LIGAMENT RECONSTRUCTION/TENDON INTERPOSITION ARTHROPLASTY FOR THUMB BASAL JOINT OSTEOARTHRITIS PRELIMINARY RESULTS OF A PROSPECTIVE OUTCOME STUDY

L. DE SMET, L. VANFLETEREN, W. SIOEN, D. SPAEPEN, H. VAN RANSBEECK

Ligament reconstruction/tendon interposition arthroplasty (LRTIA) is a common procedure for basal joint osteoarthritis of the thumb. We evaluated 31 operations in 30 patients, 28 females, 2 males with a mean age of 57 years. The mean follow-up was 24 months (range 8 to 46 months). Pain reduction was 75% on average, with good preservation of motion and of first web space. Twenty-six patients were satisfied or very satisfied ; five were not. The grip strength and key-pinch strength increased post-operatively, albeit not significantly.

Keywords : thumb ; osteoarthitis ; rhizarthrosis ; trapeziectomy ; arthroplasty.
Mots-clés : pouce ; arthrose ; rhizarthrose ; trapézectomie ; arthroplastie.

INTRODUCTION

Osteoarthritis of the basal (or carpometacarpal (CMC) or trapeziometacarpal) joint of the thumb, also called rhizarthrosis, is not uncommon. Post-menopausal women are most frequently affected. The condition is characterized by pain and crepitus, joint instability, loss of motion and strength, and finally severe adduction contracture of the first web and hyperextension deformity of the meta-carpophalangeal (MCP) joint occurs.

Although the condition has been called self-limiting in time, no evidence for this statement has been provided. The same can be said of nonoperative treatment. Many operations have been described, including ligamentous stabilization, denervation, arthrodesis, resection arthroplasty with and without interposition and with or without stabilization and total joint arthroplasty.

In 1949 Gervis (5) described simple trapeziectomy as an effective treatment. Since then several interpositions have been reported (tendon rolls, gelfoam, silicone). In 1986 Burton and Pellegrini (2) designed a procedure with trapezium excision, tendon interposition and ligamentous reconstruction to address the potential carpometacarpal instability.

The purpose of this study is to report the outcome of this procedure called ligament reconstruction/tendon interposition arthroplasty (LRTIA). This study is part of an ongoing prospective study on treatment modalities for rhizarthrosis.

PATIENTS AND METHODS

Surgical Technique

The technique was described by Burton and Pellegrini in 1986 (2, 12). General or regional anesthesia can be used. The trapeziometacarpal joint is approached through a longitudinal dorsal incision in the anatomical snuffbox, taking care not to injure the superficial branches of the radial nerve and the radial artery.

Correspondence and reprints : L. De Smet , U.Z. Pellenberg, Department of Orthopedic Surgery, Weligerveld 1, 3212 Lubbeek (Pellenberg), Belgium. E-mail : Luc.desmet@uz.kuleuven.ac.be.

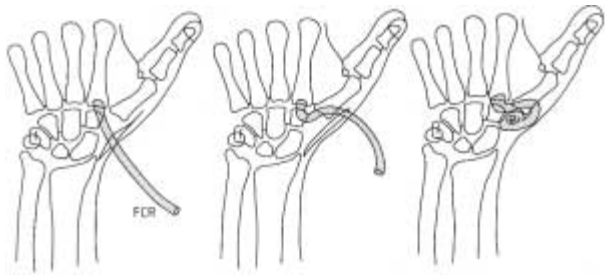

Fig. 1. — Schematic representation of LRTIA

A radially based flap of the capsule is created and the joint is opened. The trapezium is removed *in toto* or piecemeal. On the palmar side, the tendon of the flexor carpi radialis (FCR) than becomes visible. A small stab wound 10 cm proximal to the palmar wrist crease over the tendon of the FCR is performed, and the FCR is divided at that level. The tendon is retrieved through the trapeziometacarpal joint. Two sutures are placed in the palmar capsule. A tunnel is created with a burr, from the dorsoradial cortex of the metacarpal, through the medullary canal into the trapezium fossa. The FCR tendon is passed from its intact distal insertion, proximally to the base of the metacarpal, into the medullary canal and out through the hole in the cortex. The tendon is pulled tight, folded to act as a spacer, sutured to itself and then fixed in the trapezial space with the previously placed sutures. The capsule is closed with nonabsorbable sutures. After skin closure a bulky dressing is applied, and immediate mobilization is encouraged (fig. 1). In cases with hyperextension of the MCP exceeding 30°, a capsulodesis or arthrodesis is performed.

Patients

Between May 1996 and June 2000, 44 procedures were performed. Only 31 could be used for analysis, as 11 had incomplete preoperative data, one patient died and one patient suffered from a neurological disorder interfering with hand function. All patients had a preoperative evaluation, including VAS (visual analogue score) for pain, a measurement of opposition, web angle, range of motion of MCP and interphalangeal joint, key-pinch strength and grip strength.

There were 30 patients, 2 males and 28 females, with a mean age of 57 years, ranging from 46 to 69 years. Sixteen procedures were carried out on the right side, 15 on the left side. There was only one case of post-traumatic arthritis.

A "clunk" was present in 17 thumbs and grinding was present in 8 thumbs. The grip strength was 15 kg (range 4 to 32 kg, measured using the Jamar dynamometer) compared to 26 kg on the contralateral side (range 4 to 42 kg). ($p = 0.038$ t-test). The mean key-pinch strength was 4.6 kg (range (2.0 to 8.5 kg) compared to 6.1 kg contralaterally (range 2.2 to 10 kg) ($p < 0.002$, t-test). The opposition and web angles were similar on both sides (9.4 points on the Kapandji opposition score and 84° web angle).

An operation was proposed after failure of at least 6 months conservative treatment. The LRTIA was proposed independently of the radiological stage, but all patients presented with a stage 2 or higher. All operations were performed by the senior authors (LDS and HVR) or under their immediate supervision.

Evaluation

The mean follow-up time was 25 months (range 8-52 months).

Patients were reviewed by independent observers (LV, WS and DS). The DASH (disability of arm, shoulder and hand) questionnaire was used. Grip strength, key-pinch strength and range of motion were measured. A VAS for pain, function, dexterity and satisfaction was recorded.

Radiographs were taken and compared to the preoperative films. The heights of the trapezium or trapezial space were measured, divided by the length of the first metacarpal and expressed as a percentage.

RESULTS

The VAS for pain was 2.5/10 including all cases, 2.0 in those without complications ; patients satisfaction was 8.5/10, function 7.8/10 and dexterity 7.3/10. The DASH score was 28.7 (23 for uncomplicated cases, 64.8 for complicated cases). Five patients were not satisfied ; 25 with 26 procedures were satisfied or very satisfied (83.9%).

The opposition was 9.3 points on the Kapandji scale (7). The web angle was 87°. The ROM of the MCP was 0° extension to 60° flexion (average). No patients developed hyperextension of the MCP postoperatively. The key pinch strength increased from 4.6 to 5.0 kg (range 2.0 to 8.0 kg) ($p = 0.319 = + 8\%$). The grip strength increased from 15 to 26 kg (4 to 55 kg) ($p < 0.001 = + 73\%$). The mean

heighth of the trapezium was 10 mm (range 8 to 12 mm) ; length of the metacarpal was 42 mm (range 39 to 45 mm). Mean trapezial height was 6 mm (range 3 to 10 mm). The mean loss of height was 41% (range 16 to 71%).

There were only a few complications : one patient had a neuroma of the radial nerve, one suffered from severe rotator cuff tendinitis, and one patient developed a Dupuytren's contracture. Five patients had stage 1 rhizarthrosis and two had severe rhizarthrosis contralaterally.

Different correlations (Pearson-Spearman correlation coefficients) were computed. The DASH score was significantly correlated with the VAS on dexterity, but not with the VAS on pain and function.

Patient satisfaction was significantly correlated with the VAS on function and dexterity but not with the VAS on pain. Patient satisfaction was correlated with the patients' age : the younger patients were more satisfied than the older ones. Patient satisfaction was also correlated with the height of the trapezial space, as was the VAS on function.

The key-pinch and grip strength were not significantly correlated with the height of trapezial space. The DASH score was not significantly correlated with the radiographic parameters, nor with the grip or key-pinch strength.

DISCUSSION

Simple trapeziectomy has been reported as a reliable treatment for basal joint osteoarthritis of the thumb (5, 6, 14). The forces across the trapeziometacarpal joint are however very substantial, and stability of this joint is ensured by the anterior oblique (beak) ligament (3). When trapeziectomy is performed, this important ligament is sacrified, and proximal and radial migration of the metacarpal is the direct result. The instability of the CMC and the loss of height of the thumb column in hands with generalized ligamentous laxity, as seen in the postmenopausal population, is the basis for the loss of grip and pinch strength. Some studies (1, 4) have compared different techniques to treat rhizarthrosis, but could not show superior results in "stabilized" trapeziectomies or trapeziectomies with interposition compared to simple trapezium resection. However none of these studies has enough statistical power to demonstrate small differences.

There has been major concern about this proximal migration and trapeziometacarpal instability, and several technical stabilizations and interpositions have been reported. The technique described by Burton and Pellegrini combines total excision of the trapezium with reconstruction of the anterior capsule using a FCR tendon and applying interposition with the remaining end of the tendon. The outcomes of several series reporting on this procedure give good and excellent results with between 80 and 92% satisfied patients, even over the long term (2, 8-13, 15). This has been confirmed by our series. We added the DASH score to the subjective VAS evaluations and the objective measurements. The validity, reliability and relevance of the DASH score as an outcome score has been proven previously. The resulting mean DASH score of 28.7 indicates a good and reliable outcome. The strengths were measured preoperatively and at follow-up, so that longitudinal analysis was possible. These strengths increased in all cases.

The radiographic analysis demonstrates preservation of 59% of the trapezial space. The two comparative studies (1, 4) could also demonstrate a better preservation of this space in stabilized trapeziectomies LRTIA is a reliable procedure for treating carpometacarpal osteoarthritis of the thumb in relatively young patients requiring good grip and pinch strength. Further analysis is however necessary for better delimitation of this procedure as compared to other techniques.

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SAMENVATTING

L. DE SMET, L. VANFLETEREN, W. SIOEN, D. SPAEPEN, H. VAN RANSBEECK. Ligament reconstructie/pees interpositie arthroplastie voor de behandeling van rhizarthrose.

In een prospectieve studie werden de resultaten nagekeken van 30 patiënten, operatief behandeld wegens rhizarthrose aan 31 duimen. Er werd trapezectomie uitgevoerd, met reconstructie van het anterieur kapsel en met interpositie van pees in de achtergelaten ruimte. Deze techniek werd beschreven door Burton en Pelligrini in 1986. Er waren 28 vrouwen en 2 mannen, met een gemiddelde leeftijd van 57 jaar. De gemiddelde follow-up was 24 maand. Er was beduidende pijnreductie en goed behouden mobiliteit. De grijp en pinchkracht namen postoperatief toe. Er werd eveneens een outcome score uitgevoerd, m.n. de DASH score. Deze bedroeg 28,7. Zesentwintig patiënten waren tevreden (83,7%).

RÉSUMÉ

L. DE SMET, L. VANFLETEREN, W. SIOEN, D. SPAEPEN, H. VAN RANSBEECK. Arthroplastie de l'articulation trapézo-métacarpienne par reconstruction ligamentaire et interposition tendineuse. Résultats préliminaires d'une étude prospective.

L'arthroplastie par réconstruction ligamentaire et interposition tendineuse est une technique couramment utilisée dans le traitement de la rhizarthrose du pouce. Les auteurs ont évalué les résultats obtenus après 31 opérations réalisées chez 30 patients — 28 femmes et 2 hommes — dont l'âge moyen était de 57 ans. Le suivi moyen était de 24 mois (extrêmes : 8 et 44 mois). Ils ont noté une réduction de la douleur qui était en moyenne de 75%, avec une bonne conservation de la mobilité et de l'ouverture du premier espace. Vingt-six patients étaient satisfaits ou très satisfaits ; cinq étaient mécontents. La force de préhension et la force de la pince digitale étaient améliorées après l'opération, mais de façon non significative.