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Efficacy of Tenodermodesis Method in Chronic Mallet Finger Surgery

Kronik Çekiç Parmak Cerrahisinde Tenodermodez Yönteminin Etkinliği

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ÖZ

Amaç: Mallet finger, distal interfalangeal (DIP) eklemin distalindeki ekstansör tendonun terminal insersiyonunun kısmen veya tamamen yırtılması nedeniyle yaygın olarak ortaya çıkan bir yaralanmadır. Genellikle DIP ekleminin zorlanmış fleksiyonundan kaynaklanır. Bu çalışmanın amacı Tenodermodez cerrahisinin kronik çekiç parmak yaralanmasındaki etkinliğini belirlemektir.
Araçlar ve Yöntem: Toplam 15 hastanın verileri geriye dönük olarak incelendi. Konservatif tedavisi başarısız olan ve tenodermodez yöntemi ile çekiç parmak cerrahisi uygulanan tüm hastalar dahil edildi. Biz yöntemi modifiye ederek tendon ve kapsül sütürasyonu yapıldıktan sonra ayrıca cilt ve tendonu beraber kateden sütürasyon şeklinde uyguladık.
Bulgular: Hastalar 24 aya kadar takip edildi. Tüm hastalarda DIP eklem hareketinde iyileşme vardı. Dokuz hasta DIP ekleminin tam ekstansiyonuna ulaştı. Crawford'un kriterlerine göre tüm hastalarda 'ağrı yok' ve işlem sonrası 'mükemmel' veya 'iyi' skoru elde edildi. Postop komplikasyon bildirilmedi.
Sonuç: Tenodermodez yöntemi, kronik tendinöz çekiç parmak deformitesi için yüksek başarı sonuç oranına sahip küratif bir cerrahi tekniktir.

Anahtar Kelimer: cerrahi; kronik yaralanma; mallet finger; tenodermodez

ABSTRACT

Purpose: Hammertoe is an injury that usually results from partial or complete rupture of the terminal insertion of the extensor tendon distal to the distal interphalangeal (DIP) joint. It is usually caused by forced bending of the DIP joint. The aim of this study is to determine the effectiveness of tenodermodesis surgery in chronic mallet finger injury.
Materials and Methods: A total of 15 patients' data was investigated retrospectively. All the patients whose conservative treatment failed and underwent a mallet finger surgery with the tenodermodesis method were included. The technic was slightly modified: Sutures were applied, so they traverse the skin and tendon together after suturing the tendon and capsule.
Results: The patients were followed up for up to 24 months. All patients had improvements in DIP joint motion. Nine patients reached a full extension of the DIP joint. According to Crawford's criteria, all the patients had no pain and had excellent and good scores after the procedure. No postop complication was reported.
Conclusion: Tenodermodesis method is a curative surgery technic with a high success outcome rate for chronic tendinous mallet finger deformity.

Keywords: chronic injury; mallet finger; surgery; tenodermodesis

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INTRODUCTION

Mallet finger deformity is the most common closed tendon injury of the finger. It commonly occurs in the workplace or as a sports injury. It is most common in young and middle-aged men.[1] The purpose of mallet finger treatment is to maximize the distal interphalangeal (DIP) joint function and minimize discomfort. Most mallet fingers are amenable to treatment with immobilization (i.e., splinting), especially in the earlier stage. However, when the injury remains untreated, some complex injuries warrant surgical referral. Although primary and conservative treatment is promising, secondary treatment approaches are less successful in neglected and chronic cases. Complications of mallet finger may result from lack of timely recognition and treatment, leading to chronic stiffness and deformity of the DIP joint.[2] Complications may also occur as a result of splinting or surgery. Nearly all patients will have a small degree of extensor lag that does not interfere with daily activities. Surgical complications are more complex and more likely to persist. They include infection, nail plate deformity, joint incongruity, osteonecrosis, loss of reduction, hardware failure, and DIP joint deformity. Some complications require further corrective surgery. Although many different techniques have been described, there is still no unique, widely accepted, and preferred technique.[3]

The present study aimed to show that the tenodermodesis method is highly successful in mallet finger cases that did not benefit from conservative treatments and underwent surgery as a secondary treatment option.

MATERIALS and METHODS

This study was approved by Kırşehir Ahi Evran University Clinical Research Ethics Committee with the date 18-05-2021 and number 2021-09/105. An informed consent form was obtained from each patient. In this study, national and international ethical rules are observed.

Study Patients

We enrolled 15 patients with DIP injuries. The mallet finger cases that were unresponsive to the conservative splinting treatment, and the patients who were followed-up up to at least 12 months after the surgery, were included. In addition, we obtained the data retrospectively.

Statistical Analysis

No comparative analysis of the variables was performed. The data was given in the descriptive table. There was no need for any analytic program.

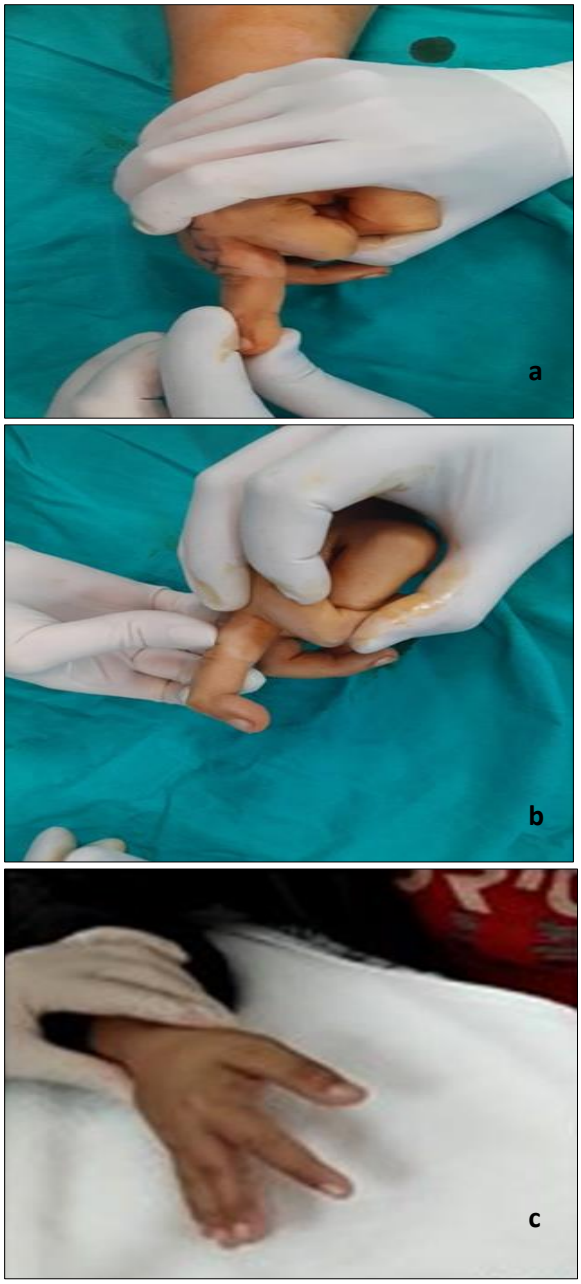
Surgical Technique and the Rehabilitation Procedures

We performed the procedure under block anesthesia. First, we applied a transverse incision to make the scar lay on the DIPJ (Pic 1).

Picture 1. The transverse incision on DIP joint

We aimed to benefit from the deformity-correcting effect of transverse skin excision applied in proximal swan neck deformity. Next, we tested the joint range of motion and then made a straight incision towards the joint by resecting the tendinous scar tissue. We checked for a full passive extension so that the two edges touch each other. To avoid resection of too much tissue, removing a smaller ellipse initially and, if necessary, widening it is recommended so that there is complete contact between the two wound edges, but normal flexion is still possible.

Three to four robust and absorbable monofilament sutures are placed 2 mm from the edge on one side and the skin, tendon, and joint capsule on the other. We modified the method and applied it as suturing that traverses the skin and tendon together after suturing the tendon and capsule. After all the sutures were passed, the joint position (hyperextension) was given, and knotting was performed. Due to the skin problems and patient compliance problems caused by long-term splinting, Kirschner -wire positioning was applied to all patients (Pic. 2a-b.).



Picture 2 a-b. Perioperative view, showing the range of DIP joint motion. **2 c** Postoperative view, showing active full extension of DIP joint

No permanent splint was used. Skin sutures were removed in 4 weeks. The Kirschner wires were removed at week 8. Movement and rehabilitation towards the proximal interphalangeal joint were followed under the control of the hand therapist. After the Kirschner wire was removed, a controlled passive movement was started, and gradual loading was performed under the control of the hand therapist. Satisfactory results were achieved in all patients after 12 weeks by using a night splint for four weeks after removing the Kirschner wire. All the patients were assessed on pain, cold intolerance, limitations in daily life, nail deformity, and the need to re-operate. All the patients underwent controlled rehabilitation for the proximal and distal joints after the 8th week.

During routine outpatient controls, the ROM of the DI joint of the affected finger was recorded using a finger goniometer. Clinical scoring was done using Crawford criteria. Patients were questioned for pain on a 10 cm long visual analog scale and grouped as no pain, mild pain, moderate pain, severe pain, and very severe pain. In addition, all the patients were assessed on pain, cold intolerance, limitations in daily life, nail deformity, and the need to re-operate.

RESULTS

A total of fifteen patients were evaluated; male patients were in the minority, %26.6 (n=4) and %73.3 (n=11), respectively. The average follow-up was 16 months (range, 10 to 24 months). The average age of the patients was 40 years (range 25 to 66 years). Pathology was dominant in the right hand (66.6%, n=10), and the ring of the finger was most affected (60%, n=9). The distribution of injured fingers was as follows: 7 affected third fingers, 3 affected fourth fingers, 3 affected fifth fingers, and 2 affected second fingers.

All the patients reported no pain at the follow-up (100%, n=15)

According to Crawford criteria, the patients (53.3%, n=8) were rated excellent, and the rest were rated as good (46.6%, n=7). No patients were grated modest or poor postoperatively.

No peri or-post operative complications such as infection, nail deformity, or bone deformity were encountered. Table 1. presents the features of the study patients in detail.

Table 1. The features of study patients and the surgery outcomes.

Patient	Sex	Affected digit	Age at surgery, Y	Follow-up, month	Injury mechanism	DIPJ extension	DIPJ flexion	Pain	Nail deformity
1	M	R, ring	36	24	slash	full	full	None	None
2	F	R,ring	45	22	slash	10°lag	full	None	None
3	M	R,ring	37	24	axial load	5° lag	full	None	None
4	F	R,index	45	18	slash	full	full	None	None
5	F	R,ring	55	14	axial load	full	full	None	None
6	F	R,index	66	12	axial load	full	full	None	None
7	F	L,ring	25	10	axial load	5° lag	full	None	None
8	F	L,index	33	18	slash	full	full	None	None
9	M	R,ring	46	12	slash	full	full	None	None
10	F	R,index	55	16	axial load	5° lag	full	None	None
11	M	R,ring	42	14	axial load	full	full	None	None
12	F	L,index	28	12	slash	5° lag	full	None	None
13	F	L,ring	32	11	axial load	full	full	None	None
14	F	L,index	31	17	axial load	5° lag	full	None	None
15	F	R,ring	33	15	slash	full	full	None	None

M- male, F- female, DIPJ- distal interphalangeal joint.

DISCUSSION

Usually, splinting is the first choice to treat chronic tendinous mallet finger, as adults are more compliant with extremity immobilization. However, the consensus among experts is that uncomplicated mallet finger injuries are best treated with splinting.[3] When the mallet finger injury evolves into a chronic injury, or when the injury is complicated, surgical treatment options are considered. Systemic reviews show that both surgical and splint techniques have a high success rate.[4,5] Our study, too, reports a good outcome of surgery for mallet finger deformity. Therefore, it appears that these treatments are equivalent and should be individualized to the patient.

The tenodermodesis technique has some shortcomings. Due to them, tenodermosis is less suggested for pediatric-age mallet finger deformity. Because of the redundant dorsal tendon and skin excision, the dorsal soft tissue of DIPJ could be tight compared with the palmar tissue after the operation. Therefore, the flexion function of DIPJ could be restricted, and it can even affect the development of the young finger. Nevertheless, their literature reports successful outcomes in the pediatric population, too.[2,6,7] Again, valid for both pediatric group and adults, the postoperative adhesions of tendon and skin may get more severe because the scars of the tendon and skin are at the same plane in the tenodermodesis operation, which can impair the movement of DIPJ. We modified the method and applied it as a suturing that traverses the skin and tendon together after suturing the tendon and capsule. So, we aimed to loosen the probable stiffness of healing skin. Our surgery outcomes are satisfactory and compatible with some previous report.[8-10]

A relatively small patient population may present a limitation for our study. However, we could emphasize that most reports in the literature consist of a similar number of cases. Thus, our study may contribute to the literature review and future meta-analyses. Again, the clinical conclusions of our study may be criticizable, but all our patients were scored as excellent and good after the surgery according to Crawford's criteria.

In conclusion, this study presents the tenodermodesis method as a highly effective and curative surgery technic for chronic tendinous mallet finger deformity. Nevertheless, increasing the value of the study would be even more effective in proving the effectiveness of the tendon technique if the present study were conducted with a control group.

Conflict of Interest

The authors declare that there is not any conflict of interest regarding the publication of this manuscript.

Ethics Committee Permission

This study was approved by Kırşehir Ahi Evran University Clinical Research Ethics Committee with the date 18-05-2021 and number 2021-09/105.

Authors' Contributions

Concept/Design: EY. Data Collection and/or Processing: EY, MY. Data analysis and interpretation: EY, MY. Literature Search: MY. Drafting manuscript: EY, MY. Critical revision of manuscript: EY, MY.

REFERENCES

1. Bendre AA, Hartigan BJ, Kalainov DM. Mallet finger. JAAOS-J Am Acad Orthop Surg. 2005;13(5):336-344.
2. Zhang L, Zuo Y-M, Huo Y-X, Wang G-Q, Zhang L. Scar overlapping suture for treating chronic tendinous mallet finger in children. J. Orthop. Surg. Res. 2019;14(1):1-5.
3. Lin JS, Samora JB. Surgical and nonsurgical management of mallet finger: a systematic review. J Hand Surg Am. 2018;43(2):146-163.
4. Smit JM, Beets MR, Zeebregts CJ, Rood A, Welters CF. Treatment options for mallet finger: a review. Plast. Reconstr. Surg. 2010;126(5):1624-1629.
5. Gurnani N, Hoogendoorn J, Rhemrev S. Mallet finger: surgery versus splinting. Ned. Tijdschr. Geneeskd. 2014;158:A6941-A6941.
6. Shin EK, Bae DS. Tenodermodesis for chronic mallet finger deformities in children. Tech Hand Up Extrem Surg. 2007;11(4):262-265.
7. Kardestuncer T, Bae DS, Waters PM. The results of tenodermodesis for severe chronic mallet finger deformity in children. J. Pediatr. Orthop. 2008;28(1):81-85.
8. Sorene E, Goodwin D. Tenodermodesis for established mallet finger deformity. Scand J Plast Reconstr Surg Hand Surg. 2004;38(1):43-45.
9. Makhlouf VM, Al Deek N. Surgical treatment of chronic mallet finger. Ann. Plast. Surg. 2011;66(6): 670-672.
10. Alla SR, Deal ND, Dempsey IJ. Current concepts: mallet finger. Hand. 2014;9(2):138-144.