



**Chronic Tendon Mallet Deformity in Finger Treated by  
Tenodesis: Case Report**

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## **Abstract**

*Mallet finger is the term applied to an extensor tendon injury or an extensor avulsion fractures in Zone I of the finger. Acute tendon mallet injuries in fingers are treated by conservative measures like splinting for 6-8 weeks. Non-compliance on the part of patients is one of the important reasons for the failure of conservative management. A mallet injury is classified as chronic when splinting cannot successfully correct a mallet deformity or more than 4 weeks has passed after the initial injury. The treatment of chronic mallet finger deformity can be challenging due to delay in diagnosis and non-compliance with external splinting. There are various reconstructive procedures proposed for the surgical management of chronic mallet finger, they include tendon plication, tendon repair with tendon graft, integrating a part of lateral band into distal phalanx and tenodesis. Herein, we discuss about a patient aged 23 years, who sustained tendon mallet injury and failed conservative treatment due to poor compliance. Patient underwent tenodesis which gave satisfying result to the patient. Tenodesis is an anatomical reconstruction of extensor mechanism in the distal interphalangeal joint of a finger.*

**Key words:** Tenodesis, Mallet finger

## **Abbreviations**


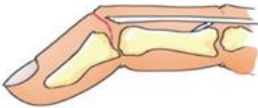
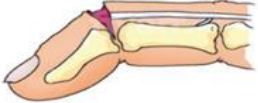



DIPJ- Distal Inter Phalangeal Joint

## **Introduction**

Mallet finger deformities are caused by a loss of continuity of extensor tendon over the distal interphalangeal joint (DIPJ) or an avulsion fracture of base of distal phalanx, which are called “tendinous mallet finger” or “bony mallet finger” respectively (1,6). They are also called baseball finger or drop finger. They are mainly work or sports related injury and is very common in young males (15). Doyle (18) classified mallet finger injuries into 4 types (Table 1), and it was according to the nature of injury; closed or open, amount of bony involvement of base of distal phalanx and based on soft tissue involvement. Type 1 Tendinous mallet fingers

are the most common presentation, usually treated by splinting for 8-10 weeks, which includes the night splinting after initial 8 weeks. Cases which fail conservative management are called chronic mallet fingers. The treatment options for a chronic mallet finger includes prolonged external splinting as well as surgical procedures. Surgery should be considered when there is an extension lag of more than 40° or functional deficit at DIP joint (12,14).

**Doyle’s classification of Mallet finger (Courtesy Acta biomed).**

<p><b>I</b>    <b>CLOSED INJURY ± SMALL AVULSION FRACTURE</b></p>	
<p><b>II</b>    <b>OPEN INJURY (LACERATION)</b></p>	
<p><b>III</b>    <b>OPEN INJURY (ABRASIONS WITH LOSS OF SKIN/TENDON)</b></p>	
<p><b>IV</b>    <b>MALLET FRACTURE</b></p> <p><b>A.</b>    <b>DISTAL PHALANX PHYSEAL INJURY (PAEDIATRICS)</b></p>	
<p><b>B.</b>    <b>FRACTURE FRAGMENT INVOLVING 20-50% ARTICULAR SURFACE (ADULT)</b></p>	
<p><b>C.</b>    <b>FRACTURE FRAGMENT INVOLVING &gt;50% ARTICULAR SURFACE (ADULT)</b></p>	

**Table:1**

There are various surgical procedures to treat chronic tendinous mallet finger, namely spiral oblique ligament reconstruction (SORL), Fowlers central tenotomy, K wire fixation of DIP joint, arthrodesis and chondrodesis(1,6,10). Tenodermodesis is a useful technique in such cases and the treatment involves careful repair of extension apparatus over DIP joint of finger and temporary k wire fixation of DIP joint for a limited period (3-4). Tenodermodesis was first reported by Iselin et al. in 1977. The clinical results of tenodermodesis are very encouraging with good patient satisfaction, with minimal complications.

## Case Presentation

A 23-years old, male patient, sustained a closed injury to the fifth finger of his right hand 6 months ago after the finger got trapped while closing the car door. He was diagnosed to have a tendon mallet injury without any bony involvement. Patient was initially managed conservatively and then advised surgery as the deformity persisted.

Patient presented to the outpatient department of our hospital with a mallet deformity of fifth finger of the right hand. On examination, he was found to have a mallet deformity (figure 1a and 1b) with an extensor lag of 40 degrees which was bothering him.



**Fig: 1a**



**Fig: 1b**

### **Mallet deformity of the fifth finger right hand**

He had further flexion from the existing flexion deformity of DIP joint and no active extension was possible.

The deformity was passively correctable, the patient was found to have a mild Swan-neck deformity in the finger was noted, but it was equivocal in both hands. Radiological assessment revealed a tendon mallet injury without any bony involvement (figure 2a and 2b).

**Fig: 2a****Fig: 2b**

### **X-ray of the fifth finger right hand AP and lateral views**

Patient opted for surgical correction of the mallet deformity. As it was a soft tissue deformity of nearly 6 months duration, it was decided to go for tenodesis procedure in the patient. Patient was explained regarding the prognosis and consented for the procedure.

### **Surgical Technique:**

Patient was taken to the operating room after optimisation. The procedure was carried under general anaesthesia, prophylactic IV antibiotic was given, and proper time out done. Right hand prepared and draped, an elliptical incision (figure 3a.and 3b) with excision of hypertrophic skin was made over the DIP joint skin crease.



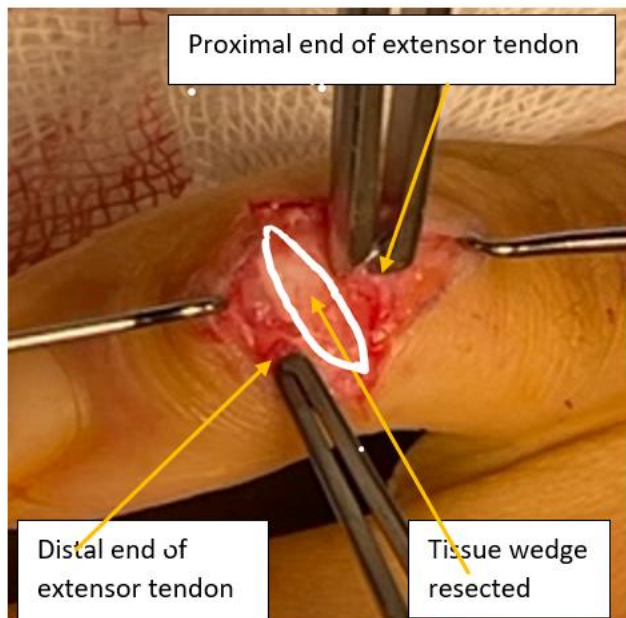
**Fig: 3a**



**Fig: 3b**

**Skin incision**

A wedge of subcutaneous tissue, fibrous tissue between the tendon ends and the redundant capsule was removed (figure 4a). The tendon ends proximally and distally were raised from the bone to get a better approximation while completing the repair. Under image control, the DIP joint was stabilised with a K wire in complete extension (figure 4b). Once the DIP joint was stabilised, the skin along with cut extensor tendon ends were sutured with 3.0 proline with a vertical mattress stitch. Dressing was applied and an aluminium splint given for the finger.



**Fig: 4a**



**Fig: 4b**



**Fig: 5a**



**Fig: 5b**

**Postoperative x-rays**

Post-operative x-ray confirmed good position of DIP joint with K wire insitu (figure 5a and 5B)

The patient was discharged on the same day, post operatively the splint was kept for 3 weeks and K wires removed after 6 weeks, as keeping the K wire for longer duration would lead to a stiff joint. We continued an aluminium splint for another 3 weeks after which he was started on controlled active and passive range of movements as aggressive physiotherapy could lead to failure of repair.

On last follow up, our patient had no pain, a very negligible extension deficit of less than 10 degrees (figure 6a and 6b) and flexion of more than 40 degrees at the DIP joint which was consistent with a good result according to Crawford criteria (Table 2).

<b>Classification</b>	<b>Clinical description</b>
Excellent	No pain, full flexion and extension of DIP joint
Good	No pain, 0°-10° extension deficit, full flexion of DIP joint
Fair	No pain, 0°-25° extension deficit, partial loss flexion of DIP joint
Poor	Persistent pain, >25° extension deficit

**Table 2.** Crawford criteria

**Fig: 6a****Fig: 6b**

**Preoperative (Fig:6a) and post-operative (Fig:6b) pictures**

## Discussion

Mallet finger is a common injury in young and middle age groups, it is an either bony or a tendinous injury. In bony mallet finger, there is avulsion injury of base of distal phalanx along with the extensor tendon. Tendinous mallet fingers are mainly zone I extensor tendon injury. Early diagnosis and management are important for a favourable outcome. Mostly, tendinous mallet deformity is managed by conservative measures, as the patients are compliant to finger immobilisation. Neglected mallet fingers may be complicated by Osteoarthritis at DIPJ or hyperextension (Swan-neck) deformity at proximal interphalangeal joint as a result of proximal retraction of central slip of extensor tendon. Missed diagnosis and inappropriate treatment can result in DIPJ dysfunction. Failures happen due to poor compliance with splinting or completing the required duration of treatment.

Chronic mallet finger represents a totally different clinical entity, defined as mallet injuries seen at least 4 weeks after injury. Surgical treatment is considered when the acute soft tissue injury evolves into a chronic deformity. Surgical correction of the deformity is recommended if there is an extension lag of more than  $40^{\circ}$  and functional deficit (12). There are various surgical options for a chronic tendinous mallet deformity, namely Central slip tenotomy, Spiral Oblique Retinacular Ligament reconstruction (SORL), K wire fixation, Chondrodesis and Arthrodesis (6.10).



5.2  
We opted for tenodesis, as the procedure is simpler than many of the above-mentioned reconstructive surgeries. Tenodesis is associated with less post-operative complications when compared to other reconstructive procedures mentioned above. Tenodesis outcome in the adult population have been widely reported (3,4,5,7,9) when compared to paediatric population. Preoperatively, we explained to our patient regarding persistence of mild extensor lag and flexion restriction. we were able to mobilise the extensor tendon ends proximally and distally to get a good approximation for final repair. It is worthwhile to note in the literature that, lengthening of the terminal extensor tendon by 1mm results in 25° extensor lag and shortening of 1mm results in restriction of distal inter phalangeal joint flexion (11).

There was no complication like skin necrosis, infection, nail plate damage or K wire failure. Our patient had no pain, achieved a flexion of more than 40° and extension lag of less than 10°, which was a good result according to Crawford criteria and comparable to the existing studies in the literature (2,3,8).

The Crawford criteria is one of the most commonly used classification system for chronic mallet finger surgery based on extension or flexion loss of DIP joint and pain with clinical relevance (17).

Iselin et al. (2) obtained 85% satisfactory results with an average flexion of 62° and an average extension deficit of 62° in a series of 26 patients.

Kon and Bloem (4) published a similar result with a mean extension deficit of 5° and flexion of 60° in a series of 27 cases.

Levante et al. (5) suggested that risk of stiffness in extension is high, if the tendon shortening exceeds 3mm.

Sorene et al (16), in a study of 16 patients with chronic mallet finger treated by tenodesis and K wire fixation of DIPJ found excellent result in 8 patients, good in 4 patients and fair in 2 patients. Extension lag reduced from 50°(30°-70°) to 9°(0-30°) and none of them had any DIPJ flexion impairment.

Yurdakul et al (8), in a retrospective study of 15 patients treated by tenodesis found excellent results in 8 patients and good results in 7 patients, and no post-operative complication was observed. In their study, they modified their repair by initially suturing the tendon and capsule, then the tendon and skin. Their aim was to make the skin more pliable.

Tenodesis has the advantage of being a technically simple procedure which gives better approximation of repair, mechanical integrity and vascularisation by approximating skin, subcutaneous tissue and extensor tendon together.

## Conclusion

Tenodesis is a safe and an effective technique for treatment of chronic soft tissue mallet finger. It allows anatomic reconstruction of extensor apparatus of DIP joint and significantly improves the clinical picture. The patients and parents should be informed regarding the persistence of mild extensor lag and limitation of DIP joint flexion.

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