



Available online at

ScienceDirect  
www.sciencedirect.com

Elsevier Masson France

EM|consulte  
www.em-consulte.com



## Case report

# Total thumb carpometacarpal arthroplasty for failed trapeziometacarpal joint arthrodesis

## *Prothèse totale trapézo-métacarpienne pour échec d'arthrodèse trapézo-métacarpienne*

M.A. De la Red-Gallego <sup>a,\*</sup>, S. Barrera-Ochoa <sup>b</sup>, M.R. Sanchez Crespo <sup>a</sup>

<sup>a</sup> Hospital Universitario Marqués de Valdecilla, Avenida de Valdecilla s/n., 39010 Santander, Cantabria, Spain

<sup>b</sup> icatMA, Hand and Microsurgery Unit, ICATME, Hospital Universitari Quirón-Dexeus, Carrer de Sabino Arana, 5-19, 08028 Barcelona, Spain

### ARTICLE INFO

#### Article history:

Received 20 October 2020  
Received in revised form 15 December 2020  
Accepted 16 December 2020  
Available online xxx

#### Keywords:

Trapeziometacarpal joint arthrodesis  
Complications  
Thumb implant arthroplasty  
Basal thumb osteoarthritis

#### Mots-clés:

Arthrodèse trapézo-métacarpienne  
Complications  
Prothèse trapézo-métacarpienne  
Rhizarthrose

### ABSTRACT

Trapeziometacarpal joint arthrodesis is a surgical option for osteoarthritis of the first carpometacarpal joint; however, it has well-known disadvantages such as non-union and reduced mobility. Revision procedures are often not discussed and lack consensus. We are reporting two cases of satisfactory thumb implant arthroplasty for failed trapeziometacarpal joint arthrodesis in order to discuss the surgical technique, its advantages compared with other surgical options and therefore its potential indications.

© 2021 SFCM. Published by Elsevier Masson SAS. All rights reserved.

### R É S U M É

L'arthrodèse trapézo-métacarpienne est une option chirurgicale pour l'arthrose de la première articulation carpo-métacarpienne, mais elle présente des inconvénients bien connus (pseudarthrose, diminution de la mobilité...). Les techniques de révision ne sont généralement pas discutées et manquent de consensus. Nous présentons deux cas de prothèse trapézo-métacarpienne implantée après échec d'une arthrodèse trapézo-métacarpienne afin de discuter la technique chirurgicale, ses avantages par rapport aux autres options chirurgicales et ses indications.

© 2021 SFCM. Publié par Elsevier Masson SAS. Tous droits réservés.

## 1. Introduction

Historically, trapeziometacarpal joint arthrodesis (TMA) has been the optimal treatment to preserve pinch strength in active young patients suffering from advanced thumb osteoarthritis. Several studies have reported good outcomes following this procedure even in patients older than 50 years [1]; however compensatory mobility over the scaphotrapezoid joint (ST) might increase the risk of pantrapezoid arthritis over time. Other well-known disadvantages and complications of this technique are the reduced mobility, prominent hardware and non-union (0–47%) [2]. Furthermore, the reported reoperation rate is 24% [3]. Although

many papers review these complications, the revision procedures are not usually discussed and lack consensus. Conolly and Rath [4] reported on a 25-year-old patient who underwent an arthrodesis procedure with a stapling technique. After non-union, a repeat arthrodesis procedure was performed by bone grafting and tension-band wiring; fusion was finally achieved. A second fusion attempt is an option when the first procedure has failed; however, there is still an inherent risk of symptomatic non-union. Ligament reconstruction and tendon interposition (LRTI) and Tightrope® suspensionplasty are other valuable options, but there remains a risk of first ray subsidence and pain due to scaphometacarpal impingement [5]. Total joint arthroplasty produces a functional and painless joint with good long-term results [6].

We report on two cases of TMA conversion to implant arthroplasty to describe the surgical technique and its possible indications.

\* Corresponding author at: Hospital Universitario Marqués de Valdecilla, Avenida de Valdecilla s/n., 39010 Santander, Cantabria, Spain.  
E-mail address: [marian9585@hotmail.com](mailto:marian9585@hotmail.com) (M.A. De la Red-Gallego).

<https://doi.org/10.1016/j.hansur.2020.12.014>

2468–1229/© 2021 SFCM. Published by Elsevier Masson SAS. All rights reserved.

© 2021. This manuscript version is made available under the CC-BY-NC-ND 4.0 license <http://creativecommons.org/licenses/by-nc-nd/4.0/>

## 2. Cases report

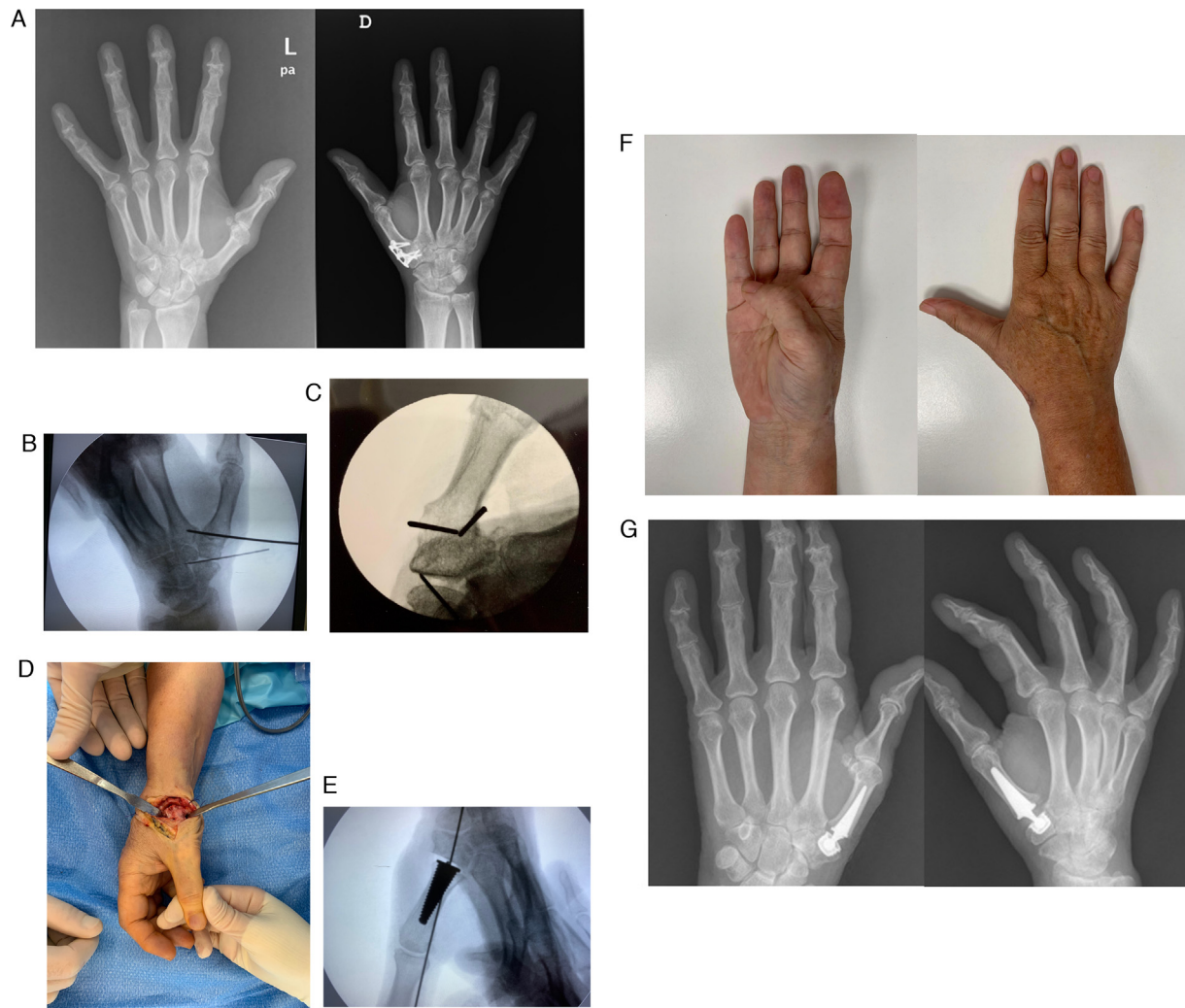
Two women (61 and 72 years) were referred to our center due to pain and limited mobility in the trapeziometacarpal joint. Both had a history of thumb osteoarthritis treated by TMA 2 and 4 years prior, respectively. X-rays showed joint fusion in both patients (Fig. 1A).

The 61-year-old patient was right-handed and did manual labor. She underwent TMA on her right hand with a plate 2 years prior. During her physical examination, she complained mainly of decreased range of motion that interfered with her work. The recorded grip strength was 4 kg and pinch strength 2.5 kg; a 15° compensatory hyperextension of the first metacarpophalangeal joint (MCP1) was registered. Thumb tip opposition distance to the little finger was 1 cm. Retropulsion was 0°. Thumb abduction was 50°. Pain was 3 on a visual analog scale (VAS).

The 72-year-old woman was left-handed. She underwent TMA in both hands and hardware removal elsewhere. She led an active and independent life and desired greater thumb movement because the bilateral TMA made it impossible for her to carry out some activities of her daily routine such as opening a big jar. The recorded grip strength was 3.5 kg and pinch strength 2 kg. No compensatory MCP1 hyperextension was registered. Thumb tip

opposition distance to the little finger was 0.5 cm. Retropulsion was –10°. Thumb abduction was 55°. Pain was 4 on VAS.

Surgery was performed as follows: After limb exsanguination, the previous dorsal incision was used. The interval between the abductor pollicis longus and extensor pollicis brevis (EPB) was identified, and the EPB was retracted ulnarly. Next, the dorsal capsule was exposed, and the existing TMA was identified. Fluoroscopy was used to locate the ST joint and the base of the thumb metacarpal bone. A 1.0 mm K-wire was placed at the TMA, parallel to the remaining trapezium articular surface in order to perform the osteotomy 2.5 mm above and below the K-wire, resulting in a 5 mm osteotomy like in the original technique (Fig. 1B). If an adduction deformity needed to be addressed, another K-wire was placed in the metacarpal before osteotomy at the angle needed to correct it (Figs. 1C, D). The capsule and periosteum were released from bone, specifically the proximal part of the first metacarpal. It is essential to shift the first metacarpal volarly with a Hoffmann retractor to allow complete exposure of the new trapezium surface. To avoid postoperative complications, we focused on centering the cup in the trapezium remnant under fluoroscopy guidance; hence, cannulated implants were preferred (Fig. 1E). Then, the technique was carried out as usual. In both cases, a semi-constrained (ISIS®) implant was inserted.



**Fig. 1.** Trapeziometacarpal arthrodesis in two female patients. Preoperative X-ray: hardware is still in place on the right side (A). Fluoroscopy view: wire inserted to locate the STT and TMA (B). Fluoroscopy view: wire inserted for angular osteotomy to correct the metacarpal adduction prior to implanting the metacarpal stem (C). Intraoperative picture of the trapezium and metacarpal exposure for osteotomy (D). Metacarpal stem in place. Wire positioned in the center of the trapezium to accurately implant to cup (E). Kapandji opposition score (left) and palm flat on the table (right) (F). Implant arthroplasty in both patients. Bilateral X-ray at follow-up (G).

Postoperative care consisted in 3 weeks of immobilization with a cast that placed the thumb in 60° volar abduction. No complications were registered. No physical therapy was needed. Eight weeks after surgery, both patients were able to place their palm flat on the table and had a Kapandji thumb opposition score of 9 (Fig. 1F).

After 2 years of follow-up, pain on VAS improved to 1 in both patients. Thumb tip opposition distance was complete. Retropulsion increased to 50° in the first patient and to 0° in the second. In the 61-year-old patient, MCP1 hyperextension was improved to 0°. Both patients were able to flat the palm flat; however, grip strength decreased to 1.5 kg in each patient and pinch strength decreased to 2 kg in the 61-year-old patient and to 1.5 kg in the 72-year-old one. Both patients were satisfied at 2 years of follow-up. X-rays showed correct implant position and no signs of complications (Fig. 1G).

### 3. Discussion

Some studies have investigated the clinical results of implant arthroplasty after joint fusion in other joints [7]. However, to our knowledge there are no reports after TMA.

TMA is a reliable procedure, as it relieves pain, restores stability, and maintains pinch strength. However, it decreases the range of motion (with varying results, probably due to different fusion positions), and makes it impossible to place the palm flat on a table. Moreover, it can lead to compensatory hypermobility of the MCP1 and ST joints. This might increase the range of motion, but it also overloads the adjacent joints that can eventually become painful [8]. These factors have led some patients to seek another procedure. Our first patient still had prominent hardware in place, we cannot eliminate this as a potential cause of pain, but her main need was additional movement. For this reason, we decided to perform hardware removal and implant arthroplasty.

Interposition arthroplasty could have been another choice in these cases but it was ruled out in both patients: in the younger patient due to her intention to return to work as soon as possible and in the older one due to the risk of thumb subsidence and disability in a patient where the CMC joint in the other hand was already fused.

In the short and mid-term, CMC joint arthroplasty provides faster pain relief than LRTI and consequently faster return to daily activities and work [9]. In addition, long-term follow-up reports demonstrate good outcomes in terms of pain relief and range of motion while the complication rate is decreasing [6]. Moreover, if a complication develops after implant arthroplasty, LRTI can be performed with good results [10] while the opposite is not feasible.

Although similar to primary implant arthroplasty, the reconversion from arthrodesis to arthroplasty should incorporate additional steps. One of the most important is centering the cup under fluoroscopy guidance as the trapezium's shape might be altered.

We must point out that in general terms, the indications for arthrodesis and the indication for total joint arthroplasty are not

the same. Arthrodesis is indicated more in younger male manual workers and total joint arthroplasty is indicated more in older women with less-demanding activities. Revising an arthrodesis into a total joint arthroplasty might increase motion but will decrease strength and might lead to long-term failure when used in a young patient; thus, we do not advocate it in patients younger than 55 years.

So far there have been no reports of joint implant arthroplasty after TMA. This case report shows that this procedure leads to good outcomes in terms of pain and range of motion.

### 4. Conclusion

Indications for conversion from TMA to arthroplasty might be adjacent joint disease, bilateral arthrodesis that impairs mobility and patient dissatisfaction; it restores range of motion, relieves pain, and may decrease the stress in adjacent joints.

### Ethics form

The local ethics committee approved the protocol of the study. Patients provided written informed consent before participation, in accordance with the Declaration of Helsinki guiding biomedical research involving human subjects.

### Disclosure of interest

The authors declare that they have no competing interest.

### References

- [1] Fulton DB, Stern PJ. Trapeziometacarpal arthrodesis in primary osteoarthritis: a minimum two-year follow-up study. *J Hand Surg Am* 2001;26:109–14.
- [2] Pardini AG, Lazaroni AP, Tavares KE. Compression arthrodesis of the carpometacarpal joint of the thumb. *Hand* 1982;14:291–4.
- [3] Alberts KA, Engkvist O. Arthrodesis of the first carpo-metacarpal joint. *Acta Orthop Scand* 1989;60:258–60.
- [4] Conolly WB, Rath S. Revision procedures for complications of surgery for osteoarthritis of the carpometacarpal joint of the thumb. *J Hand Surg Br* 1993;18:533–9.
- [5] Hess DE, Drace P, Franco MJ, Chhabra AB. Failed thumb carpometacarpal arthroplasty: common etiologies and surgical options for revision. *Hand Surg Am* 2018;43:844–52.
- [6] Martín-Ferrero M, Simón-Pérez C, Coco-Martín MB, Vega-Castrillo A, et al. Trapeziometacarpal total joint arthroplasty for osteoarthritis: 199 patients with a minimum of 10 years follow-up. *J Hand Surg Eur* 2020;45:443–51.
- [7] Barrera-Ochoa S, Mendez-Sanchez G, Mir-Bullo X. Pyrocarbon interposition arthroplasty for failed total wrist arthrodesis. *J Hand Surg Eur* 2017;42:968–9.
- [8] Dormitorio B, Hattori Y, Yukata K, Sakamoto S, Doi K. The use of dynamic radiographs in trapeziometacarpal joint arthrodesis for accurate range of motion evaluation. *J Orthop Sci* 2018;23:75–80.
- [9] Ulrich-Vinther M, Puggaard H, Lange B. Prospective 1-year follow-up study comparing joint prosthesis with tendon interposition arthroplasty in treatment of trapezio-metacarpal osteoarthritis. *J Hand Surg Am* 2008;33:1369–77.
- [10] Lenoir H, Erbland A, Lumens D, Coulet B, Chammass M. Trapeziectomy and ligament reconstruction tendon interposition after failed trapeziometacarpal joint replacement. *Hand Surg Rehabil* 2016;35:21–6.