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ORIGINAL ARTICLE

Results of surgical treatment rhizarthrosis by means of trapeziometacarpal joint arthrodesis with a quadrangular osteosynthesis plate

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KEYWORDS
Thumb;
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Trapeziometacarpal artritis

Abstract
Objective: To review the results of thumb trapeziometacarpal arthrodesis fixed by trapeziometacarpal joint osteoarthritis with a rectangular plate.
Materials and methods: A retrospective review of trapeziometacarpal arthrodesis was performed. Sixteen arthrodeses with rectangular plate fixation were performed on 14 patients. The mean age was 54 years (range 44-60). The dominant hand was involved in 8 cases. The mean follow up was 28 months (range 10-46 months). The DASH score and Mayo Wrist Score were used for functional evaluation. The visual analogue pain scale was used for pain evaluation. The ability to perform activities requiring use of the thumb and the ability to return to work were also analysed. X-rays were evaluated to determine consolidation rates and development of adjacent joint degeneration.
Results: DASH score improved from 60 (range 50-85) to 25 (range 5-61) points. Overall mobility decreased, but the results regarding the performance of daily living activities were improved. All but one patient returned to their previous jobs. The average pain score improved from 6 (range 4-10) to 2 (range 0-9). There were no cases of radiographic degeneration progression in adjacent joints. Arthrodesis consolidation was achieved in all cases.
Conclusion: Trapeziometacarpal arthrodesis is a reliable procedure for thumb osteoarthritis.
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PALABRAS CLAVE
Rizartrosis;
Artrodesis;
Articulación trapecio-metacarpiana;
Pulgar

Resultados del tratamiento quirúrgico de la rizartrosis mediante artrodesis trapeciometacarpiana con placa de osteosíntesis cuadrangular

Resumen
Objetivo: Evaluar los resultados obtenidos en la rizartrosis mediante artrodesis con placa de osteosíntesis cuadrangular.
Material y método: Estudio retrospectivo en 16 artrodesis (14 pacientes). La edad media fue de 54 años (rango 44-60). La mano afectada fue la dominante en 8 casos. El tiempo medio de seguimiento fue de 28 meses. La evaluación funcional se realizó mediante las escalas DASH y Mayo Wrist Score y la evaluación del dolor mediante la escala analógica visual (EVA). Se analizó pre y postoperatoriamente la capacidad de realizar actividades que implican a la articulación trapecio-metacarpiana y la reincorporación a su trabajo previo. Radiográficamente se analizó la consolidación y el desarrollo de artrosis en las articulaciones vecinas.
Resultados: La puntuación en la escala DASH mejoró, de 60 puntos preoperatoria a 25 postoperatoria. La movilidad global disminuyó, pero mejoró la capacidad de realizar actividades específicas. Todos los pacientes menos uno se reincorporaron a su trabajo previo. La EVA mejoró de 6 antes (rango 4-10) a 2 puntos después de la cirugía (rango 0-9). Se registró una pseudoartrosis y no vimos progresión de artrosis en articulaciones vecinas.
Conclusión: La artrodesis de la articulación trapeciometacarpiana con placa de osteosíntesis cuadrangular es una técnica eficaz y segura para el tratamiento de la rizartrosis
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Introduction

The trapeziometacarpal (TMC) joint is the second most frequent joint in the hand to develop osteoarthritis, following the distal interphalangeal joint. Likewise, osteoarthritis is the degenerative pathology of the upper members that most frequently requires surgery.[1,2] This elevated prevalence may be due to the saddle morphology of hand articular surfaces, which provide great mobility but also condition an articulation largely dependant on the ligament structures for maintaining appropriate stability and congruence.[1] Other possible causes for osteoarthritis appearing at this level are inflammatory diseases, ligamentous hyperlaxity or traumas.

There are numerous surgical options for TMC osteoarthritis treatment when the conservative ones have failed. These include ligament reconstruction,[3,4] osteotomy of the base of the first metacarpal, interposition arthroplasty,[5] TMC joint prosthesis[6] or TMC arthrodesis.[7] The goals of all these options are to restore function and eliminate pain. However, there is no evidence as to the superiority of one technique over another with respect to results obtained, nor random comparative studies on this question.[5,8-13]

Arthrodesis has been defended by many authors as a technique that gives effective pain relief, stability and strength, providing appropriate hand function.[2,7,8,14] The classic indication for this surgery consists of young patients with a high functional demand,[15] although we have seen more recent series that propose its use in patients more than 40 years old.[16] Possible disadvantages that have been indicated include the appearance of osteoarthritis from overload of adjacent joints (range 0-47%, depending on the series[12,15,16]), limitation of movement and pseudarthrosis (rates ranging from 0% to 50%).[13-16] No consensus exists as to the osteosynthesis material used either, whether screws, needles or plates.[17,18]

The objective of this study was to evaluate the results obtained with arthrodesis of the TMC joint by rectangular plate osteosynthesis for the treatment of TMC osteoarthritis.

Patients and methodology

A retrospective study was carried out, covering a series of patients with Eaton's[3] stage II and III TMC osteoarthritis who underwent TMC arthrodesis using a rectangular plate as osteosynthesis material. By means of a radial dorsal approach, the TMC joint was exposed at the space between the abductor pollicis longus and the extensor pollicis brevis muscles. Once the joint surfaces were exposed, osteotomy was performed and the proximal end of the first metacarpal and the trapezial articular surface were resected. The optimal position for arthrodesis was 30-40° of palmar abduction, 15° of pronation and 10-20° of radial abduction. In all patients, the same rectangular plate (Profile® plate, Stryker) was used; no bone grafts were required. Our study excluded patients on whom other surgeries had been performed prior to the arthrodesis for treatment of TMC osteoarthritis, as well as those in whom the cause was other than primary osteoarthritis.

Following the operation, the joint was immobilised by a thermoplastic orthosis for six weeks, after which time the patients were referred to rehabilitation. All of the patients were operated on by the same surgeon (DCL), in the same hospital and received the same implant. Evaluation and

result recording was performed by a single evaluator (EGP) who was not the surgeon.

With these criteria, we analysed a series of 16 arthrodesis performed on 14 patients in the period 2005-2008. The average age, at the moment of the arthrodesis, was 54 years (range, 44-60 years); 3 of the patients were male and the rest were female. The hand treated was the dominant one in 8 cases; there were 7 right and 9 left hands.

The Eaton[3] classification was used to evaluate the radiological state of the osteoarthritis. Six patients were found to be in Eaton stage II and 10 were in Eaton stage III. Mean follow-up period was 28 months (range, 10-46 months).

Preoperative evaluation was performed by studying the medical records, while postoperative condition was evaluated by clinical study of the patient. If the patient could not come to the hospital, postoperative evaluation was based on medical record review (all patients had been followed up in consultation until functional recovery and hospital discharge) plus a telephone interview.

For the functional evaluation, the DASH[19] scales were used pre- and postoperatively, as well as the Mayo Wrist Score.[20] The patients also filled in a questionnaire on their ability to perform five specific activities involving the TMC joint (capacity to pick up small objects, to do up buttons, open a jar, turn a key and write), in both the pre- and postoperative period. Responses were given a score from 1-5 (1-without difficulty, 2-slightly difficult, 3-moderate difficulty, 4-significant difficulty, 5-impossible to do) (fig. 1). The analysis of the results also included whether the patients had been able to return to their normal job at work, registering if such return was with or without restrictions. Patient pain was evaluated using a visual analogue scale (VAS, score 0-10).

Likewise, x-ray development of the consolidation, the appearance of osteoarthritis in the adjacent joints and the presence of complications were followed.

The degree of satisfaction with the results of the surgery was evaluated subjectively (patients choosing from very satisfied, satisfied, unsatisfied or very unsatisfied). The patients were also asked in they would chose the same treatment again.

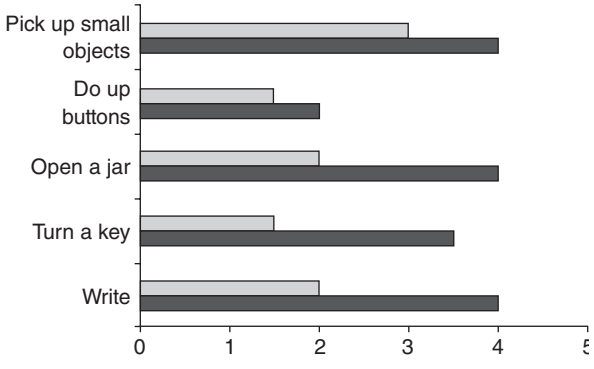

Figure 1 Evaluation of the capability of performing specific activities that involve the TMC joint. Preoperative results (grey) and postoperative results (black).

Results

In the functional evaluation, improvement was found in all the parameters studied. The mean score in the DASH scale improved from 60 points in the preoperative period (range, 50-85) to 25 (range, 5-61) in the postoperative (fig. 2). In the Mayo Wrist Score results, 20% of the patients achieved an excellent postoperative score (between 90-100 points), 40% good (80-90), 10% satisfactory (60-80) and 30% of patients less than 60 points or poor.

The ability to perform specific activities that involve the TMC joint improved in the majority of the patients, from significant difficulty (score of 4) to slight difficulty (score of 2); the capacity to pick up small objects was the factor that caused the most limitation (fig. 1). Global postoperative mobility decreased with respect to preoperative, but without any repercussions on being able to perform activities of daily life, according to patient reports.

All of the patients except one returned to their normal jobs, 9 of them without any restrictions and 6 with some limitation. The patient who did not return to work was on leave for work incapacity for TMC joint problems and presented results markedly inferior to those of the rest of the patients in all the parameters evaluated, even though no complications occurred. In spite of everything, this patient stated that operating again would be chosen and declared the wish to operate on the other hand.

The mean score on the VAS pain scale improved from 6 points (range, 4-10) preoperative to a postoperative score of 2 (range, 0-9; if the patient referenced in the preceding paragraph is excluded, the range is 0-3). With respect to x-ray evaluation, one non-painful pseudarthrosis case, without clinical repercussion, was found. Likewise, it was shown that no case developed osteoarthritis in adjacent joints (fig. 3). Removing the osteosynthesis material was not necessary in any of the cases.

Subjective evaluation was very satisfactory in 50% of the patients (8 patients); 32% (5 patients) reported that they were satisfied and 18% (3 patients) unsatisfied. No very unsatisfied patients were seen. All the patients except one would have the surgery again. That patient stated that the results obtained had not fulfilled the preoperative expectations.

With respect to complications, there was the case of pseudarthrosis previously mentioned. In addition, there was

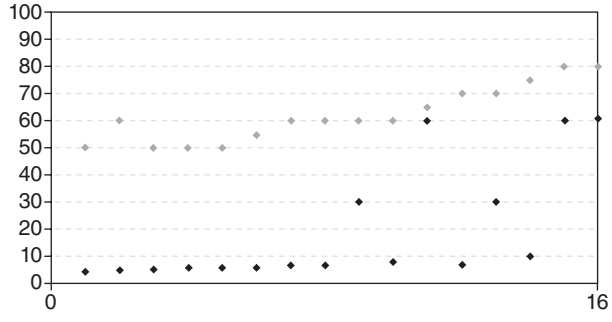

Figure 2 Preoperative (black) and postoperative scores on the DASH scale.

Figure 3 Anteroposterior (a) and oblique (b) x-ray of trapeziometacarpal arthrodesis with a rectangular osteosynthesis plate.

one case of material failure with mobilisation of a screw and two cases of non-aesthetic scarring that were solved without any sequelae.

Discussion

TMC joint arthrodesis as a treatment for TMC osteoarthritis is a motive for controversy due to the potential development of pseudarthrosis, limitations in mobility and possible appearance of osteoarthritis from overload of adjacent joints. Even so, various authors report good results with respect to resolution of pain, joint stability and long-term function,[2,12,14] independently of the osteosynthesis material.

In this study, we analysed the results obtained using the same synthesis implant for arthrodesis in all the patients, including only patients with primary osteoarthritis as the cause of the TMC osteoarthritis, which limited the number of cases included. However, achieving a homogeneous series with respect to the osteosynthesis method was a great help in evaluating the appearance of pseudarthrosis, which presented in only a single asymptomatic case. This finding is corroborated in the References, there being a good number of pseudarthrosis cases not requiring any type of treatment.[16] One limitation of our study is the low number of patients, which stemmed from trying to select a homogenous group as to surgical technique, implant, surgeon and TMC osteoarthritis aetiology. Bearing in mind this last aspect, cases that had an inflammatory disease or antecedent trauma as the cause of the osteoarthritis were excluded from the study.

If you compare the pseudarthrosis rates published in these other studies using other osteosynthesis methods, there was 7% reported in the series of Fulton and Stern,[16] using Kirschner needles as the synthesis method, on 59 arthrodeses with primary osteoarthritis as the main diagnosis. Authors from the same institution later compared those results with those obtained using a plate and screws as the method of arthrodesis fixation;[17] they obtained a similar pseudarthrosis rate (8% in the group with synthesis by plate), without finding significant differences in pseudarthrosis in the two group (although this group was not as homogeneous in having primary osteoarthritis as the cause of TMC osteoarthritis). Bamberger et al.[14] found an 8% pseudarthrosis rate using Kirschner needles and staples as the stabilisation method.

With respect to the appearance of osteoarthritis from overload on adjacent joints (principally the scaphoid-trapezium-trapezoid (STT) or metacarpo-phalangeal), there were no cases. However, it is true that the follow-up period was short (28 months; range, 10-46) and a longer one might be needed to be able to properly confirm this complication. Nevertheless, results published on this matter are inconsistent and diverse. Carroll[15] did not find any cases of STT joint osteoarthritis in a series of 67 patients with a follow-up range of 1-25 years, but Rizzo and Shin[12] found (mean follow-up of 11 years) that 39 out of 139 arthrodeses developed a certain degree of osteoarthritis in adjacent joints, of which 8 were symptomatic and 2 required a second operation for this motive.

In reference to the limitation in mobility that arthrodesis can cause, several studies have compared this parameter with other treatment techniques, such as ligamentoplasty, with contradictory results.[13]

In conclusion, TMC arthrodesis with a rectangular osteosynthesis plate is an effective technique that provides good functional results, minimises the number of complications and achieves a high degree of subjective satisfaction. We feel that this operation constitutes a good option for obtaining a stable joint in patients who require strength and need not to avoid loss of mobility.

Conflict of interest

The authors declare no conflict of interest.

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