

Original article

## CONSERVATIVE VERSUS K-WIRE PINNING OF ACUTE MALLET FINGER IN ADULTS

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### Abstract

Mallet finger lesions are common. The diagnosis of mallet finger is essentially clinical, the patient's recent history includes the mechanism of injury. A radiographic lateral and anteroposterior views of the DIPJ usually see bony avulsion of distal phalanx or it may be a ligamentous injury with normal bony anatomy, Wehbe and Schneider described a method to measure the size and displacement of the bony fragment. The aim of this study is to compare the results between of conservative and K-wire pinning management of acute mallet finger Doyle type I in adult patients. Patients were divided into two groups. Group (A) were treated with aluminum orthosis that immobilized the DIPJ in full extension for six weeks. And Group (B) were treated with percutaneous fixation of the distal interphalangeal joint using a smooth Kirschner wire. No external splint age was used and the wire was removed after six weeks. A total of 40 patients suffering from acute mallet finger type I Doyle's classification admitted in orthopedics and traumatology department of Sohag university hospital from February 2019 to November 2019. All patients had Follow up radiographs taken of the affected finger at one week, four weeks, and eight weeks. Functional outcomes were determined using Crawford's evaluation criteria. The final extensor lag was significantly better in the pin group (12.3 vs 6.6°). The amount of improvement between the groups was statistically significant and in favor of percutaneous pinning (16.15 vs 20.55°), also the flexion loss was lesser in pin group (5.4 vs 4.1°). The optimal treatment for mallet finger injuries remains controversial in the literature. Many orthotic devices for conservative management and surgical techniques have been described in the past. This study shows that closed reduction by use of K-wires provide functionally better result in acute mallet finger cases. Surgical treatment by a single k-wire is better than conservative treatment as regard clinical and radiological results. Conservative technique may have less complications, but the difference in final clinical results is in favor of surgical treatment.

Keyword: Mallet finger, Orthosis, Extension, Sport

### 1. Introduction

Mallet finger is a traumatic lesion of the terminal extensor band in zone 1, characterized by division of the tendon insertion alone (Tendinous mallet) or an avulsion of the articular surface of the distal phalanx (Bony mallet) [1]. Mallet

finger lesions are common, with a prevalence of 9.3% of all tendon and ligament lesions in the body and an incidence of 5.6% of all tendinous lesions in hand and wrist [2], high-energy mechanisms of injury are more common in young

males and low-energy mechanisms of injury are common in elderly females [3]. The diagnosis of mallet finger is essentially clinical [4], the patient's recent history includes the mechanism of injury, the patient usually complains of pain and of being unable to perform full active extension of the DIPJ [4]. Upon examination, a passively reducible mallet deformity, swelling, and/or ecchymosis of the dorsal aspect of the DIPJ is found. Fingertip rests at 45° of flexion. Radiographic lateral and anteroposterior views of the DIPJ usually reveal bony avulsion of distal phalanx or it may be a ligame-

## 2. Patients and method

It is a prospective study of 40 patients admitted in orthopedics and traumatology department of Sohag university hospital after approval of the institute ethical committee. There were (26 males and 14 females; mean age 44.8 years; range 20-72 years) suffering from acute mallet finger type I Doyle's classification (22 bony and 18 tendinous) [6]. The study was conducted from February 2019 to November 2019. The right hand was involved in 28 patients and the left in 12 patients. The fingers affected included 2 index fingers, 10 middle fingers, 12 ring fingers, and 16 little fingers. The dominant hand was involved in 28 patients and the non-dominant hand in 12 patients. The injuries occurred during falling on hand in 18 patients, hitting hard objects in 14 patients, playing football in 4 patients, and fighting in 4 patients. No patient had any medical history of bone diseases that could have influenced surgical outcomes. The mean duration from injury to surgery was 8.35 days (range 3-13 days). Functional outcomes were determined using Crawford's

### 2.1. Conservative technique

Treatment involves complete immobilization of the involved joint in full extension or slight overextension for at least 6 weeks, followed by 2 weeks of nighttime splinting. Importance of maintaining complete and continuous immo-

bilization of the affected joint cannot be overstressed, as if the distal interphalangeal joint is allowed to flex during the course, the course needs to be restarted [4,5,8].

ntous injury with normal bony anatomy [4], Wehbe and Schneider described a method to measure the size and displacement of the bony fragment [4,5]. The aim of this study is to compare the results between of conservative and K-wire pinning management of acute mallet finger Doyle type I in adult patients clinically by consolidation of the fracture, extension lag at DIP joint, nail bed deformity, DIP joint pain, any dorsal prominence, and the active ROM and radiologically by follow up x-rays using lateral and anteroposterior views.

evaluation criteria [7]. The patients were divided into two groups: **Group (A)** were treated with aluminum splint that immobilized the DIPJ in full extension (12 bony and 8 tendinous) for six weeks. **Group (B)** were treated with percutaneous fixation of the distal interphalangeal joint using a smooth Kirschner wire. No external splintage was used and the wire was removed after six weeks (10 bony and 10 tendinous). All patients had Follow up radiographs taken of the affected finger at one week, four weeks, and eight weeks. An informed written consent was obtained from all participants. The study was approved by Scientific & Ethical committees at Sohag faculty of medicine. Pre-operative assessment was done at emergency room. Inclusion criteria were adult patients, acute mallet injury, tendinous mallet, and bony mallet either non-displaced or <2 mm displacement. Exclusion criteria were open lesions, comminuted fractures, and patients with proximal fractures, Poly traumatic patients, and volar subluxation.

bilization of the affected joint cannot be overstressed, as if the distal interphalangeal joint is allowed to flex during the course, the course needs to be restarted [4,5,8].

## 2.2. Surgical technique

Treatment protocol involved using a single smooth Kirschner wire. The patient is positioned supine with the affected extremity on a hand table. Surgery is performed under local anesthesia with finger tourniquet control. The DIP joint of the injured finger was stabilized in slight hyperextension using a single K-wire from the tip of the distal phalanx and cross the DIP joint to the middle phalanx by retrograde manner into at least 50% of the length of the medullary canal of the middle phalanx. The pin

was cut above the skin, then bent over the tip of the finger. The wire was removed after six weeks. Then, we took X-ray photographs to conform completely reduction was achieved. When the cortex of the fragment appeared to be joined on the radiographs, we confirmed that union of the fracture had occurred (range 5-6 weeks), then the wire is removed under a digital nerve block performed in the office. The finger was allowed to active motion 48 hours later [6].

## 3. Results

During this study period 40 patients were treated for acute mallet finger Doyle type I from February 2019 to November 2019. Patients were divided into two groups. All patients returned at the out-patient clinic for follow-up, including examination, radiographs and a patient satisfaction at 1, 4 and 8 weeks. The mean follow-up period was 8 weeks (range 7.5-8.2 weeks). At the final follow-up, the results were graded by Crawford's criteria, which rank patients from excellent to poor as follows: Excellent for full extension, full flexion, and no pain. Good for extension deficit 0-10, full flexion, and no pain. Fair for Extension deficit 10-25, any flexion loss, and no pain. Poor for Extension deficit >25, any flexion loss, and persistent pain [7]. In Group (A) (Extension orthosis group), the extensor lag improved a mean of 16.15° (from 28.45° before treatment to 12.3° final). The mean final extensor lag was 12.3° (range, 4-26°), the mean flexion loss was 5.4° (range, 0-10°). 4 patients (incidence, 20%) had mild dorsal skin maceration due to orthosis at the end of treatment duration. In Group (B) (The pin group), the extensor lag improved a mean of 20.55° (from 27.15° before surgery to 6.6° final). The mean final extensor lag was 6.6° (range, 0-13°), the mean flexion loss was 4.1° (range, 0-7°). 6 complications (incidence, 30%)

occurred. 4 cases of superficial pin site infections developed 3 days, 7 days, 12 days, and 14 days after surgery and were treated with a 7-day course of oral antibiotics. The infection resolved, and each pin was removed uneventfully 6 weeks after the surgical procedure with no need for premature removal of the wire. And 2 cases of nail dystrophy at 10 days, and 23 days. No re-operation was needed in all cases. No neurovascular complications occur in any case. All fractures demonstrated evidence of radiographic healing within an average healing time of 5.6 weeks (range, 5-6 weeks). The final extensor lag was significantly better in the pin group (12.3 vs 6.6°) (P value = 0.001). The amount of improvement between the groups was statistically significant and in favor of percutaneous pinning (16.15 vs 20.55°), the flexion loss was non-significantly better in pin group (5.4 vs 4.1°) (P value = 0.095). At the final follow up, patients were evaluated according to Crawford grading system [6], according to extension lag, flexion loss and pain. In Group (A), there were five (25%) excellent, two (10%) good, eight (40%) fair and five (25%) poor. In Group (B), there were eight (40%) excellent, six (30%) good, five (20%) fair, and one (5%) poor. (P value= 0.041). There was statistically significant difference between the two groups (p<0.05).

## 4. Discussion

Mallet finger treatment a common sport injury seen in orthopedic outpatient department all over the world with a prevalence of 9.3% of all tendon and ligament lesions in the body and an incidence of 5.6% of all tendinous lesions in hand and wrist [2]. The treatment of mallet finger aims to restore anatomical reduction, early restoring DIP function with good ROM, avoid complications. The optimal treatment for mallet finger injuries remains controversial in the literature [7,9]. Many orthotic devices for conservative management and surgical techniques have been described in the past. Some investigators still advocate conservative treatment because of the surgical risks, and others recommend surgery to reduce complications [10,11]. Doyle type I injuries do include both isolated tendon injuries and small avulsion fractures. It was not possible to separate them in our analysis, because the vast majority of the studies did not sep-

arate out the type, and there would have only been a small number of studies left to evaluate [6]. This prospective study included 40 adult patients. They were divided into two groups, group (A) Conservative treatment, and group (B) surgical treatment, 20 patients in each group. The average period of follow up was 8 weeks. Clinically the results evaluated according to criteria of Crawford [7], the clinical and radiological results between two groups were compared statistically by SPSS program using t-test, the differences between two groups is statistically significant. This study demonstrated complication rates of 20% (nonsurgical) and 30% (surgical). The complications of surgical treatment were 4 pin site infection and 2 nail deformities. In contrast, the complications of nonsurgical treatment were 4 mild and transient dorsal skin maceration reported with nonsurgical treatment.

## 5. Conclusion

*Surgical treatment by a single k-wire is better than conservative treatment as regard clinical and radiological results. Conservative technique may have less complications, but the difference in final clinical results is in favor of surgical treatment.*

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