

Midterm Results of Total Trapeziectomy and Suture-Button Suspensionplasty for Trapeziometacarpal Osteoarthritis

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ABSTRACT

Objective: To retrospectively analyze the results of total trapeziectomy and suture-button suspensionplasty for trapeziometacarpal osteoarthritis at a minimum follow-up of 2 years. **Materials and Methods:** Twelve patients who underwent this procedure were evaluated at least 2 years after surgery. Range of motion and metacarpal height were assessed. All patients completed the QuickDASH questionnaire and the Visual Analog Scale (VAS). **Results:** Eight women and four men (mean age, 63 years) were evaluated at a mean follow-up of 75 months. Adequate opposition was achieved in all patients, with a mean radial abduction of 59.8° and palmar abduction of 61.9°. The mean QuickDASH score was 21%, and the mean VAS score was 1.55. The mean distance between the first metacarpal and the scaphoid was 5.86 mm. There were no major complications. **Conclusions:** The favorable results of total trapeziectomy and suture-button suspensionplasty support its use in the treatment of trapeziometacarpal osteoarthritis, with an acceptable risk of complications. Subjective and objective outcomes are similar to those of other techniques; however, the benefit of this procedure lies in the initial stability provided by the implant, which does not depend on tissue healing. Therefore, rehabilitation can begin 10 days after surgery. At a time when total joint arthroplasty for trapeziometacarpal osteoarthritis is increasingly used, this technique could provide a simple and safe salvage option after failed total joint arthroplasty.

Keywords: Trapeziometacarpal osteoarthritis; suture-button suspensionplasty.

Level of Evidence: IV

Resultados a mediano plazo de la trapecectomía total y la suspensoplastia con botón para la rizartrosis

RESUMEN

Objetivo: Analizar retrospectivamente los resultados de la trapecectomía total y la suspensoplastia con botón para la rizartrosis en un seguimiento mínimo de 2 años. **Materiales y Métodos:** Se evaluó a 12 pacientes operados con esta técnica durante 2 años o más después de la cirugía. Se determinaron el rango de movilidad y la altura metacarpiana. Todos completaron el cuestionario QuickDASH y la escala analógica visual. **Resultados:** Se evaluó a 8 mujeres y 4 hombres (edad promedio 63 años) con un seguimiento promedio de 75 meses. En todos, se obtuvo una adecuada oposición, con una abducción radial promedio de 59,8° y una abducción palmar de 61,9°. El puntaje QuickDASH promedio fue del 21%, y el de la escala analógica visual, de 1,55. El espacio promedio entre el primer metacarpiano y el escafoide fue de 5,86 mm. No hubo complicaciones mayores. **Conclusiones:** Los resultados favorables de la trapecectomía completa y la suspensoplastia con botón alientan su utilización para tratar la rizartrosis, con un riesgo de complicaciones aceptable. Los resultados subjetivos y objetivos son similares a los de otras técnicas, pero el beneficio de este procedimiento consiste en la estabilidad inicial brindada por el implante, que no requiere tiempo de cicatrización; por lo tanto, la rehabilitación se inicia a partir de los 10 días de la cirugía. En el auge de las prótesis totales para rizartrosis, esta técnica podría ser una alternativa sencilla y segura para el rescate de la artroplastia total fallida.

Palabras clave: Rizartrosis; suspensoplastia con botón.

Nivel de Evidencia: IV

INTRODUCTION

Trapeziometacarpal osteoarthritis is a common condition that can significantly impair activities of daily living. The articular surfaces of the two bones involved are saddle-shaped and articulate perpendicularly to each other, allowing a wide range of motion but also increasing joint stress and instability. Biomechanically, generating 1 kg

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of pinch force at the tip of the thumb results in a load 10 times greater at the trapeziometacarpal joint.^{1,2} Degeneration and laxity of the carpometacarpal ligaments contribute to dorsal subluxation and subsequent joint damage.² When nonoperative treatment fails, surgical intervention should be considered, with multiple options available. In cases of early-stage disease, characterized primarily by instability and minimal or no osteoarthritis, dorsal capsulodesis, volar ligament reconstruction, or extra-articular osteotomy of the first metacarpal may be indicated. In cases of advanced joint involvement and substantial damage to the articular surface, treatment options include trapeziometacarpal joint arthrodesis, total joint arthroplasty, suspensionplasty with tendon interposition, partial or complete trapeziectomy, or a combination of these procedures. These techniques yield similar outcomes at different stages of trapeziometacarpal osteoarthritis.³ However, trapeziectomy alone has the lowest complication rate and shortest operative time, although its main drawback is the frequent proximal migration of the first metacarpal, with consequent functional impairment.⁴ Partial or complete trapeziectomy can be temporarily stabilized with Kirschner wires placed from the first metacarpal to the second metacarpal or the distal pole of the scaphoid (or to the remaining trapezium in a hemitrapeziectomy) to reduce the tendency toward proximal migration of the first metacarpal.² This fixation requires prolonged immobilization and a second procedure to remove the wires, while providing no structural support during the rehabilitation period once the wires have been removed. When post-trapeziectomy stabilization is achieved by placing a button between the first and second metacarpals, early mobilization can be initiated because the construct provides firm support throughout the rehabilitation period and does not require a second procedure for implant removal.

This article describes the results of a retrospective review of complete trapeziectomy with button suspensionplasty in patients with more than 2 years of follow-up.

MATERIALS AND METHODS

The study protocol was approved by the institution's Ethics Committee, and all patients provided written informed consent to participate in the study.

Over a five-year period (2017-2022), 17 patients underwent complete trapeziectomy and button suspensionplasty performed by the same surgeon. Patients with persistent symptoms of trapeziometacarpal osteoarthritis despite nonoperative treatment and radiographic evidence of trapeziometacarpal osteoarthritis were included. According to the Eaton-Littler classification,⁵ the cases were distributed as follows: stage II (3 patients), stage III (8 patients), and stage IV (1 patient). Five patients were excluded because of inadequate follow-up, as they had not attended the scheduled appointments for evaluation. The study group therefore consisted of eight women and four men, with a mean age of 63 years. 66.6% underwent surgery on their dominant hand (8 cases). The mean follow-up was 6.2 years (Table 1).

Table 1. Demographic data of the patients.

Study population	8 women	4 men	Total: 12 patients
	Mean	Range	Standard deviation
Age (years)	62.9	52-78	8.3
Follow-up (months)	75.25	43-94	16.22

Evaluation

Subjective outcomes were assessed using the QuickDASH, a validated questionnaire that measures patient-reported upper extremity disability on a scale from 0 to 100.⁶ Maximum pain during activity was also assessed using the visual analog scale (VAS) for pain.⁷

Thumb range of motion was assessed by goniometry, with photographic documentation of opposition, radial abduction, and palmar abduction (Figure 1). Trapezial height was measured as the distance from the most distal aspect of the distal pole of the scaphoid to the base of the first metacarpal on a Roberts-view radiograph (Figure 2).

Medical records were also reviewed to document operative time and identify any surgical or postoperative complications.



Figure 1. Photographic documentation of thumb opposition to the distal palmar crease, radial abduction, and palmar abduction.



Figure 2. Roberts view used to measure metacarpal-scapoid distance.

Surgical Technique

The procedure was performed on an outpatient basis under regional anesthesia using the Gedda and Moberg approach.⁸ The Mini-TightRope® suspension button (Arthrex, USA) was placed immediately before trapeziectomy to preserve the trapezial space. The entry point for the system's suture-passing pin was located immediately volar to the insertion of the abductor pollicis longus tendon at the base of the first metacarpal. This maintains an appropriate line of pull and allows the button to be positioned radial to the abductor pollicis brevis tendon, thereby reducing the risk of postoperative button prominence.⁹ The pin was directed from its entry point at the base of the first metacarpal toward the ulnar cortex in a distal and slightly volar direction, aiming toward the proximal metaphyseal-diaphyseal junction of the second metacarpal. A longitudinal dorsal incision was then made over the second metacarpal, through which the sutures attached to the proximal button were retrieved. A transverse tunnel was then drilled through the second metacarpal at the proximal metaphyseal-diaphyseal junction using the system's suture-passing pin, and the suture was passed through it. We find this additional step easier than passing through both metacarpals in a single step; furthermore, it allows the button on the second metacarpal to be positioned deeper and with less prominence. The resulting oblique orientation of the suture provides a tension vector that more effectively prevents proximal migration of the first metacarpal than a transverse orientation.

Once the system had been passed, the button at the level of the second metacarpal was secured with a simple knot (to allow readjustment if necessary), and the trapezium was then resected. An H-shaped capsulotomy was performed on the radiopalmar aspect of the trapeziometacarpal joint, raising one flap proximally and another distally, which remained attached to the distal pole of the scaphoid and the base of the first metacarpal, respectively. Although a periosteal elevator may be used, we find a curved bone gouge (or Smith-Petersen bone gouge) to be the most useful instrument for complete release of the trapezium. If the trapezium could not be resected in a single piece, the remaining fragments were removed with a rongeur.

After removal of the trapezium, manual axial compression of the first metacarpal was performed, and adequate stability without proximal migration was confirmed by direct visualization and fluoroscopy (Figure 3). Once stability had been confirmed, the system was definitively secured with multiple knots. The trapezial space was then filled with a resorbable spacer (Spongostan®), the capsule and skin were closed, and a thumb spica cast was applied for 10 days.



Figure 3. Intraoperative fluoroscopic image showing adequate button position and first metacarpal height.

Rehabilitation

Ten days after surgery, the cast and sutures were removed, and patients began range-of-motion exercises as part of occupational therapy. They were allowed to use the hand for activities of daily living (eating, personal hygiene, computer use, and driving), while manual sports and strenuous activities were restricted. At 6 weeks, strengthening with resistance exercises was initiated, and unrestricted activity was resumed at 12 weeks.

RESULTS

Range of motion was satisfactory in all 12 cases, with adequate thumb opposition to the distal palmar crease, a mean radial abduction of 59.9° (range, 50-75°), and a mean palmar abduction of 61.9° (range, 50-75°) (Figure 1).

The mean QuickDASH functional score was 21 (range, 2.3-54.5). The mean visual analog scale score for pain during strenuous use of the hand was 1.55/10 (range, 0-5) (Table 2). All patients resumed their previous activities and were cleared for strenuous activities at 3 months.

Table 2. Outcomes for the 12 patients evaluated.

	Mean	Range	Standard deviation
Range of motion			
Radial abduction (°)	59.89	50-75	8.7
Palmar abduction (°)	61.9	50-75	9.4
Functional Assessment			
QuickDASH	21	2.27-54.5	19
Visual Analog Scale	1.55	0-5	1.63
Radiological evaluation			
MTC-S distance (mm)	5.86	5-7.5	1.05

MTC-S distance = the distance from the scaphoid to the base of the first metacarpal on a Roberts radiograph.

The mean distance between the scaphoid and the base of the first metacarpal on Roberts-view radiographs was 5.86 mm (range, 5-7.5 mm) (Figure 2).

The mean duration of the procedure, from skin incision to sling application, was 116.8 min (range, 85-180; standard deviation, 28.4).

Two complications occurred. One patient with rheumatoid arthritis had mild residual pain (1/10 on the visual analog scale) in the diaphyseal region of the second metacarpal, probably associated with overall involvement of the hand and poor soft-tissue quality resulting from chronic corticosteroid therapy. She declined further procedures on the hand because she did not have significant pain or functional limitation. The second complication occurred in a patient who developed symptoms of complex regional pain syndrome, which resolved after one year of multidisciplinary management including rehabilitation, psychotherapy, and medication prescribed by the pain management team.

DISCUSSION

In this study, after a minimum follow-up of 2 years, subjective outcomes, as assessed using the QuickDASH and visual analog scale scores, and objective outcomes (range of motion) were favorable, as was the time to return to previous activities. Although some proximal migration of the first metacarpal was observed on radiographs obtained after more than 2 years of follow-up, a mean distance of 6 mm between the first metacarpal and the scaphoid was maintained. This collapse did not result in significant functional impairment, as 11 of the 12 patients achieved

excellent outcomes in terms of range of motion and subjective scores. Other studies support our experience, with results similar to those observed in our case series.^{10,11}

There was one case of residual pain at the site of the second metacarpal tunnel in a patient with rheumatoid arthritis and one case of reflex sympathetic dystrophy that responded to medical treatment after one year. There were no injuries to the radial artery, the sensory branches of the radial nerve, or the nerve to the first dorsal interosseous muscle, and cadaveric studies have confirmed that these structures are located away from the surgical site.¹² No metacarpal fractures occurred with the use of the system's suture-passing pin, without the need to drill holes with a drill bit.

Hemitrapeziectomy or complete trapeziectomy with temporary stabilization using Kirschner wires and immobilization for 4 weeks provides good long-term outcomes. In the study by Hofmeister et al., hemitrapeziectomy with thermal capsular shrinkage and temporary pin fixation resulted in complete recovery of pinch strength, grip strength, and range of motion, with a mean proximal migration of 2 mm at a mean follow-up of 7.6 years.¹³ Although some proximal migration of the first metacarpal was observed in our series at follow-up beyond 2 years, it was less pronounced than that reported after isolated trapeziectomy.^{3,4} The most common complications of pin fixation are infection (8%) and pin migration. Similarly, the classic ligament reconstruction and tendon interposition technique provides good outcomes but also requires 4-6 weeks of immobilization to allow soft-tissue healing.^{3,4,11,14,15} The technique used in our series simplifies and shortens the procedure and reduces morbidity compared with ligament reconstruction using a tendon autograft.

The main advantage of button suspensoplasty is the possibility of initiating thumb mobilization soon after the initial postoperative pain period (10 days). This technique would provide stabilization to prevent proximal migration of the first metacarpal without requiring prolonged immobilization. Ten days after surgery, immobilization is discontinued and rehabilitation is initiated. The implant maintains the position of the first metacarpal as range-of-motion exercises are initiated, followed by strengthening exercises.

Regarding button position, two technical steps may reduce its prominence, thereby decreasing the likelihood of irritation and the need for implant removal. At the base of the first metacarpal, the area immediately volar to the insertion of the abductor pollicis longus tendon is recommended as the entry point for the system's suture-passing pin. This maintains an appropriate line of pull and allows the button to be positioned radial to the abductor pollicis brevis tendon.⁹ At the proximal metaphyseal-diaphyseal region of the second metacarpal, we drill transversely to the axis of the second metacarpal using the system's suture-passing pin, in an additional step separate from passage through the first metacarpal. This allows the button to be positioned deeper within the second intermetacarpal space. Although there are no significant differences in clinical or biomechanical outcomes,⁹ placement of the second metacarpal button at the proximal metaphyseal-diaphyseal junction rather than at the mid-diaphysis is recommended, as this tends to provide a range of motion closer to normal, less proximal migration, and greater distance from the nerve to the first dorsal interosseous muscle.^{9,12}

There is a clear difference in cost between the button suspensoplasty device and the Kirschner wires used for temporary stabilization or the simple sutures used for tendon ligament reconstruction. However, we believe that the shorter immobilization period and abbreviated rehabilitation afforded by this device represent an important benefit that patients should be made aware of when deciding on their treatment.

The limitations of this study include its retrospective design, the absence of a control group, and the lack of preoperative scores for comparison with postoperative outcomes. In addition, pinch strength was not measured as an objective outcome. The strengths of our case series include the description of a simple technique that would allow early mobilization for a common condition and the long follow-up period (mean, 75 months).

The encouraging results achieved with the button suspensoplasty device, the high level of patient satisfaction, favorable QuickDASH and visual analog scale scores, and excellent range of motion after a minimum follow-up of 2 years suggest that button suspensoplasty may be a useful option for the surgical treatment of trapeziometacarpal osteoarthritis. Because it does not require a prolonged healing period, it shortens overall recovery and allows patients to return sooner to work and activities of daily living. It is a relatively quick, minimally invasive technique that could also have a role when total prosthetic thumb carpometacarpal arthroplasty fails and requires removal of the prosthesis.

Multicenter, randomized studies with larger sample sizes will be needed to more accurately determine the benefits of this technique.

Conflicts of interest: The authors declare no conflicts of interest.

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