



Trapeziectomy with ligament reconstruction and tendon interposition arthroplasty in a male cohort : a retrospective study

Liselore MAECKELBERGH, Kira VANDEVOORDE, Maarten VAN NUFFEL, Ilse DEGREEF, Luc DE SMET

Dept. Orthopaedic Surgery, Hand Unit, University Hospitals Leuven

Osteoarthritis of the carpometacarpal joint of the thumb is a common disease, mostly affecting middle aged women. This article presents the results of a trapeziectomy with a ligament reconstruction/tendon interposition procedure. We evaluated 60 male patients with 76 operated thumbs. The mean follow-up was 62 months (ranging from 13 to 133 months, with SD of 33 months). The outcome was measured with the disabilities of the arm, shoulder and hand score, a Nelson Hospital score, a Visual analogue scale score and range of motion. The preoperative height of the trapezium was measured and compared with the height of the trapezial space postoperatively. The disabilities of the arm, shoulder and hand score improved from 25.6 to 16.1. The Visual analogue scale score for pain, satisfaction, dexterity and function were correlated with each other. On x-ray, there was an average loss of 67% of trapezial height compared preoperatively with postoperatively, but no correlation was found with clinical outcome parameters.

Keywords : thumb ; arthrosis.

INTRODUCTION

The thumb is the second most common site affected by osteoarthritis. In postmenopausal women 17-33% are affected, in comparison with 5-11% of men in the same age group. Male older than

75 years account for 25% of the carpometacarpal (CMC) arthritis (12).

A conservative treatment is the first choice of treatment, but if it fails, surgery can be an option. Numerous techniques have been described for the surgical treatment of this chronic disease. In 1986, Burton and Pellegrini described a procedure with a resection of the trapezium with tendon interposition and ligamentous reconstruction (LRTI) (2). Several studies show favorable results for the ligament reconstruction procedures in comparison with the less complex surgical options (16,23). Ulrich-Vinthers compared prosthetic arthroplasty with LRTI (24). The arthroplasty had better results in term of faster and better pain relief and a better functional outcome. However, the follow-up was relatively short. In 2013, we reported a comparative study with a mean follow-up of 9 years and found

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- Liselore Maeckelbergh,
 - Kira Vandevoorde,
 - Maarten van Nuffel,
 - Ilse Degreef,
 - Luc De Smet

Dept. Orthopaedic Surgery – Hand Unit, University Hospitals Leuven

Correspondence : L. Maeckelbergh, orthopaedics, University Hospital Leuven, UZ Pellenberg, Weligerveld 1, B3210 Lubbeek.

E-mail : liselore.maeckelbergh@hotmail.com

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no significant difference between prosthetic arthroplasty and LRTI (8).

The purpose of this study was to report the outcome of the trapeziectomy with a ligament reconstruction/tendon interposition procedure in a pure male cohort.

PATIENTS AND METHODS

We included all the male patients that were operated with a trapeziectomy with LRTI procedure because of osteoarthritis of the CMC joint between January 2002 and December 2015. The exclusion criteria were revision surgery. We included 108 male patients. Seven patients were deceased at the time of the control (January 2017). The other 101 patients received an invitation for an outpatient visit. Sixty patients were included for analysis. Fifty-one patients would not participate in the study. An approval of the ethical committee of the hospital was obtained.

We included 60 patients with 76 procedures. The mean age at the time of surgery was 59 years, ranging from 47 to 76 years. Forty-one procedures were carried out at the dominant hand.

All operations were performed by one of the senior authors (LDS and ID) or under their immediate supervision (2).

The mean follow-up time was 62 months (range 13 to 133 months, SD 33). The patients were reviewed by independent observers (LM and KVD).

The disabilities of the arm, shoulder and hand (DASH) questionnaire, Nelson Hospital score (NHS) and a visual analogue scale (VAS) for pain, function, dexterity and satisfaction was used (4). Grip strength, key-pinch and range of motion were measured in both hands. The key pinch was measured with a key pinch dynamometer and grip strength with a Jamar-hand dynamometer. The American Society of hand Therapist' recommendations for testing grip and pinch strength were followed (18). Patients were seated on a chair without armrests. The shoulder was adducted, the elbow flexed at 90°, with the forearm and wrist in neutral position. Patients were instructed to squeeze the handgrip as hard as they could. The first 3 settings were used. The range of motion was noted with the Kapandji

score and extension/abduction of the CMC joint and flexion/extension of the metacarpophalangeal (MCP) joint. These measurements were performed with a finger goniometer. For extension of the CMC joint the forearm is held in full supination, wrist in 0° flexion/extension/radial and ulnar flexion, CMC joint of thumb in 0° of abduction/adduction. MCP joint and IP joint in 0° of flexion/extension. For abduction of the CMC joint, the forearm is held in 0° supination/pronation, wrist in 0° flexion/extension/radial and ulnar flexion. CMC, MCP and IP joint in 0° of flexion/extension. For the MCP joint the forearm was held in 0° supination/pronation, wrist in 0° flexion/extension, radial and ulnar flexion. MCP joint in 0° abduction/adduction.

The preoperatively DASH scores were compared with the postoperatively DASH score. Correlation was determined with the Pearson correlation coefficient. Complications were reviewed in the medical records. Radiographs were taken and compared to the preoperative x-rays. The height of the trapezium preoperatively and the trapezoidal space postoperatively were measured. The height is compared with the subjective and clinical outcome parameters.

All patients received pre- and postoperatively an x-ray (Kapandji view). Goffin described the technique for measurement of the trapezium and the trapezoidal space (14). The technique used the following points of reference, identified on an antero-posterior radiological projection of the CMC joint in a neutral position. A line projected through the radial articular surface of the second metacarpal and the trapezium. The next line is perpendicular to the first line and parallel to the distal extremity of the scaphoid. The third line is perpendicular to the first line and parallel to the base of the first metacarpal. The distance between the second and third line is the height of the trapezoidal cavity or trapezium.

RESULTS

Twenty-four patients had a preoperative disabilities of the arm, shoulder and hand score (DASH) score of 25.6 (ranging from 13 to 44).

The outcome data are summarized in table 1,2,3.

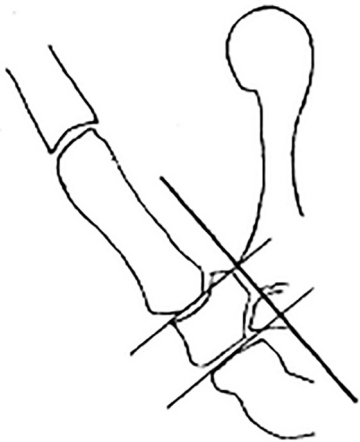


Fig 1. — Measurement of the trapezium and the trapezoidal space described by Goffin (14).

Table 1. — Outcome operated hand

Postoperatively (76 hands)	Mean	Ranging	SD
DASH	16.1	0-71.6	16.6
NHS	91.1	50-108	14.7
VAS pain	1.9	0-7	1.9
VAS satisfaction	8.3	2-10	2.0
VAS function	7.8	1-10	2.3
VAS dexterity	7.5	1-10	2.3
Kapandji	9.5	5-10	1
extension CMC	45.6°	20°-90°	8.8
abduction CMC	45.1°	20°-88°	9.9
MCP flexion	40.1°	0°-60°	11.1
MCP extension	-0.3°	-30 -40°	9.1
Grip force	36.4kg	6.8kg-57kg	9.8
key pinch	7.4kg	2kg-58kg	6.2

The VAS for pain was 1.9/10 (SD 1.9), patient satisfaction 8.3/10 (SD 2), function 7.8/10 (SD 2.3) and dexterity 7.5/10 (SD 2.3). The DASH score was 16.1 (SD 16.6) and the NHS was 91.1 (SD 14.7). The opposition was 9.5 points on the Kapandji scale (SD 1). The motion in the MCP joint was 0° extension (SD 9.1) tot 40° flexion (SD 11.1). In 6 cases, there was a hyperextension at the level of the MCP joint. The key pinch had an average of 7.4 kg (SD 6.2) and the grip force 36.4kg (SD 9.8).

The mean trapezial height was 11.1mm preoperatively (range 4.9 to 15mm). Postoperatively was the mean trapezial space 3.5mm (range 0 to

Table 2. — Outcome data of the not operated hand

Controlateral side (44 hands)	Mean	Ranging	SD
Kapandji	9.6	6-10	0.8
extension CMC	48°	26°-80°	9.4
abduction CMC	43.7°	24°-78°	8.9
MCP flexion	45.3°	0°-62°	14.5
MCP extension	2.6°	-10°-40°	8.7
Grip force	34.9kg	5.5kg-60kg	10.9
key pinch	9kg	2kg -52kg	1.2

Table 3. — Height of the trapezium or trapezial space

N=60	Mean	Ranging	SD
Trapezial space preoperatively (mm)	11.1	4.9-15	2.1
Trapezial space postoperatively (mm)	3.5	0-10.1	1.7

10.1 mm). This shows an average loss in height of 7.6mm or 67%.

There were only a few complications. In 8 procedures, there was a superficial wound infection that was treated with per oral antibiotics. One patient needed a reoperation with debridement for infection. In 4 cases there were clinical signs of algoneurodystrophy. One patient had a neuroma of the radial nerve and one other patient needed a revision procedure.

There was an overall improvement in the DASH score. We saw 88% satisfaction rate. The VAS score for pain, satisfaction, dexterity and function were correlated with each other. There was no correlation between the functional scores and the trapezial space.

DISCUSSION

Thumb CMC arthritis is a chronic condition that affects a large part of the population. Several surgical treatments have been described, ranging from a trapeziectomy with ligament reconstruction, with or without tendon interposition to prosthesis. Previous studies have shown good results for trapeziectomy with tendon interposition in populations that consist of a large number of female patients. In this study, we want to look at the results of this procedure in the male cohort with a longer follow-up. (1,3,5,6,11,26).

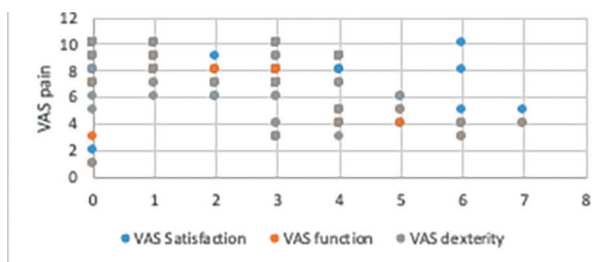


Fig 2. — Correlation between VAS

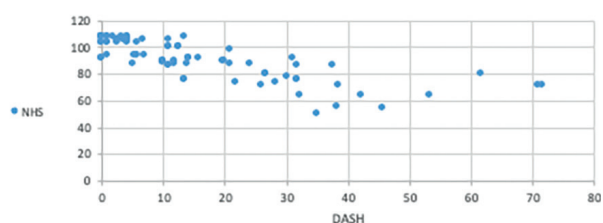


Fig 3. — correlation between DASH and NHS

The technique described by Burton and Pellegrini combines the resection of the trapezium with reconstruction of the anterior capsule and applying interposition with the remaining end of the FCR (2). The outcome of this procedure shows good to excellent results, with 80 to 92% satisfied patients. Nylen examined 100 thumbs (11 men and 89 women) with an average follow up of 36 months (19). He showed good results in 88 of 100 patients and 49% became completely pain free. an increased grip strength (preoperatively 40 kPa, postoperatively 50 kPa) was seen in 44% of the cases. The pinch strength improved from 0.96 to 1.44 kPa (72% stronger pinch). De Smet showed a good functional result in 26 out of 31 patients (7).

Lins looked at 30 thumbs (27 patients: 25 females and 2 men) after a LRTI procedure with a mean follow-up of 3.5 years (16). There was a satisfaction in 89% of the patients and the VAS for pain was 3. There was a 50% and 43% improvement in grip and key pinch strength. They saw also a 33% decrease of trapezoidal height. Davis randomized 183 thumbs (all females) for treatment by either simple trapeziectomy, trapeziectomy with palmaris longus interposition or trapeziectomy with ligament reconstruction and tendon interposition using the FCR (6). They reported a good result after one year with no pain in 25 of 62 LRTI patients. Key

pinch after one year was 4.5kg and the grip strength 20.4kg.

Gangopadhyay showed in 2012 the results of 174 thumbs (trapeziectomy, trapeziectomy with palmaris longus interposition or trapeziectomy with ligament reconstruction and tendon interposition using the FCR) with a mean follow up of 5 years (10). A key pinch of 3.6kg and grip strength of 20kg in the LRTI group was found and a Kapanji score of 7 to 8 in 137 thumbs.

Tamaino presented in 1995 the results of 22 thumbs (19 female and 3 men) after a LRTI procedure with an average follow up of 9 years. He reported a grip strength of 24.6kg (92% improvement), a key pinch of 4.9kg (65% improvement) and Kapanji score (22/24 thumbs) of 9 (22).

In our all male population, we see similar results in Kapandij score, grip/pinch force in comparison with other studies with similar follow-up (6,10,16,19,22).

We see a range of motion, key pinch and grip strength in the operated hand similar to the contralateral side. There was no x-ray taken of the contralateral hand to determinate the degree of osteoarthritis. So the effect of osteoarthritis on the strength could not be detected.

De Smet published in 2013 results of LRTI versus prosthesis, with a minimal follow-up of 9 years (8). He included 55 females: 32 LRTI procedures and 23 prosthesis. He reported a quick Dash of 29, NSH of 78, VAS pain of 2.3 and VAS satisfaction of 76 for the LRTI group. In this study with a male cohort, we see better results in the DASH, NHS and VAS score.

Park showed results of three techniques: hemitrapeziectomy with costochondral graft interposition, LRTI and hematoma distraction arthroplasty (20). 60 patients were included. The LRTI group had a postoperative mean DASH of 19.26, a pinch strength of 4kg.

Hartigan compared 58 thumbs treated with arthrodesis with 49 thumbs treated with LRTI (15). He demonstrated a satisfaction rate of 90%. The LRTI group had a better range of motion with regard to opposition and the ability to flatten the hand.

Interposition is done to prevent subluxation and proximal migration. It has been suggested that an interposition procedure may not maintain trapezoidal

height and so not restores completely the thumb strength. This can cause scaphoid impingement and so degenerative changes on its distal border. Studies have shown 27-33% loss of the trapezial space using the LRTI procedure. Metacarpal subsidence after trapeziectomy has been a concern, but recent literature shows no correlation between subsidence and the clinical and subjective outcome. Trumble found a moderate correlation between reduced subluxation and improved DASH scores (23). Downing and Davis show no influence on clinical outcome in correlation with the height of the trapezial space (6,9). Proximal migration has been reported to be lie between 6.5% and 62% (3,9,22,26). In our results, we found no correlation between clinical and subjective outcome parameters and the trapezial height.

CONCLUSION

Osteoarthritis of the CMC joint of the thumb is a frequently encountered problem in the orthopedic practice, more often in the female population than in the male. Many surgical options have been proposed. Ligament reconstruction/tendon interposition procedure shows good results in literature. We see a good range of motion, key pinch and grip strength in the operated hand. In literature it is difficult to compare the results of different studies because of the different outcome parameters that are being used. But our strict male cohort has similar to better results than the mixed populations. Further long term studies with the same outcome data are necessary to evaluate the result of a trapeziectomy with LRTI procedure in a male population.

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