic aspect