

Contents lists available at [ScienceDirect](http://www.sciencedirect.com)

International Journal of Surgery Case Reports

journal homepage: www.casereports.com

Rhizarthrosis fourth grade of eaton with hyperextension of the metacarpophalangeal joint

Omar Faour-Martín^{a,*}, Miguel Ángel Martín-Ferrero^b, Jose Antonio Valverde-García^a, Aurelio Vega-Castrillo^b, María Ángeles De La Red-Gallego^c^a Complejo Hospitalario De Ávila-Sacyl, Spain^b Hospital Clínico Universitario De Valladolid, Spain^c Hospital Marqués De Valdecilla De Santander, Spain

ARTICLE INFO

Article history:

Received 22 January 2013

Received in revised form 17 May 2013

Accepted 8 July 2013

Available online 13 August 2013

Keywords:

Burton

Pellegrini

Thumb

Surgical management

ABSTRACT

INTRODUCTION: Restoration of thumb function with a painfree, stable, and mobile joint with preserved strength are the main goals of treatment of painful arthritis of the thumb. We present our clinical experience in surgical treatment of this disease, in its highest degree of affectation.

PRESENTATION OF CASE: A 57-year-old woman presents with a 2-year history of worsening pain at the base of her right, dominant, trapezial-metacarpal (TM) joint. Her thumb metacarpophalangeal (MCP) joint hyperextends 30° with lateral pinch. Radiographs demonstrate Eaton stage IV degenerative changes of her TM joint and no arthritis of her thumb MCP joint. She was successfully treated with a modified Burton–Pellegrini arthroplasty and sesamoidesis to the metacarpal head.

DISCUSSION: In cases of advanced rhizarthrosis conventional surgery does not serve to correct deformities of the metacarpophalangeal joint that may affect to the postsurgical outcomes.

CONCLUSION: rhizarthrosis management must be carried out in a global way. When a surgical treatment is planned, all deformities must be taken into account.

© 2013 The Authors. Published by Elsevier Ltd on behalf of Surgical Associates Ltd.

Open access under [CC BY-NC-ND license](http://creativecommons.org/licenses/by-nc-nd/4.0/).

1. Introduction

Thumb basilar arthritis is a common and often debilitating condition seen in more than half of women aged over 71 years.¹ It manifests as pain localized to the base of the thumb, as well as global hand dysfunction including weak pinch and grip, and inability to grasp large objects.² Eaton and Glickel³ described the radiographic severity of basilar joint arthritis, and these stages are often used to dictate treatment. Restoration of thumb function with a painfree, stable, and mobile joint with preserved strength are the main goals of treatment of painful arthritis of the thumb.⁴ Several interventions have been described, including volar ligament reconstruction, trapeziometacarpal arthrodesis, trapeziectomy alone, trapeziectomy with ligament reconstruction, and arthroplasty.^{5,6} However in some cases of rhizarthrosis, neither conservative treatment nor standard surgical techniques can successfully solve all the symptoms.⁷ In addition, comparatively little has been described

about how to manage the accompanying hyperextension deformity of the metacarpophalangeal (MCP) joint that often exists.²

Burton and Pellegrini⁸ described the use of one-half of the width of the Flexor Carpi Radialis (FCR) tendon to reconstruct the palmar oblique ligament, to suspend the metacarpal of the thumb, and to fill the new arthroplasty space created by the excision of the trapezium. We present a case of surgical treatment of the highest degree of rhizarthrosis associated to MCP hyperextension with a sesamoidesis procedure to the metacarpal head and a modification of the Burton and Pellegrini technique, which consists in harvesting of the entire FCR tendon and in avoiding the use of any metal wire.

2. Presentation of case

A fifty-seven-year-old woman was admitted to the orthopaedic outpatient department complaining of pain and swelling at the first ray of the right hand that had been occurring over the preceding two years. Furthermore, she described feeling weak when trying to catch or hold objects, including serious difficulties in carrying out basic daily activities. There was no previous history of trauma. The patient was a manual worker and right-handed, with a personal history of allergy to pyrazolones, an anxious-depressive syndrome and hypothyroidism that was being pharmacologically treated.

On physical examination, pain and crepitation were noted in the metacarpophalangeal joint of the thumb, which appeared swollen

* Corresponding author at: C/Antonio montesinos, 2, 1° C, 37003 Salamanca, Spain. Tel.: +34 630081151.

E-mail address: ofmartin@msn.com (O. Faour-Martín).

with a positive shoulder deformity. In addition, the pain worsened with compression on the axis of the first metacarpal together with a simultaneous flexion-extension movement (Cranck Test) and a rotational movement (Grind Test). A compensatory deformity, such as a 30° hyperextension of the metacarpophalangeal joint of the thumb was found. This abnormality did not decrease with passive abduction of the trapeziometacarpal joint. As for mobility, major limitation was observed in the opposition of the thumb. The patient displayed no signs of carpal tunnel syndrome or other entities such as trigger fingers or De Quervain’s tenosynovitis.

The mean value of the Disabilities of the Arm, Shoulder and Hand Questionnaire (DASH score)⁹ corresponded to severe difficulty in performing daily activities or severe symptomatology (Table 1). The value of the Analogical Visual Scale was 8 out of 10. The grip (Jamar Digital Hand Dynamometer; Therapeutic Equipment Corp., Clifton, NJ) and pinch force (Preston pinch gauge; JA Preston, New York, NY) were 14.2 kg and 2.3 kg, respectively.

Radiographic assessment demonstrated a marked impingement of the trapeziometacarpal joint with a total loss of contour of the articular surfaces and the presence of subchondral cysts with a subluxation of the joint surface greater than a third. Osteophyte size was greater than 2 mm, with a markedly dysplastic scaphoid and pantrapezial degenerative changes.

Thus, this was a case of fourth-grade rhizarthrosis according to the classification of Eaton,³ associated with hyperextension of the metacarpophalangeal joint (Fig. 1). As a result of the dysplastic morphology of the trapezium, conventional arthroplasty with trapeziometacarpal prosthesis was ruled out. Surgery for advanced rhizarthrosis was scheduled and a modified Burton–Pellegrini¹⁰ arthroplasty was performed as described below (Figs. 2 and 3).

The operation was carried out under local anaesthesia; an incision of 4 cm was made over the volar aspect of the trapeziometacarpal joint. After isolating the radial artery, the joint was localised between the tendons of the extensor pollicis brevis (EPB) and longus (EPL). After a book-shaped capsulotomy, the trapezium bone was removed. Although in this case we extracted it in one piece, the trapezium is usually withdrawn fragmented to prevent possible injury to the tendon of the flexor carpi radialis (FCR), which crosses obliquely through the trapeziectomy space to insert into the base of the second metacarpal. Full thickness

Table 1
DASH results.

DASH score ^a	Preoperative period	1 year after surgery
Opening a tight or new jar	4	1
Writing	4	0
Turning a key	4	1
Preparing a meal	3	0
Pushing open a heavy door	4	0
Placing an object on a shelf above the head	2	0
Doing heavy household chores	4	0
Gardening or doing yard work	4	0
Making a bed	2	0
Carrying a shopping bag or briefcase	3	0
Carrying a heavy object (over 5 kg)	3	1
Changing a light bulb overhead	3	1
Washing or blowing drying the hair	2	0
Washing the back	2	0
Putting on a pullover sweater	2	0
Using a knife to cut food	3	0
Recreational activities that require little effort	2	0
Recreational activities that require taking some force or impact through the arm shoulder or hand	4	0
Recreational activities that require moving the hand freely	3	0
Managing transportation needs (getting from one place to another)	3	0
Sexual activities	2	0
Social activities	3	0
Work and other daily activities	4	1
Pain	3	0
Pain when performing activities	4	0
Tingling	2	0
Weakness	3	0
Stiffness	3	0
Difficulty in sleeping	3	0
Impact on self-image	2	0
Total	3.00	0.17

^a Ability to perform the activities: 0, no difficulty or no symptom; 1, slight difficulty or mild symptom; 2 moderate difficulty or symptom; 3, severe difficulty or symptom; 4, unable to perform or very severe symptom.



Fig. 1. radiography: (a) advanced rizarthrosis; (b) postoperative, 1 year F-U.

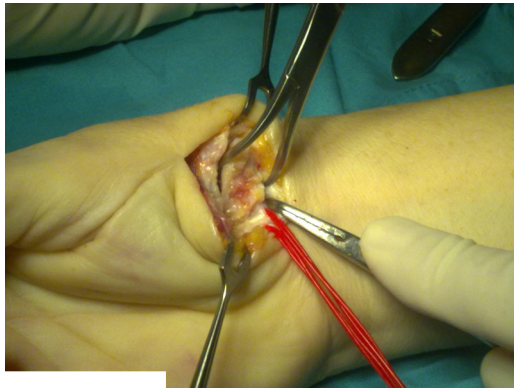


Fig. 2. Dysplastic trapezium.

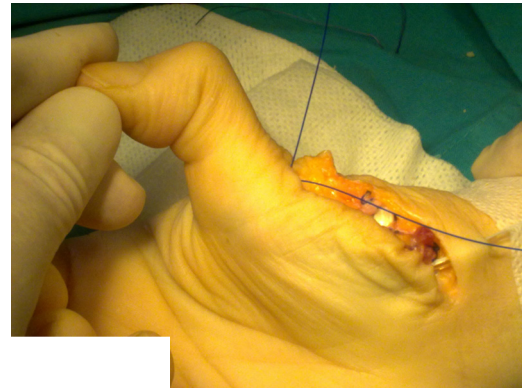


Fig. 4. Metacarpophalangeal hyperextension.

FCR tendon was harvested in the musculocutaneous union in the forearm, and then recovered in the space formed after the trapeziectomy. This step was made via two transverse incisions and pulled from the tendon insertion into the second metacarpal.

A tunnel at the base of the first metacarpal was prepared, approximately one centimetre from the articular surface with a dorsal-volar direction. A 3.2 mm diameter drill was used to perform the hole. Then the tendon was passed through the tunnel and sutured onto itself to suspend the first metacarpal. With the rest of the tendon, an anchovy-shaped plasty was created and then anchored with two threads at the bottom of the incision, filling the space occupied by the trapezium. A good closure of the joint capsule prevented the expulsion of the plasty. In this case, prior to the plasty placement, we proceeded to perform a sesamoidesis to the metacarpal head with a non-reabsorbable suture to prevent metacarpophalangeal hyperextension; the effectiveness of this surgical step was verified intraoperatively (Figs. 4 and 5).

A volar splint including the first ray was placed for a period of 3 weeks. After this time, the patient was referred to the rehabilitation service and three months after surgery, she returned to her usual work and was free of pain.

We were granted written informed consent from the patient and from the Ethics commission to perform a reevaluation one year after surgery. The patient remained without symptomatology and the metacarpophalangeal joint continued to be stable, with an opposition movement up to the distal volar crease and an opening of the first commeasure of more than 50°. The mean value of the DASH score⁹ at follow-up was between the absence of symptoms and the slightest degree of discomfort (Table 1). The X-ray control showed no metacarpophalangeal collapse.

3. Discussion

Restoration of thumb function ideally should provide pain-free, stable motion at the basal joint with adequate strength and proper balance of the entire ray.¹¹

Various surgical procedures have been described for stage III and IV osteoarthritis (OA) of the thumb carpal-metacarpal joint. Trapeziometacarpal arthrodesis is associated with loss of mobility and a transfer of reaction forces to the neighbouring joints.¹² Trapeziectomy alone leads to an important loss of strength. The literature specifically regarding trapeziometacarpal total joint prosthesis is rather limited, and the indications are not clearly delineated.¹³ With this in mind, patients with advanced radiographic OA changes of the scaphotrapezial joint with a wedge shaped trapezium are not ideal candidates for this technique.

In our case report, surgery was performed with a modification of the original technique proposed by Burton and Pelligrini,¹⁰ as we avoided using an intermetacarpal Kirchsner wire and the entire FRC tendon was harvested. Although those authors initially described the harvesting of only half of the tendon, other studies have demonstrated that its entire removal does not affect normal wrist biomechanical properties and provides a better tenosuspension.⁷ We obtained good results, in line with those reported in long-term studies for cases without MCP deformities treated by means of ligament reconstruction and tendon interposition techniques.^{10,14}

Pilato et al.¹⁵ reported poor results for the cases of rhizarthrosis associated to MCP hyperextension. These authors treated the MCP deformity with a temporary stabilization of the joint with wires. Authors reported that the correction obtained intraoperatively was not guaranteed in time.



Fig. 3. FCR interposition.

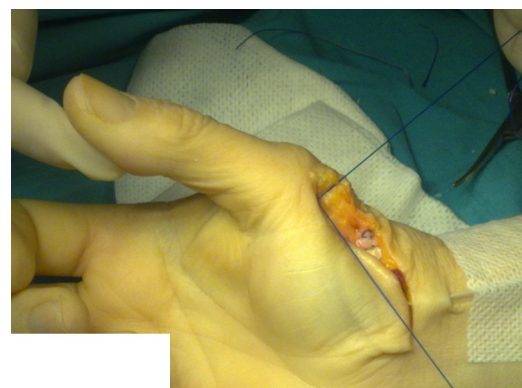


Fig. 5. Metacarpophalangeal correction with sesamoid arthroereisis.

Evidence for the management of MCP joint hyperextension is largely limited to technique descriptions, case reports, or retrospective case series.^{16,17} Treatment algorithms have been published to guide the management of this deformity, and include cast application or no treatment for extension less than 10°, percutaneous pinning of the joint or extensor pollicis brevis transfer for deformities between 10° and 20°, volar capsulodesis or sesamoidesis for deformities between 20° and 40°, and arthrodesis for deformities greater than 40°.¹⁷ Despite the heterogeneity in treatment methods, the variability in functional outcome measures reported and the lack of specificity of these outcomes for thumb function make direct comparison even more difficult.

We want to emphasise that although trapezium resection and arthroplasty of tenosuspension and interposition is useful for clinical resolution and maintaining proper functionality, it does not correct deformities of the metacarpophalangeal joint in cases of advanced rhizarthrosis,² which may affect postsurgical outcomes. In this case of metacarpophalangeal (MCP) hyperextension with a laxity degree greater than 20°, the operation must be supplemented with another technique, such as sesamoid bone tethering to the metacarpal head.¹⁸

4. Conclusion

Rhizarthrosis management must be carried out in a global way. To achieve good results in the surgical treatment of this disease, the metacarpophalangeal hyperextension must be treated. Sesamoidesis to the metacarpal head is able to correct this deformity and to contribute to the favourable outcomes provided by the techniques of ligament reconstruction and tendon interposition such as the modified Burton–Pellegrini technique.

Conflict of interest statement

There is not conflict of interests.

Funding

None.

Ethical approval

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Author contributions

O. Faour-Martín contributed in study design, writing and data collections for this article; M.A. Martín-Ferrero contributed in study design; J.A. Valverde-García contributed in writing; A. Vega Castrillo contributed in data collections; M.A. De La Red-Gallego contributed in study design and writing of this article.

References

- Sodha S, Ring D, Zurakowski D, Jupiter JB. Prevalence of osteoarthritis of the trapeziometacarpal joint. *J Bone Joint Surg* 2005;**87**:2614–8.
- Armbruster EJ, Tan V. Carpometacarpal joint disease: addressing the metacarpophalangeal joint deformity. *Hand Clin* 2008;**24**:295–9.
- Eaton RG, Glickel SZ. Trapeziometacarpal osteoarthritis: staging as a rationale for treatment. *Hand Clin* 1987;**3**:455–69.
- Barron OA, Glickel SZ, Eaton RG. Basal joint arthritis of the thumb. *J Am Acad Orthop Surg* 2000;**8**:314–23.
- Fulton DB, Stern PJ. Trapeziometacarpal arthrodesis in primary osteoarthritis: a minimum two-year follow-up study. *J Hand Surg* 2001;**26**:109–14.
- Kriegs-Au G, Petje G, Fojtíl E, Ganger R, Zachs I. Ligament reconstruction with or without tendon interposition to treat primary thumb carpometacarpal osteoarthritis: surgical technique. *J Bone Joint Surg* 2005;**87**:78–85.
- Wajon A, Carr E, Edmunds I, Ada L. Surgery for thumb (trapeziometacarpal joint) osteoarthritis. *Cochrane Database Syst Rev* 2009;(4):CD004631. <http://dx.doi.org/10.1002/14651858.CD004631.pub3>.
- Burton RI, Pellegrini Jr VD. Surgical management of basal joint arthritis of the thumb. Part II. Ligament reconstruction with tendon interposition arthroplasty. *J Hand Surg (Am)* 1986;**11**:324–32.
- Atroshi I, Gummesson C. The disabilities of the arm shoulder and hand (DASH) outcome questionnaire. Reliability and validity of the Swedish version evaluated in 176 patients. *Acta Orthop Scand* 2000;**71**:613–8.
- Tomaino MM, Pellegrini VD, Burton RI. Arthroplasty of the basal joint of the thumb. Long-term follow-up after ligament reconstruction with tendon interposition. *J Bone Joint Surg (Am)* 1995;**77**:346–55.
- Badia A. Total joint arthroplasty for the arthritic thumb carpometacarpal joint. *Am J Orthop* 2008;**37**:4–7.
- Mureau MA, Rademaker RP, Verhaar JA, Hovius SE. Tendon interposition arthroplasty versus arthrodesis for the treatment of trapeziometacarpal arthritis: a retrospective comparative follow-up study. *J Hand Surg* 2010;**26**:869–76.
- Badia A, Sambandam SN. Total joint arthroplasty in the treatment of advanced stages of thumb carpometacarpal joint osteoarthritis. *J Hand Surg Am* 2006;**31**:1605–14.
- Tomaino MM, Coleman K. Use of the entire width of the flexor carpi radialis tendon for the ligament reconstruction tendon interposition arthroplasty does not impair wrist function. *Am J Orthop* 2000;**29**:283–4.
- Pilato G, Gamberoni D, Surace MF, Baldo E, Cherubino P. The modified Burton–Pellegrini method for the treatment of trapeziometacarpal arthritis. Medium-term results. *Chir Organi Mov* 2005;**90**:241–52.
- Zancolli ER, Perrotto CJ. New transfer for correction of thumb metacarpophalangeal hyperextension in cases with associated surgery for basal thumb osteoarthritis (transfer of the volar half of the abductor pollicis brevis). *Tech Hand Upper Extrem Surg* 2011;**15**:92–3.
- Brogan DM, Kakar S. Metacarpophalangeal joint hyperextension and the treatment of thumb basilar joint arthritis. *J Hand Surg Am* 2012;**4**:837–8.
- Poulter RJ, Davis TR. Management of hyperextension of the metacarpophalangeal joint in association with trapeziometacarpal joint osteoarthritis. *J Hand Surg (Br)* 2011;**36**:280–4.