

Five year long term result of total joint arthroplasties in the treatment of trapeziometacarpal osteoarthritis

David Gómez-Garrido¹, Victor Triviño-Mayoral², Victor Delgado-Alcala², Javier Cervera-Irimia¹, Maria Medina-Lorca³, Felix Sánchez-Sánchez², Cristina Ibáñez-Vicente⁴, Ignacio Pérez-Gurbindo⁵, Luigi Meccariello⁷, Giuseppe Rollo⁷, Giuseppe Pica⁸, Alessandro Tomarchio⁹, Andrea Pasquino⁷, Michele Bisaccia⁶

¹Department of Orthopaedics and Traumatology, Hospital General de Villalba, Spain; ²Department of Orthopaedics and Traumatology, Complejo Hospitalario de Toledo, Toledo, Spain; ³Hospital Universitario 12 de Octubre, Madrid, Spain; ⁴Hospital Universitario de Getafe, Spain; ⁵Universidad Complutense de Madrid, Spain; ⁶Department of Orthopaedics and Traumatology, Santa Maria della Misericordia Hospital, University of Perugia, Perugia, Italy; ⁷Department of Orthopedics and Traumatology, Vito Fazzi Hospital, Lecce, Italy; ⁸Department of Orthopedics and Traumatology, AO San Pio- G. Rummo Hospital, Benevento, Italy; ⁹Department of Orthopedics and Traumatology, S. Croce e Carle Cuneo Hospital, Cuneo, Italy

Summary. *Introduction:* Trapeziometacarpal (TMC) osteoarthritis is a common disease. Patients with advanced disease who have failed conservative treatment have different surgical options, including total joint prosthesis. The aim of this study was to investigate the long-term outcome and complications of trapeziometacarpal (TMC) total arthroplasty. *Materials and Methods:* One hundred and forty-seven patients with TMC osteoarthritis were surgically treated with TMC arthroplasty, and one hundred and thirty-seven patients were seen for follow-up (102 women and 35 men). At follow-up patients were asked to complete a visual linear-analogue scale (VAS) for satisfaction with the result of the operation and persisting pain from the thumb, the Spanish validated Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire was used to evaluate function of the affected hand. (9) The radiological examination consisted of posterior-anterior and oblique radiographs. In preoperative radiographs Eaton-Little was used, and in postoperative radiographs were assessed with regard to implant loosening and alignment. *Results:* The subjective outcome was satisfactory in 126 cases (92 %), 14 (12 %) patients would undergo the same procedure in the other hand. The DASH questionnaires were 19.55 (range 5.6-33,5) on average, and EVA was 1 on average. The mean key pinch strength was 5.8 Kg at 5 years follow-up. The most frequent postoperative complication was De Quervain tenosynovitis (21%), other complications were: Cup loosening (3.6%), traumatic dislocation (3,6%). The prosthesis was removed in nine cases (7%). There were four intraoperative complications. The survival rate for ARPE prosthesis was 92,7% at 60,5 months. TMC total arthroplasty offers a reliable treatment alternative in patients with thumb carpometacarpal joint osteoarthrosis which conservatives' treatment had failed. *Conclusions:* The TMC joint prosthesis is an option for patients with TCM osteoarthritis, provides satisfactory outcomes and has a low failure rate.(www.actabiomedica.it)

Key words: thumb, arthritis, metacarpal, finger, joint, outcome, DASH, prosthesis

Introduction

The first carpometacarpal joint of the thumb gives the myriad of activities that an average human un-

dertakes. It can move in three main planes: abduction-adduction, flexion-extension and opposition. The main ligamentous stabilizers of this articulation are the anterior oblique ligament and the dorsoradial ligament.

Trapeziometacarpal (TMC) osteoarthritis is a common entity (1). The eventual degenerative change of TMC joint including joint space narrowing, osteophyte formation, ligament attenuation and dorsal radial subluxation of the joint (2).

TMC osteoarthritis is a common disease in postmenopausal women, leading to severe disability and pain (1, 3), Prevalence reported as high as 15% in older than 30 years and precise causes remain unclear (4). The typical presentation is insidious radial thumb pain that it is worsened with use, has decreased her ability to perform daily activities, decreases strength and dexterity. There has been an increasing stiffness and cramping with increasing stage (2). Physical examination often show a dorsoradial prominence of the first metacarpal base, pain is usually focus in trapeziometacarpal joint and crepitus may often be felt, and the grind test of the trapeziometacarpal joint will often produce pain (2).

Radiographs of the TMC joint in the standard anteroposterior, 30° anteroposterior, lateral and oblique view help confirm the diagnosis. But not only radiographic evidence is enough in order to make the diagnosis, since approximately 25% of women and 8% of men will develop radiographic evidence of TMC osteoarthritis, and only 28% of this woman will admit to pain (2).

Several different methods exist for the radiographic staging of TMC arthritis. Eaton-Littler classification system is currently most widely used for TMC osteoarthritis staging (4) (Table 1).

Conservative treatment including NSAIDs and splinting is mostly successful, and surgical treatment is only indicated in resistant cases (1, 3).

Surgical options vary with the stage and nature of the disease. Multiple surgical procedures have been introduced since simple excision reported in 1949 by Geravis (5), include fusion, thumb metacarpal extension osteotomy, simple excision of the trapezium, trapeziectomy combined with interposition arthroplasty and total joint replacement.

The two most frequently used techniques currently are implant arthroplasty and trapeziectomy with ligament reconstruction and tendon interposition (LRTI). Although a prospective study by Martinez-Martinez et al comparing LRTI with implant

Table 1. Classification of trapeziometacarpal joint arthritis

Stage	Characteristics
I	Slight widening of the joints space, less than 1/3 subluxation
II	Narrowing of the trapeziometacarpal joint and osteophytes or loose bodies less than 2 mm in diameter
III	Marked decrease in the trapeziometacarpal joint space, subchondral cyst, osteophytes or loose bodies bigger than 2 mm
IV	Degeneration involves the scaphotrapezium joint.

arthroplasty, demonstrated no significant differences in Visual Linear Analogue Scale (VAS), Disabilities of the Arm, Shoulder and Hand (DASH) and pinch grip strength at 12-month follow up. (6) Many authors continued to recommend trapeziectomy with ligament reconstruction and tendon interposition (LRTI) as the gold standard for surgical treatment, since high complication rates of implant arthroplasty and the need for more long-term studies (7).

A number of different joint replacements have been developed including spacers, hemiarthroplasties and total joint replacements. The ARPE TMC joint total arthroplasty was introduced in 1991, it has become one of the established treatments for this disease, and ARPE TMC joint total arthroplasty have been reported 10-year survival rate of 94% with high patient satisfaction (8).

The purpose of this retrospective study was to determine the complication rate, the survival rate and patient satisfaction for a consecutive series of patients undergoing primary trapeziometacarpal total arthroplasty.

Patients and methods

In 147 consecutive patients with osteoarthritis of the trapeziometacarpal joint 151 (14 bilateral case) thumbs were surgically treated at Hospital Virgen de la Salud (Toledo, Spain) between 2013 and 2014. The indication for surgery was failure of conservative treatment in patients with TMC. 137 patients were seen for follow-up, 2 patients had died, and 18 patients were lost to follow-up.

Patients included in the study had undergone TMC joint arthroplasty for primary osteoarthritis, and conservative treatment fails, including steroid injections and physical therapy for a minimum of 6 to 12 weeks.

The ARPE TMC joint arthroplasty consists of an unconstrained uncemented arthroplasty with a cup inserted into the trapezium and a stemmed component inserted into the thumb metacarpal.

At follow-up patients were asked to complete a visual linear analogue scale (VAS) for satisfaction with the result of the operation and persisting pain from the thumb, the Spanish validated Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire was used to evaluate function of the affected hand (9). The radiological examination consisted of posterior-anterior and oblique radiographs. In preoperative radiographs Eaton-Little was used, and in postoperative radiographs were assessed with regard to implant loosening and alignment.

Surgical technique

A lateral approach was used in all cases, with the incision centred over the TMC joint, the extensor pollicis brevis was reflect dorsally and the abductor pollicis longus was reflected ventrally. The capsule of the TMC joint was opened longitudinally, and saw was used to cut off 6-8 mm of the proximal surface of the first metacarpal perpendicular to the metacarpal axis.

And awl was used to open the intramedullary canal of the first metacarpal bone and enlarged with rasps until satisfactory cortical contact was obtained. The trial stem was implanted, and the back of the stem was aligned with the nail of the thumb.

The fist metacarpal was then subluxate ventrally to provide access to the trapezium, a thin bone cut was made to remove a little bone as possible. The osteophytes were removed.

The centre of the trapezium in distal surface was identified and a hole was drilled with surgical awl, this hole was enlarged with curettes and trapezium reamer.

A trial head was inserted, and a trial reduction undertaken, the trial was assessed for stability and impingement. The definitive head was inserted and the joint reduced. The capsule and the skin were closed (Figure 1).



Figure 1. Example of trapeziometacarpal prosthesis

A short plaster of Paris arm cast in functional position for 3 weeks was used in all patients. After 3 weeks the cast was removed, and an exercise programme was undertaken.

The Kaplan-Meier method was used to estimate survival probability over time.

All surgeries were performed by the same experienced and fully qualified orthopaedic had surgeon, and at follow-up the patients were evaluated by Italian independent researchers.

Result

In all, 137 patients (151 thumbs) were reviewed at a mean of 60,5 months (range 55-66), after the procedure. Most of the patients were women: 102 women and 35 men. The mean age was 61,6 years (range 46-78 years) at the time of the surgery. The dominant hand was affected in 79% of patients and 38% had already undergone trapeziectomy with LRTI (Zancolli technique) for basal joint arthritis in their contralateral hand. 83 right thumbs and 54 left thumbs were treated; 91 of the treated thumbs were dominant (Table 2).

129 number nine cups were implanted in the trapezium and 8 number ten, 97 number nine and 40

Table 2. Description of population

137 Patients	151 Thumbs
102 Female	35 Male
83 Righ hand	54 Left Hand

number ten stems were implanted in the first metacarpal. An angulated neck was used in 122 cases and 15 straight neck was used.

The Eaton-Littre grade(4) was: Grade II in 2 cases, grade III in 101 cases and grade IV in 34 cases.

The subjective outcome was satisfactory in 126 cases (92%), 14 (10%) patients would undergo the same procedure in the other hand. The DASH questionnaires was 19.55 (range 5.6-33,5) on average, and EVA was 1 on average. The mean key pinch strength was 5.8 Kg at 5 years follow-up.

There were a high rate 29 cases (21%) of De Quervain`s tenosynovitis, these complications occur around the 3rd month and it was recovery with conservative treatment.

77% demonstrated no evidence of loosening or subsidence. 13% demonstrated changes. Cup loosening in five cases (3,6%). The other radiologically changes were minor abnormalities without clinical impact like slight mal positioning of components, partial areas of radiolucency around cup or and heterotopic bone around de joint.

The prosthesis was removed in nine cases (7%) six at five years and three at four years. A trapezectomy and ligament reconstruction and LTRI (Welby techniques) was performed in all case of prosthesis loosening with clinical impact.

There were four intraoperative trapezoidal fracture (3%) that occurred on impaction of the cup, immobilization for 6 weeks was enough for three patients and in one case trapezectomy and LRTI was necessary since impaction of the cup was not possible.

Five (3,6%) traumatic dislocation occurred along five years, in three cases close reduction and immobilization was undertaken for 3 weeks and the normal function was recovered, and in two case the cup was loosening, and new surgery was performed (Welby Technic).

The survival rate for ARPE prosthesis was 92,7% at 60,5 months.

Discussion

Osteoarthritis of the TCM joint is a frequent disease in the elderly and in postmenopausal women, can

cause severe pain, weakness, and marked disability (3, 10).

In the case that nonsurgical treatment fails, many surgical options have been described for the treatment of severe TMC arthritis.(3)(11) However, there is no evidence that one technique is better than another (7, 10).

Simple excision was first reported in 1949 by Gervis, with good results in eighteen operations in fifteen patients. Simple trapeziectomy is an easy and quick procedure (5).

In more recent reports, LRTI arthroplasties are popular, and it is considered to be the gold standard for surgical treatment of TMC osteoarthritis(1)In the randomised studies which compare trapeziectomy alone or combined with LRTI, no statistical difference was found (12, 13). Trapeziectomy with LRTI resulted in similar grip strength as simple trapeziectomy, the surgical technique led to a significant loss in pinch strength and significantly higher disability (DASH) score (14).

Thumb metacarpal extension osteotomy was described by Wilson in 1973, Artroschi et al, compared trapeziectomy with LRTI with metacarpal extension osteotomy, and concluded that metacarpal osteotomy should be limited to patients with early stage (15).

TMC arthrodesis is an effective alternative to LRTI procedure for patients with high physical demand. Fusion of the TMC articulation proved to be a reliable surgery with good long term results, different methods of fixation have been described in the literature The main problem of the arthrodesis technique is the non-union and hardware failure, although non-union not always are symptomatic(1). Kazmer et al, compared 14 patients treated with modified arthrodesis versus 22 LRTI patients, and found 25% greater pinch strength in fusion group, as well as similar range of motion, the non-union rate was of 7 % (16). Non-union rates in literature are on average 8% to 21% (7).

Another newer alternative technique is suspensionplasty with Mini TightRope and hemitrapeziectomy, it is a new arthroscopy technique. Some retrospective study found good outcomes, but there is little long-term data on the use this surgical procedure (17).

Total TMC joint replacement surgery was developed in 1973 by De la Caffinière, since the first de-

scription many designs of cemented and uncemented prostheses have emerged (18).

In the 2008s Ulrich-Vinther et al compared the Elektra joint prosthesis with trapeziectomy and LRTI, and reported that patients with joint prosthesis achieved faster recovery, more comfort, better strength and better range of motion without and increased complication rate (19).

Martin-Ferrero et al, studied the 10-year long-term results of the ARPE prosthesis in 64 patients, and report 10 year survival rate of 93.9%, with median VAS score at 10 year was 1.1 and the mean key pinch strength 5.6 kg (8). This result are comparable with our study.

Bricout et al, reported survival rate of the Maia prosthesis of 91% at 62 months, and subjective satisfactory outcome in 87% of patients. They also could detect risk factors for surgical revision, as presence of preoperative thumb deformity, poor trapezium bone quality discovered during the surgery and incorrect positioning of trapezium cup (20).

De Quervain tenosynovitis after TMC arthroplasty in the first years is a reported complication. Goubau et al reported 17% rate of De Quervain disease (21) and Bricout et al 16% (20). This rate is similar in this report.

Major complications are not too frequent, and revision surgery rate usually is less than 10% in the recent literature. Trapeziectomy with LRTI is considered an option in revision case, with worsened outcome and unpredictable compared with primary LRTI surgery. (22, 23)

The TMC joint prosthesis is an option for patients with TCM osteoarthritis, provides satisfactory outcomes and has a low failure rate. The main complications were De Quervain tendinopathy, trapezium cup loosening and prosthetic dislocation, but not all complication required revision surgery since the clinical status could be successfully.

If revision surgery is needed, trapeziectomy and LRTI is still an option, while TMC arthroplasty in revision surgery of trapeziectomy and LRTI is not possible.

Human and animal right: For this type of study is not required any statement relating to studies on humans and animals. All

patients gave the informed consent prior being included into the study. All procedures involving human participants were in accordance with the 1964 Helsinki declaration and its later amendments.

Conflict of interest: Each author declares that he or she has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article

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Correspondence:
Luigi Meccariello, MD
Department of Orthopedics and Traumatology,
Vito Fazzi Hospital, Piazzetta Filippo Muratore,
Block: A- Floor: V, Lecce, Italy
Tel. +393299419574
Fax: +390823713864
E-mail: drlordmec@gmail.com