

# Acute Finger Deformity

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A 43-year-old man presents to the Fast Track of the Emergency Department with chief complaint of injury and pain to the middle finger of his left hand. He fell onto his out-stretched hand this morning during his morning run. He thought at first that he had simply “jammed” his finger, but when he noticed that he was unable to fully extend the distal aspect of the digit, he decided to seek treatment. He has no known prior trauma or injury to this hand and no other pertinent medical or surgical history.

On physical exam, the distal interphalangeal joint (DIP) of the third digit of his left hand is in flexion at rest (Figure 1). The dorsum of his DIP and proximal phalanx are swollen and ecchymotic, and both areas are tender to palpation. The DIP was able to be fully extended with passive motion, but the patient was unable to actively extend the joint. Passive and active ranges of motion were elicited at the other left upper extremity joints proximally and distally with intact neurovascular and ligamentous integrity. Radiography illustrated no avulsions, misalignments, or other bony abnormalities.

## QUESTIONS

1. What is the name of this patient’s specific injury?

- A. Boutonniere deformity
- B. Jersey finger
- C. Mallet finger
- D. Swan neck deformity

2. The main treatment option for the noted deformity includes:

- A. Immediate surgical intervention
- B. Physical therapy only
- C. Splinting in the extended position
- D. Splinting in the flexed position

## FIGURE 1:

Flexion of the distal interphalangeal joint

Photo credit: Palmetto Health Tuomey Emergency Department



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## ANSWERS

### 1. What is the name of this patient's specific injury?

Correct answer: C) Mallet Finger

Mallet finger is an extensor tendon injury of the DIP, with the hallmark presentation being the inability to actively extend the DIP and the DIP being in flexion at rest.<sup>1</sup> Boutonniere Deformity is an injury to the extensor tendon overlying the PIP joint, involves the PIP joint being hyper-flexed and the DIP joint being forced into hyper-extension.<sup>2,3</sup> Jersey finger is a flexor digitorum profundus tendon injury at the base of the distal phalanx.<sup>4</sup> The mechanism of injury occurs when an already maximally flexed DIP joint is forcefully hyperextended. On physical exam there may be pain and tenderness over the volar aspect of the DIP with the finger in slight extension at rest on a hard surface and no active flexion of the DIP.<sup>5</sup> Swan neck deformity is hyperextension of the PIP joint with flexion of the DIP joint, and can either be physiologic, secondary to a chronic mallet finger injury or secondary to inflammatory diseases.<sup>3</sup>

### 2. The main treatment option for the noted deformity includes:

Correct answer: C) Splinting in the extended position

In a non-complicated mallet injury, non-operative, conservative management is the best and most preferred option for treatment.<sup>6</sup> The recommendation is strict continuous splinting of the DIP joint in extension for approximately 6-10 weeks, with a strict minimum of 6 weeks.<sup>2,7,8</sup>

## DISCUSSION

Mallet finger, an extensor tendon injury of the distal interphalangeal joint (DIP), is the most common closed-tendon injury of the fingers, primarily affecting the dominant hand's middle finger, and secondarily the ring finger and 5th digit.<sup>1</sup> The injury frequently presents in young and middle-aged men with a mechanism of injury involving collision sports such as football, rugby, baseball, or even in falls, depending on hand placement and force.<sup>1</sup> In the elderly population, much less force is required to sustain injury; for example, a minor action such as pulling up a bed sheet could result in the deformity.<sup>8</sup>

Mallet finger results from forced flexion of the distal phalanx (fingertip) and subsequently causes a partial or complete tear to the extensor tendon.<sup>1</sup> An accompanying avulsion fracture of the distal phalanx may occur.<sup>1</sup> The superficial location of the tendon as well as the relatively avascular insertion predispose the tendon to injury and longer healing time.<sup>2</sup> Mallet finger is considered a minimally disabling deformity, although it can be quite concerning to patients' due to appearance and fear of function limitation.<sup>9</sup>

The finger may have swelling, ecchymosis, and tenderness to palpation of the dorsum of the DIP joint, with the hallmark presentation being the inability to actively extend the DIP and the DIP being in flexion at rest.<sup>1</sup> However, extension of the DIP is possible passively.<sup>1</sup> Integumentary, neurovascular, and collateral

ligament integrity should also be evaluated.<sup>1</sup> Anterior-posterior, lateral, and oblique radiographs, should be performed to assess for avulsion fractures, malalignments, or significant bony injury, but may be normal with only ligamentous injury.<sup>1,9</sup> Some individuals with joint hyperlaxity could have pseudo-mallet swan neck deformities that are unrelated to trauma or mallet finger history.<sup>3</sup> Also, in elderly patients, due to osteoarthritic changes, a pseudo-mallet deformity may be present.<sup>3</sup>

Doyle classification of mallet fingers is utilized to describe the injury as well as to guide treatment.<sup>3</sup> A Type I mallet finger injury, the most common type, is defined as a closed injury, with or without a small avulsion fracture (dorsal), and is considered non-complicated if there is no subluxation or the intra-articular fracture involves less than 1/3 of the articular surface.<sup>3</sup> The injury worsens in presentation and prognosis with Type II to Type IV, all of which are open injuries.<sup>3</sup>

The first reported treatment for Type I mallet finger injuries by Dr. Mason in 1930 advocated for immediate surgical intervention.<sup>9</sup> It was not until 1962 that a consensus grew to support conservative therapy with splinting, which has persisted as the mainstay of treatment.<sup>9</sup> In cases of a Type I, non-complicated mallet injury, non-operative, conservative management is the best and most preferred option for treatment.<sup>6</sup> The recommendation is strict continuous splinting of the DIP joint in extension for approximately 6-10 weeks, with a strict minimum of 6 weeks.<sup>2,3,7,8</sup>

There are numerous reported splinting techniques, but when considering which splint type to use, the type of splint is not necessarily as important as the patient's compliance.<sup>6</sup> The goal of splinting is to slightly hyperextend the DIP joint to restore functional anatomy and reduce extensor lag to the pre-injury state.<sup>9</sup> Stack splints (Figure 2: Stack Splint) were the earliest utilized conservative treatment, and while it still yields similar outcomes to other splint types, there have been reported skin complications.<sup>6</sup> More recently, custom thermoplastic (molded) splints are available via orthopedic specialists, which are very similar in design to the original Stack splints, however these can be more costly.<sup>9</sup> In the outpatient setting, or if cost is a concern, dorsal padded or volar padded aluminum splint could be utilized (Figure 3: Volar splint). Dorsal splints must be used with care as they may inflict pressure on the actual site of tendon rupture, an already relatively avascular area, and could further compromise healing or cause ulceration.<sup>9</sup> Volar splints avoid direct pressure on the dorsum of the finger, reducing skin complications, but do not restrict DIP flexion as well.<sup>9</sup> Each type of splint carries risks of transient sensory problems, skin irritation, maceration, or ulceration.<sup>9</sup> There are no studies that illustrate a significant difference in clinical outcomes (extensor lag) between dorsal padded splints, volar padded splints, or custom-made splints.<sup>3</sup> It is up to the physician to consider each patient's risk factors, lifestyle factors, and expected compliance to determine which splint type would be most suitable.

Whichever splint type is chosen, proper splinting places the DIP in slight hyperextension while still maintaining full range of motion at the PIP joint.<sup>3</sup> This splinting must be strictly maintained continuously for a minimum of 6 weeks.<sup>2,3,7,8</sup> It is crucial to stress

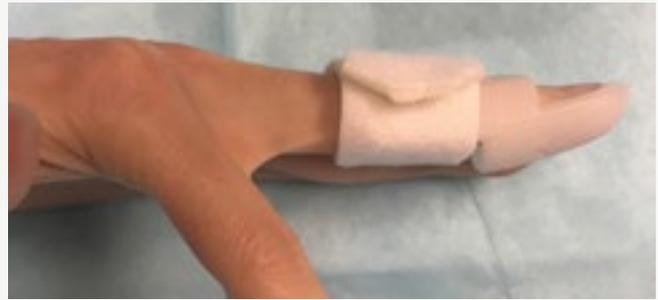
to the patient the importance of adherence to splinting treatment and that the DIP should not be allowed to flex at any time during the splinting period, or the treatment “clock” must be re-set to zero.<sup>2,3,9</sup> If the splint needs to be removed for any reason, the finger should remain in extension on a hard, flat surface.<sup>3</sup> After a full 6-week period, the finger is re-assessed and active extension is attempted. If achieved, then weaning from use of the splint can be initiated.<sup>3</sup> However, if at the initial 6-week evaluation an extension lag or a fixed flexion deformity persists, continue strict splinting for another 4-6 weeks.<sup>3,8</sup> The DIP extensor lag is more of an aesthetic concern than a functional one, with patient reports of high satisfaction for unhindered function and minimal difficulties with work or activities of daily living; thus it is advised to attempt nonoperative treatment multiple times prior to orthopedic consultation.<sup>3,8,9</sup> However, if the extensor lag is significant, the patient complains of worsening pain, or decreased function secondary to the injury, then orthopedic consult could be considered earlier.<sup>6,8</sup>

If conservative management has been dutifully attempted and failed or if disability is present, surgery can be considered.<sup>6</sup> Surgery should also be considered in more complicated cases of injury, those with subluxation of the distal phalanx, large articular fractures (bone fragments more than 1/3 of the joint surface), diastasis greater than 3mm, concomitant open injury, or recurrent injuries.<sup>6</sup> Hand physical therapy or home exercises can be incorporated throughout the duration of treatment, such as PIP flexion exercises, to prevent stiffness and maintain functional use of hands.<sup>3</sup>

This differential diagnosis of mallet finger should include, but are not limited to jersey finger, swan neck deformity, DIP dislocation, distal phalanx fracture, and Boutonniere deformity.

- **Jersey finger** is a flexor digitorum profundus tendon injury at the base of the distal phalanx.<sup>4</sup> Mechanism of injury occurs when an already maximally flexed DIP joint is forcefully hyperextended, as when a player has a strong grip on a jersey and the opposing player attempts to pull away, hence the name “jersey finger.”<sup>10</sup> Ring finger is most commonly involved due to its fingertip being more prominent during grip.<sup>4</sup> On physical exam there may be pain and tenderness over the volar aspect of the DIP with the finger in slight extension at rest on a hard surface and no active flexion of the DIP.<sup>5</sup> If the patient presents within 10 days of the injury, surgical repair is warranted, if past ten days, then decisions must be individualized.<sup>11</sup>
- **Swan neck deformity**, hyperextension of the PIP joint with flexion of the DIP joint, can either be physiologic, secondary to a chronic mallet finger injury, or secondary to inflammatory diseases. It is important to discern between a mallet finger injury and a swan neck deformity, as both present with visible flexion of the DIP.<sup>3</sup> A “distal Bouvier-type maneuver” can be utilized to distinguish a lax PIP source of DIP flexion from a swan neck deformity secondary to a chronic (possibly untreated) mallet finger.<sup>3</sup>
- **DIP dislocations** are rare, due to the enhanced stability of the adjacent tendon insertions and soft tissues tightly enveloping the joint. When present, they are commonly dorsal and lateral in direction and frequently associated with an open wound.<sup>3</sup> If a closed dislocation is suspected, a closed reduction can be attempted following digital or wrist block anesthesia.<sup>2,3</sup>
- **Distal phalangeal fractures**, the most common fractures in the hand, usually result from crushing or shearing forces and if there is tendinous involvement, more commonly appear at the base.<sup>2,12</sup> Epiphyseal injuries, in children and adolescents, can occur when the distal phalanx has been hyper-flexed and can present like an open mallet deformity and easily misdiagnosed as a joint dislocation.<sup>12</sup> Treatment involves a volar or hair-pin splint, without immobilization of the PIP joint and surgical follow up.<sup>2,12</sup>
- **Boutonniere Deformity**, injury to the extensor tendon overlying the PIP joint, involves the PIP joint being hyper-flexed and the DIP joint being forced into hyper-extension.<sup>2,3</sup> Treatment entails maintaining the PIP joint in strict extension for 5 to 6 weeks, similarly to the mallet finger but involving the PIP joint.<sup>2,3</sup>

**FIGURE 2:**  
Stack splint



**FIGURE 3:**  
Volar Splint of distal interphalangeal joint  
Photo credit: Palmetto Health Tuomey Emergency Department



The patient in Figures 2 & 3 had findings consistent with a Type I, non-complicated mallet finger injury. He was splinted with a volar padded splint with the DIP in slight hyperextension. He was counseled on the importance of strict maintenance of the DIP extension at all times and referred to outpatient hand surgery follow-up.

When patients present with any finger injury it is important for the physician to consider a broad differential diagnosis as surgical intervention may be required for some injuries. Dorsal, volar, or custom-made splints are all similarly effective treatment options, and the splint that facilitates the highest patient compliance should be chosen.<sup>3,6,9</sup> Counsel patients that most studies illustrate that following splinting compliance, despite residual extensor lag, pain was negligible and finger function was highly satisfactory, with no significant effect on work or daily activities.<sup>3,6</sup>

#### **AUTHOR DISCLOSURES:**

No relevant financial affiliations.

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