



Review of Dual Mobility Trapeziometacarpal Prosthesis in Patients with Rhizarthrosis: Our Experience in a Study of 66 Cases. Low Risk of Dislocation and Few Complications

Revisión de prótesis trapeziometacarpiana de doble movilidad en pacientes con rizartrrosis: Nuestra experiencia en un estudio de 66 casos. Bajo riesgo de luxación y escasas complicaciones

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Rev Iberam Cir Mano 2023;51(2):e96–e100.

Abstract

Introduction Trapeziometacarpal prosthesis implantation occurs for more than 50 years. Its disadvantage includes potential osteolysis, loosening, or dislocation. The development of dual mobility trapeziometacarpal prosthesis aimed to reduce the dislocation risk.

Material and Methods We analyzed 66 cases of dual mobility trapeziometacarpal prostheses implantation from 2019 to 2022, evaluating functionality, mobility, pain, and complication results.

Results The sample included 76.7% women, and the mean age of our patients was 62.4 years. Pain measured per the visual analog scale (VAS) scale decreased from 8.1 points preoperatively to 1.5 postoperatively. In 92.6% of the patients, the Kapandji index one month after surgery ranged from 9 to 10. In addition, the Quick Disabilities of the Arm, Shoulder, and Hand (DASH) score decreased from 46.2 to 9.8 points. There were two cases of cup loosening and one trapezium fracture in the first month after surgery. From one month to one year, we had one case of stem loosening. These complications required revision surgery. We did not observe any cases of dislocation.

Conclusions The dual mobility trapeziometacarpal prosthesis is a surgical option with good functional, mobility, and survival outcomes for patients with rhizarthrosis amenable to surgery.

Keywords

- ▶ osteoarthritis
- ▶ trapeziometacarpal prosthesis
- ▶ dual mobility
- ▶ thumb
- ▶ dislocation

received
July 15, 2023
accepted
October 9, 2023

DOI <https://doi.org/10.1055/s-0043-1777095>.
ISSN 1698-8396.

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Thieme Revinter Publicações Ltda., Rua do Matoso 170, Rio de Janeiro, RJ, CEP 20270-135, Brazil

Resumen

Introducción Las prótesis trapeziometacarpianas son implantadas desde hace más de 50 años. Entre sus complicaciones, destacan la posibilidad de osteolisis, aflojamiento o luxación. Con el fin de disminuir el riesgo de luxación, se desarrollaron las prótesis trapeziometacarpianas de doble movilidad.

Material y Métodos Se analizaron 66 casos de prótesis trapeziometacarpiana de doble movilidad intervenidos entre 2019 y 2022, y se evaluaron los resultados de funcionalidad, movilidad, dolor y aparición de complicaciones.

Resultados El 76.7% fueron mujeres y la edad media de 62.4 años. El dolor medido en escala EVA disminuyó de 8.1 preoperatorio a 1.5 postoperatorio. En el 92.6% de los pacientes, el índice de Kapandji al mes de la cirugía se encontraba entre 9 y 10. Además, el QuickDASH disminuyó de 46.2 a 9.8. Encontramos en el primer mes tras la cirugía dos casos de aflojamiento de cotilo y una fractura de trapecio. Desde el primer mes hasta cumplir el año, tuvimos un caso de aflojamiento de vástago. Estas complicaciones requirieron tratamiento quirúrgico de revisión. No observamos ningún caso de luxación.

Conclusiones La prótesis trapeziometacarpiana de doble movilidad es una opción quirúrgica con buen resultado funcional, de movilidad y supervivencia para pacientes con rizarthrosis candidatos a cirugía.

Palabras clave

- ▶ rizarthrosis
- ▶ prótesis trapeziometacarpiana
- ▶ artrosis
- ▶ doble movilidad
- ▶ luxación

Introduction

Trapeziometacarpal (TMC) osteoarthritis is the most common condition in hand surgery. The prevalence of TMC osteoarthritis ranges from 8 to 12%, reaching up to 33% in postmenopausal women.¹ TMC is the second most common location of osteoarthritis in the hand, after the distal interphalangeal joint. In the general population, one in four women and one in twelve men present degenerative changes at the TMC level, mostly asymptomatic.²

The static stability of the TMC joint depends on the joint capsule and the ligaments surrounding it. It is controversial which is the primary stabilizer of the TMC joint. Historically, the anterior oblique ligament had a greater significance. However, today, we believe the stabilizing role of the dorsoradial ligament is higher in a joint affected by wear resulting from the biomechanical effect of load translation.^{2,3}

The treatment of symptomatic rizarthrosis is broad and ranges from several conservative treatment options to surgery. There are numerous specific surgical treatments for TMC osteoarthritis: trapezectomy with or without tenosuspension, interposition arthroplasties, joint arthrodesis, or prosthetic replacement, which has gained importance in recent years. The technique used will depend on the patient's age and activities, the radiological stage, and the experience of the surgeon.³

Historically, the surgical technique of choice in advanced TMC osteoarthritis has been trapezectomy, whether total or partial. It is a simple technique with good short- and medium-term outcomes for reducing pain and improving thumb mobility. In recent years, its indication has increased thanks to the arthroscopic technique.

Although TMC arthroplasty has been used for decades, recent years have witnessed significant growth in its perfor-

mance. The first prosthesis described was the De La Caffinière in the 1970s, a ball-and-socket-type prosthesis, which presented frequent major complications, such as osteolysis and loosening. Subsequently, similar non-cemented or constrained prostheses were introduced and offered better long-term outcomes despite a considerable dislocation rate (10%).^{3,4} To reduce the probability of dislocation, dual-mobility TMC prostheses began to be used in 2010, mimicking the concept of hip prostheses.

This study aimed to evaluate the outcomes of a series of patients diagnosed with advanced TMC osteoarthritis with failed conservative treatment. These subjects underwent surgery by the same professional, who placed a Moovis-type dual-mobility TMC prosthesis with a ball-and-socket modular design and a conical cup (► **Figure 1**)

Material and Methods

Study Design

This study was retrospective, based on a series of cases operated on in our center using Moovis-type dual-mobility TMC prosthesis. In total, the analysis included 60 patients (66 prostheses) undergoing surgery from 2019 and 2022.

The demographic data collected included age, gender, dominant hand, and the degree of osteoarthritis per the Eaton-Littler scale.

The Kapandji index assessed mobility in the first month after surgery. In addition, we analyzed complications within the first year after surgery, pain according to the visual analog scale (VAS), and the Quick Version of the Disabilities of the Arm, Shoulder, and Hand (qDASH) functional questionnaire at the beginning and the end of follow-up. The mean follow-up was 13.6 months (range, 11.3 to 16 months).



Fig. 1 Pre- and postoperative radiographs of a 68-year-old male patient with rhizarthrosis in the left hand and undergoing dual-mobility thumb prosthesis placement.

Surgical Technique and Postoperative Protocol

The same surgeon performed all procedures under regional anesthesia and ischemia.

The surgeon performed a longitudinal radial incision at the base of the first metacarpal, centered on the TMC joint. After joint approach and protecting the sensory branch of the radial nerve, the surgeon made an inverted L-shaped capsulotomy.

With a saw, the surgeon performed an oblique osteotomy at the base of the first metacarpal, approximately 3 to 5 mm in thickness. Under scopic control, after exhaustive osteophyte removal, the center of the trapezium was located and received a Kirschner wire to serve as a guide for the cannulated drills. The neoacetabulum was reamed followed by placing a press-fit impacted cup of appropriate size. Subsequently, the surgeon performed an intramedullary reaming of the metacarpal bone and placed the corresponding press-fit stem. The trial head and neck were added followed by implant reduction. Definitive implant placement occurred after checking the stability and range of mobility. Next, the surgeon proceeded to capsular closure, hemostasis, skin closure, and compressive bandage placement.

From the first postoperative day, we allowed patients to use their hands for basic activities for daily living. On the seventh postoperative day, after bandage removal, rehabilitation began. We instructed the patients to avoid heavier tasks or carrying weights for 6 weeks.

Table 1 Patients' characteristics

Characteristic	Value
Number of patients	60
Number of thumbs	66
Female:male ratio	46/14
Operated side (%)	
Right	53%
Left	38%
Bilateral	9%
Mean age	62.4
Mean surgical time (minutes)	38.3

A radiological follow-up occurred after 4 weeks to identify potential complications and assess thumb mobility.

Follow-up included periodic clinical and radiological examinations around 3 and 12 months. At the end of the follow-up period, we determined pain per VAS and functional outcomes using the qDASH questionnaire.

Results

Patients undergoing surgery included 46 women (76.7%) and 14 men (23.3%). In six subjects, surgery was bilateral. The average age of patients was 62.4 years, ranging from 47 to 77. The operated hand was the dominant one in 57% of the cases and the non-dominant hand in 43% of patients (► **Table 1**)

The Eaton-Littler classification evaluated the preoperative radiographs; 56 and six joints had stage III and IV injuries, respectively. One patient received a thumb prosthesis for a trapezium fracture. Another procedure occurred in 47% of the interventions; the most frequent secondary procedures were the median nerve release in the carpal tunnel and ganglion resection.

During follow-up, 93.9% of patients had no complications. Only four (6.1%) complications occurred during the entire follow-up, three of them in the first postoperative month and another one a year later.

Regarding complications during the first postoperative month, there were two cases of cup mobilization treated by replacement and one trapezium fracture treated by a surgical stapedectomy.

From the first month to the first postoperative year, there was one case of stem loosening treated by replacement (► **Table 2**)

Table 2 Complications during patient follow-up

Complications	Number of patients (%)
Cup loosening	2 (3%)
Trapezium fracture	1 (1.5%)
Stem loosening	1 (1.5%)
Total	4 (6%)

Table 3 Visual analog scale (VAS) before surgery and at the end of follow-up

VAS	Mean	Confidence interval
Preoperative	8.1	7.7-8.5
Postoperative	1.5	0.5-2.6

Table 4 qDASH values before surgery and at the end of follow-up

qDASH	Media	IC
Pre-quirúrgico	46.2	41.4-50.1
Post-quirúrgico	9.8	5.6-13.9

Reviewing the first postoperative month, we observed complete mobility in 92.6% of the prostheses (Kapanji score, 9 to 10). The Kapanji score was 7 in two cases and 8 in two subjects.

The mean VAS before intervention was 8.1 compared to 1.5 at the end of the follow-up (► **Table 3**). Regarding the qDASH questionnaire, the preoperative mean score was 46.2 (confidence interval [CI], 41.4-50.1) and 9.8 (CI, 5.6-13.9) at the end of the follow-up period (► **Table 4**). Comparing the beginning and the end of the follow-up period, the differences in both questionnaires were statistically significant ($p < 0.01$).

Discussion

In recent years, the use of dual-mobility TMC prostheses in patients with symptomatic advanced rhizarthrosis has grown exponentially.

This increase results from improvements in surgical techniques and implants, evolving from the first De La Caffinière prostheses (with a high rate of osteolysis and loosening) to the current dual-mobility prostheses that allow greater mobility and a lower rate of dislocations.⁴

Our study revealed a significant improvement in thumb pain, mobility, and functionality. Pain per VAS decreased by an average of 6.6 points, while mobility according to the Kapanji scale was excellent at 92.6%, and the qDASH decreased from 46.2 to 9.8 points on average.

These results are consistent with those published in the literature.

Dreant et al.⁵ performed a retrospective study similar to ours, analyzing 28 Moovis-type dual-mobility thumb prostheses. These authors reported improved strength, pain, and mobility, with a postoperative Kapanji score of 10. They assessed the final functional outcomes using the QuickDASH questionnaire, with an average score of 12, and the Michigan Hand Outcomes questionnaire, with an average score of 87%.

In contrast, Lussiez et al.⁶ analyzed 107 cases of dual-mobility thumb prostheses for more than 3 years and reported an improvement in pain (postoperative VAS, 0.8), mobility (postoperative Kapanji score, 9.4), and a good functional outcome (QuickDASH score, 20; increase in clamp strength from 3.5 kg to 5.5 kg).

Although most patients have a good outcome, this surgery is not free of complications. The most frequent complications in this type of intervention include cup mobilizations, dislocations, trapezius fractures, and, to a lesser extent, infections.

In our series, we had two cases of cup loosening and one trapezius fracture during the first postoperative month. From the first month to the first post-surgical year, there was a stem loosening. We did not have any case of prosthetic dislocation. As such, the complication rate in our sample was low, at 6.1%.

Regarding complications, Dreant et al.⁵ reported one revision surgery for painful trapezium osteolysis.

Lussiez et al.⁶ reported five complications requiring implant replacement, including one cup mobilization, two painful osteolysis around the cup, and two cases of polyethylene wear.

As in our series, the two previous studies, both in patients undergoing surgery to place a dual-mobility TMC prosthesis, had no case of prosthetic dislocation.

Cootjans et al.⁷ followed up on 166 ARPE-type TMC prostheses (single-mobility prostheses) and found eight cases of prosthetic dislocation. In four of them, the prosthesis was stable after closed reduction, not requiring surgery. The remaining four patients underwent a revision surgery.

A systematic review by Vermeulen et al.⁸ found that the total TMC prosthesis is a good option to treat stages II and III rhizarthrosis. These authors also mention that the outcome could be better, at least in the short term, than trapezectomy with tendon interposition. However, they did not find one surgical treatment superior to another to treat symptomatic advanced TMC osteoarthritis.

Dual-mobility TMC prostheses were designed to reduce the dislocation rate. We had no cases of prosthetic dislocation.

Our study has some limitations. Its retrospective nature has inherent limitations, and the sample size was small. The follow-up time includes short and medium-term, and longer patient evaluations are required to assess long-term survival and late complications.

Conclusions

Outcomes from dual-mobility TMC prostheses were satisfactory concerning mobility, functionality, and pain improvement. The rate of complications in the short and medium term was low, with minimal risk of dislocation.

The placement of a dual-mobility prosthesis in patients with symptomatic TMC osteoarthritis is a surgical option with good outcomes, recommended especially in patients with moderate to high functional demand and requiring fast postoperative recovery.

Ethical Responsibilities

Protection of people and animals

The authors declare the procedures followed the ethical standards of the pertinent human experimentation committee, the World Medical Association, and the Declaration of Helsinki.

Data Confidentiality

The authors declare that they have followed their institutional protocols regarding the publication of patient data.

Right to Privacy and Informed Consent

The authors have obtained informed consent from the patients, subjects, or both referred to in the article.

This document is in the possession of the corresponding author.

Conflict of Interests

The authors declare no conflict of interests.

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