



## Eaton and Littler Ligament Reconstruction for the Painful first Carpometacarpal Joint : Patient satisfaction

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**The ligamentous reconstruction according to Eaton and Littler (7) was designed to restore the stability of the carpometacarpal joint of the thumb. We evaluated the patients' satisfaction after an Eaton and Littler-procedure as well as possible risk factors in the development of thumb basal joint instability. A retrospective chart review and clinical assessment or telephone survey are executed in 33 patients, with a mean follow-up of 7 years. Only 45% of the patients were satisfied. Within the group of clinical assessed patients, there were significant differences in thumb function comparing operated with not operated side. Overall joint hypermobility can be a contributing factor for this thumb basal joint instability, but has no effect on the outcome after an Eaton-Littler procedure.**

**Keywords :** Eaton-Littler operation; unstable carpometacarpal thumb joint; patient satisfaction

### INTRODUCTION

Thumb carpometacarpal joint (CMC1) instability can be idiopathic, or caused by trauma and inflammation. Hypermobility can be a contributing factor (7). CMC1 instability leads to effusion, pain, weakness and eventually degenerative changes (6,7,16,17,18).

In patients not responding to conservative treatment, several surgical procedures can stabilise the

CMC1 (7,14,18). One of these surgical techniques is introduced by Eaton and Littler (7). In this Eaton-Littler procedure (EL-procedure) a ligament reconstruction with a flexor carpi radialis tendon loop is used to stabilise the unstable saddle joint of the thumb (6,7).

The purpose of this study is to assess patients' satisfaction after an EL-procedure.

### PATIENTS AND METHODS

We assessed the files of 45 patients (50 thumbs) who were operated between 1999 and 2012. The population consists of 38 female and 7 male patients with a mean age of 42 years (range : 19-63), and mean follow up of 7 years (range : 6 months – 13 years; SD : 4.34). The causes of instability were traumatic in 18 patients, idiopathic in 22, two were cerebral palsy-related, one had a dysplasia of the trapezium, one rheumatoid arthritis and one Ehlers-Danlos syndrome.

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All patients who had not already undergone revision surgery were invited for clinical assessment. Patients, who were unable to attend, were questioned by telephone.

The operation as described by Eaton and Littler was performed (7). In this procedure an extra-articular ligament reconstruction stabilises the basal joint of the thumb (23). A strip of the tendon of the flexor carpi radialis muscle is harvested proximal to the volar wrist crease. With this tendon, the stability of CMC1 is restored in two planes. First, the volar part of the joint capsule, the anterior oblique ligament (AOL), is reinforced. Then, the radial part of the joint capsule, which is devoid of ligamentous strengthening, is augmented. Finally, by guiding the harvested tendon through a drill hole in the first metacarpal and passing it deep to the origin of the abductor pollicis longus, the dorsoradial ligament (DRL) is reinforced (3,7,10,13,14,23).

The mobility of the thumb was assessed with the Kapandji-method (12) and web space opening goniometry (11). Grip force and key pinch force were measured (15). A Visual Analogue Scale (VAS) was used to evaluate pain at rest and at exertion, ranging from 0 (no pain) to 10 (excruciating pain) (4). Patients' satisfaction was scored on a Likert score, from 0 (not satisfied) to 10 (very satisfied) (5,21). Global joint laxity was assessed with the Beighton-score (2,20). Disability was measured with a QuickDASH-questionnaire (1). We also asked: "Would you choose to undergo the operation again and why?"

For patients not able to attend the previous described survey, a telephone questionnaire was performed. Satisfaction and pain at rest and exertion were evaluated from 0 to 10 and the quickDASH-questionnaire was completed. The question to redo the procedure was also asked.

Of the 45 patients, 9 needed revision surgery; 15 of the 36 remaining patients accepted the invitation and were assessed clinical. Nine patients participated only in the telephone survey. Twelve patients were moved (11) or had not given informed consent (1) and were considered as lost to follow up. The response rate was 73.33% (Figure 1).

Statistical analysis was performed by using the student's t-test function. A p-value of < 0.05 was considered significant.

## RESULTS

The 9 revision surgeries were prosthesis placement (2), arthrodesis (3), trapeziectomy (2), or full denervation (1). One procedure, performed elsewhere, was not specified. These patients were considered not satisfied by EL-surgery alone. All of them had persisting pain. Three of them developed radiological osteoarthritis. Of these 9 patients, 2 were male and 7 female. The mean age in this group was 47 years (range : 20-63 years).

The 24 participating patients (4 male, 20 female) had a mean age of 41 years (range : 24-61). Nineteen were operated to the dominant hand. The mean satisfaction was 7.4 (range : 0-10; SD : 2.5),

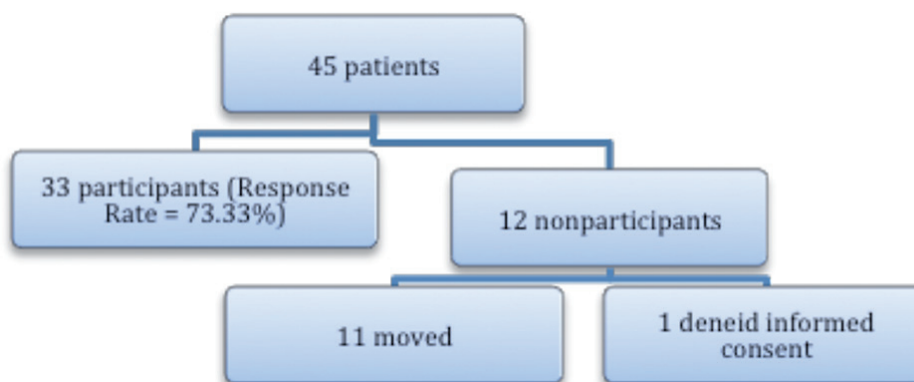


Fig. 1. — Distribution of total patient population in participants and nonparticipants

the mean VAS-pain at rest 1.9 (range : 0-7.5; SD : 2.4) and at exertion 4.3 (range : 0-10; SD : 2.9). The mean QuickDASH-score was 31.4 (range : 0-61.4; SD : 21.7). Fifteen of the 24 patients (62.5%) would choose the operation again (Figure 2). Table I displays the different aetiologies of the CMC1-instability as well as the presence of joint hypermobility and the outcome after EL-surgery. Seven (all female) of the 24 patients had joint laxity.

The group of 15 patients who were clinically assessed had a mean age of 42 years (range : 23-61). Their functional assessment is displayed in Table II. Five of the 15 patients had a Beighton score of 4 or more. However, 3 of these 5 hypermobile patients would have the EL-procedure redone. Ten patients would redo the operation, because they find their function and pain better than before the EL procedure. Five patients would not redo the operation because the instability and pain returned after several years (Figure 2).

The group of 9 patients (7 female, 2 male) who participated only in the telephone survey had a mean age of 38 years (range : 24-50). Their mean QuickDASH-score was 22.5 (range : 4.6-61.4; SD : 19.8). The mean VAS-satisfaction was 7.6 (range : 3-10; SD : 2.3) and the mean VAS pain at rest and at exertion was 1.8 (range : 0-5; SD : 2.0) and 4.9 (range : 1-10; SD : 3.3) respectively. Two patients reported the subjective feeling of having hypermobile joints.

Eighteen of the 33 included patients (55%) would not have an EL-procedure anymore or had a revision surgery. 45% of the patients were satisfied. The outcome of men compared to women was not significantly different ( $p = 0.54$ ).

## DISCUSSION

Eaton et al. reported in 1984 a follow-up study of 38 ligamentous reconstructions in 36 patients (6). None of them had a poor outcome. All but four patients were free of pain or had a significant pain reduction. The other 32 patients had good strength and thumb mobility and can be considered satisfied, although extension-abduction was reduced in 56% (6). Freedman et al. reported in 2000 a series of 24 ligament reconstructions in 19 patients (8). They

Table I. — This table represents the comparison of the outcome concerning hypermobility in the different aetiological groups (EDS = Ehlers-Danlos Syndrome; RA = rheumatoid arthritis, CP = cerebral palsy)

Cause	Mobility	Outcome
Traumatic cases: 11	Hypermobile: 2	Redo?: "YES" 1
		Redo?: "NO" 1
	Not hypermobile: 9	Redo?: "YES" 5
		Redo?: "NO" 4
Idiopathic cases: 8	Hypermobile: 4	Redo?: "YES" 4
		Redo?: "NO" 0
	Not hypermobile: 4	Redo?: "YES" 1
		Redo?: "NO" 3
EDS: 1	Hypermobile: 1	Redo?: "YES": 1
RA: 1	Not Hypermobile: 1	Redo?: "YES": 1
CP-related: 2	Not hypermobile: 2	Redo?: "YES": 1
		Redo?: "NO": 1
Trapezium dysplasia: 1	Not hypermobile: 1	Redo?: "NO": 1

concluded that, despite of persisting pain in 71% of the cases, all but one patient would repeat the same surgery, although functional tasks remained difficult (8). In 2001, Lane et al. reported a long-term follow-up study of 37 reconstructions in 35 patients (14). Only one case had a poor result. Stability, function and pinch strength were good. Also in this clinical trial the post-operative abduction-extension was reduced in 70% of the patients (14). Radda et al. performed 10 ligament reconstructions in 8 patients (19). All of them would redo the operation. Motion and function were excellent. The pain was improved, as was the strength (19). In a previous trial of this institution, we found that 19 out of 21 patients would redo the same operation again (23).

Despite overall positive findings in five previous clinical trials (6,8,14,19,23), this study uncovers a

Table II. — Results of the functional assessment of the subgroup of the 15 clinical assessed patients. The p-value compares the affected versus the unaffected side and the VAS pain at exertion versus VAS pain at rest. \* = significant

Tested Function	Mean	SD	Range	P-value
Satisfaction	7.3	2.7	3.5 – 10	
VAS Pain at rest	1.9	2.7	0 – 7.5	(P = 0.003*)
VAS Pain at exertion	3.9	2.7	0 – 7.5	
QuickDASH-score	37.1	21.5	0 – 61.4	
Key pinch affected	4.5 kg	2.6	1 – 10 kg	P = 0.071
Key pinch normal	6.1 kg	2.1	1 – 10 kg	
Handgrip affected	16.5 kg	8.1	4 – 30 kg	P = 0.032*
Handgrip normal	23.3 kg	8.1	4 – 32 kg	
Kapandji affected	9.2	1.4	5 – 10	P = 0.030*
Kapandji normal	10	0	10 – 10	
Webspace affected	78.6°	17.2	55 – 116°	P = 0.013*
Webspace normal	94.5°	15.3	67 – 119°	

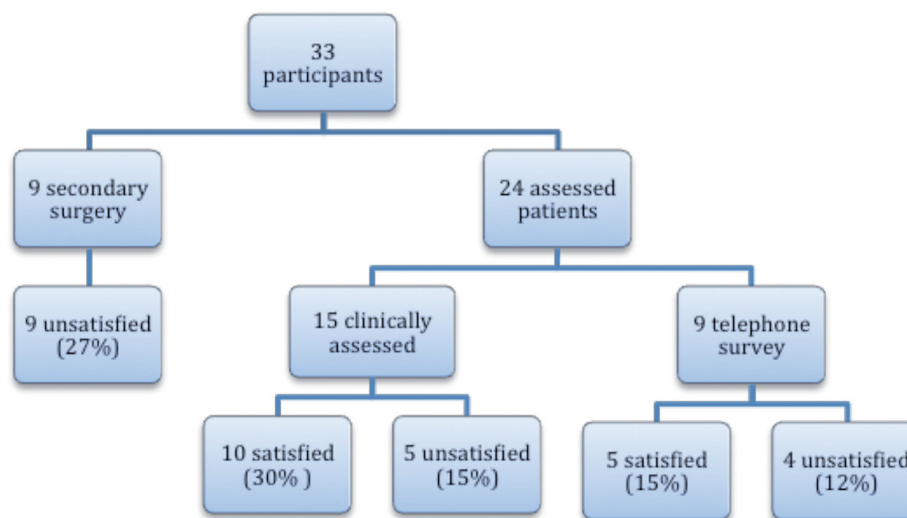


Fig. 2. — Distribution of participants and their satisfaction after EL-surgery

global satisfaction after an EL-procedure for CMC1-instability of only 45%. Within the subgroup of clinical assessed patients the webspace and kapandji-score were significant reduced in comparison to the not-operated side, indicating an overall reduced range of motion of the CMC1. In line of the above-mentioned literature, the reduced webspace is concordant to the reduced extension-abduction after an EL-procedure as seen by Eaton et al. and Lane et al. (6,14). According to the literature, the key pinch strength can be well restored with an EL-procedure

(6,14). This study confirms this finding, however, the hand grip strength is significant reduced after the EL-procedure. This reduced grip strength, along with the significant higher VAS pain-score at exertion, possibly explain why less than half of the patient population in this trial would redo the same operation. In conclusion, this clinical trial indicates that the EL-procedure is probably not the best treatment for CMC1-instability and new treatment options should be further explored.

Hypermobility can be a contributing factor in developing CMC1-instability (7). The patient population in this trial is too small to draw conclusions about this statement. Table II shows the different causes of CMC1-instability in the assessed patients and whether or not they have hypermobile joints. Although hypermobility tends to contribute more to the idiopathic form of CMC1-instability it does not affect patients' satisfaction after an EL-procedure.

There are limitations in this study. First of all it was partially a telephone survey and several patients could not be assessed clinically. The second disadvantage is that there were few preoperative data available to compare thumb function pre- and postoperative. Last, the patient population was relatively small.

## REFERENCES

1. **Beaton DE, Wright JG, Katz JN.** Development of the quickDASH: comparison of three item-reduction approaches. *J Bone Joint surg* 2005 ; 87 : 1038-1046.
2. **Beighton P, Solomon L, Soskolne CL.** Articular mobility in an African population. *Ann Rheum Dis.* 1973 ; 32 : 413-418
3. **Bettinger PC, Linscheid RL, Berger RA, Cooney WP, An K.** An Anatomic Study of the Stabilizing Ligaments of the Trapezium and Trapeziometacarpal Joint. *J Hand Surg.* 1999 ; 24 : 786-798
4. **Collins SL, Moore RA, McQuay HJ.** The visual analogue pain intensity scale : what is moderate pain in millimetres? *Pain* 1997 ; 72 : 95-97
5. **Dolan P, Sutton M.** Mapping visual analogue scale health state valuations onto standard Gamble and Time trade-off values. *Soc Sci Med.* 1997 ; 44 : 1519-1530.
6. **Eaton RG, Littler JW.** Ligament Reconstruction for the Painful Thumb Carpometacarpal Joint. *J Bone Joint surg* 1973 ; 55 : 1655-1666.
7. **Eaton RG, Lane LB, Littler JW, Keyser JJ.** Ligament reconstruction for the painful thumb carpometacarpal joint: A long-term assessment. *J Hand Surg.* 1984 ; 9 : 692-699.
8. **Freedman DM, Eaton RG, Glickel SZ.** Long-Term Results of Volar Ligament Reconstruction for Symptomatic Basal Joint Laxity. *J Hand Surg.* 2000 ; 25 : 297-304.
9. **Giacomozzi C, Giansanti D, Morelli S, Maccioni G, Macellari V.** New instrumental set for the assessment of the hand functionality. *Med. Biol. Eng. Comput.* 2003 ; 41 : 513-515.
10. **Iyengar K, Gandham S, Nadkarni J, Loh W.** Modified Eaton-Littler's Reconstruction for Traumatic Dislocation of the Carpometacarpal Joint of the Thumb—A Case Report and Review of literature. *J Hand Microsurg.* 2013 ; 5 : 36-42.
11. **Jensen CB, Rayan GM, Davidson R.** First web space contracture and hand function. *J Hand Surg.* 1993 ; 18 : 516-520.
12. **Kapandji A.** Clinical test of apposition and counter-apposition of the thumb. *Ann Chir Main* 1986 ; 5 : 67-73.
13. **Kulshreshtha R, Gibson C, Jariwala AC, Wigderowitz CA.** A biomechanical evaluation of the Eaton-Littler trapezometacarpal joint ligament reconstruction procedure : a cadaveric study. *J Bone Joint surg* 2013 ; 95 : 13-17.
14. **Lane LB, Henley DH.** Ligament Reconstruction of the Painful, Unstable, Nonarthritic Thumb Carpometacarpal Joint. *J Hand Surg.* 2001 ; 26 : 686-691.
15. **Mathiowetz V, Weber K, Volland G, Kashman N.** Reliability and validity of grip and pinch strength evaluations. *J Hand Surg.* 1984 ; 9 : 222-226.
16. **Murugkar PM, Brandsma JW, Anderson AM, Gurung K.** Reliability of Thumb Web Measurements. *J hand ther.* 2004 ; 17 : 58-63.
17. **Neumann DA, Bielefeld T.** The carpometacarpal joint of the thumb : Stability, deformity, and therapeutic intervention. *J Orthop Sports Phys Ther* 2003 ; vol. 33, n°7 : 386-399
18. **Park MJ, Lichtman G, Christian JB, Weintraub J, Chang J, Hentz VR, Ladd AL, Yao J.** Surgical treatment of Thumb Carpometacarpal Joint Arthritis : A Single Institution Experience from 1995–2005. *Springer Hand* 2008 ; 3 : 304-310.
19. **Radda C, Meizer R, Chochole M, Landsiedl F, Krasny C.** Eaton Littler ligament reconstruction of the painful unstable thumb CMC joint. *J Bone Joint surg* 2009 ; 91 : 223.
20. **Remvig L, Jensen DV, Ward RC.** Epidemiology of General Joint Hypermobility and Basis for the Proposed Criteria for Benign Joint Hypermobility Syndrome : Review of the Literature. *J Rheumat.* 2007 ; 34 : 804-809.
21. **Robinson A, Dolan P, Williams A.** Valuing health status using VAS and TTO : what lies behind the numbers? *Soc Sci Med.* 1997 ; 45 : 1289-1297.
22. **Spector TD, Nandra D, Hart DJ, Doyle DV.** Is hormone replacement therapy protective for hand and knee osteoarthritis in women? : The Chingford study. *Ann Rheum Dis* 1997 ; 56 : 432-434
23. **Van Giffen N, Van Ransbeeck H, De Smet L.** Stabilisation of the pre-arthritis trapeziometacarpal joint using ligament reconstruction. *Chir main* 2002 ; 21 : 277-281.