



Conservative Treatment of Chronic Mallet Fracture Non-union after Failed Pin Fixation

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Abstract

Introduction: Operative treatment of mallet finger fractures is generally recommended for patients in whom more than one-third of the articular surface is involved with volar subluxation. We present a case of conservative treatment with chronic nonunion of a mallet finger fracture after failed mallet finger surgery.

Presentation of Case: A 16-year-old boy presented with a bony fragment (mallet formation) of his left long finger. The fragment occupied 40% of the articular surface, with volar subluxation of the distal phalanx. Percutaneous needle curettage of the fracture site and pinning were performed. Six weeks later, the fragment was displaced and had rotated. Hence, all the pins were removed, and a splint was applied. The fracture displayed nonunion and volar subluxation of the distal phalanx. The patient continued with the splinting, and the fracture finally healed. At 27 months after the surgery, radiological examination showed very good remodeling of the distal interphalangeal joint surface with anatomic joint congruence. Functional results at 27 months were good according to Crawford's classification.

Conclusion: Chronic nonunion of a mallet finger can be cured conservatively even when a fracture gap is seen along with displacement of the fragment and volar subluxation of the distal phalanx.

Keywords

Bony Mallet; Non-Union; Conservative Treatment

Introduction

Mallet fracture is a common injury of the hand that often occurs during a ball game. Some patients do not undergo prompt, appropriate treatment, presenting to a hospital several weeks after the injury. If a mallet fracture is not properly treated, it may become painful secondary to pseudoarthrosis or subluxation of the distal interphalangeal (DIP) joint.

Surgical treatment has been suggested for such fractures involving >30% of the articular surface or

for fractures with volar subluxation of the distal phalanx [1,2]. Surgery is appropriate because patients with such fractures are at increased risk for secondary osteoarthritis and aesthetically unacceptable outcomes.

Various surgical techniques are available to treat displaced mallet fractures, including Kirschner (K)-wire pinning, pull-out wiring, compression pin fixation, hook plate fixation, and microscrew fixation. The extension block (K-wire) technique, reported by Ishiguro et al [3], is widely performed to treat acute

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bony mallet fingers. This percutaneous method is easier and less invasive than most currently available methods. We routinely perform it for cases of mallet fracture with involvement of >30% of the articular surface and DIP joint subluxation. We sometimes add a third K-wire as a flexion block to prevent volar displacement.

We report a case of chronic nonunion of a mallet finger after failed operative treatment with both extension and flexion blocks using K-wires. The displaced fragment was ultimately treated with splinting, after which bone union was achieved without joint incongruity or degenerative changes.

Presentation of Case

A 16-year-old boy injured his left long finger while playing volleyball. He visited a local clinic 3 weeks after the injury because of persistent pain and swelling of the left finger and was referred to our hospital for further treatment. Initial radiographs showed a bony mallet of his left long finger, with the fragment occupying 40% of the articular surface, and the presence of volar subluxation of the distal phalanx (**Fig-1a**). The fracture was classified as type IIB according to the Wehbe and Schneider classification [4].

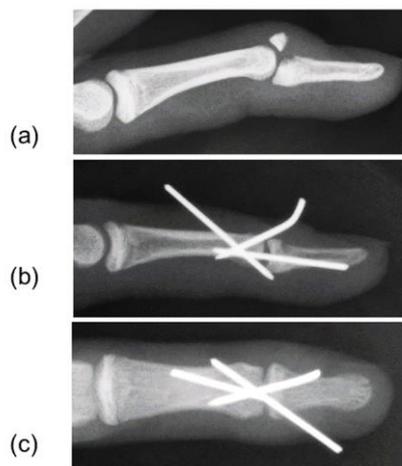


Fig-1:

(a) Preoperative radiograph. Volar subluxation of distal phalanx was seen.

(b) Postoperative lateral radiograph.

(c) Postoperative anteroposterior radiograph.

Surgery was performed under regional anesthesia 5 weeks after the injury. Following percutaneous needle curettage of the fracture site [3], we fixed the fracture with 1.25-mm Kirschner (K)-wire as an extension block pin and 0.045-inch Z-wire as a flexion block pin to reduce volar subluxation of the distal phalanx. Finally, a 0.045-inch Z-wire was inserted for temporary joint fixation (**Fig-1b,c**). The patient returned to his previous clinic for dressing changes after the operation. When he revisited our hospital 6 weeks later, plain radiography showed that the fragment had rotated dorsally, and the distal phalanx was volar-subluxated (**Fig-2a**). Because he wanted to play volleyball as soon as possible, the K- and Z-wires were removed.

The patient and his family did not want a re-operation. Hence, when he played volleyball, his long and ring fingers were buddy-taped. When not playing volleyball, he wore a volar aluminum splint to protect the DIP joint. At 8 weeks after the operation, a fracture gap was apparent, and the distal phalanx was still volar-subluxated (**Fig-2b**). At 3 months postoperatively, the fracture gap had enlarged, and the DIP joint was hyperextended and volar-subluxated, which was judged to indicate nonunion (**Fig-2c**). At 4 months postoperatively, the fracture gap had slightly diminished (**Fig-2d**), and at 7 months the fragment and distal phalanx approximated each other (**Fig-2e**). At 8 months, the fracture was united, although the head of the middle phalanx was irregular (**Fig-2f**). At 27 months after surgery, the fracture was fully united, the head of the middle phalanx was cured, subluxation of the distal phalanx was reduced, and the DIP joint surface had remodeled (**Fig-3a**). The range of motion was -10° of extension and full flexion with no pain (**Fig-3b,c**). His mallet finger treatment outcome assessment was good according to Crawford's classification [5].

Discussion

Bony mallet finger surgery is often challenging. Thus, surgical treatment has been suggested for fractures involving >30% of the articular surface or for those with volar subluxation of the distal phalanx [1,2].

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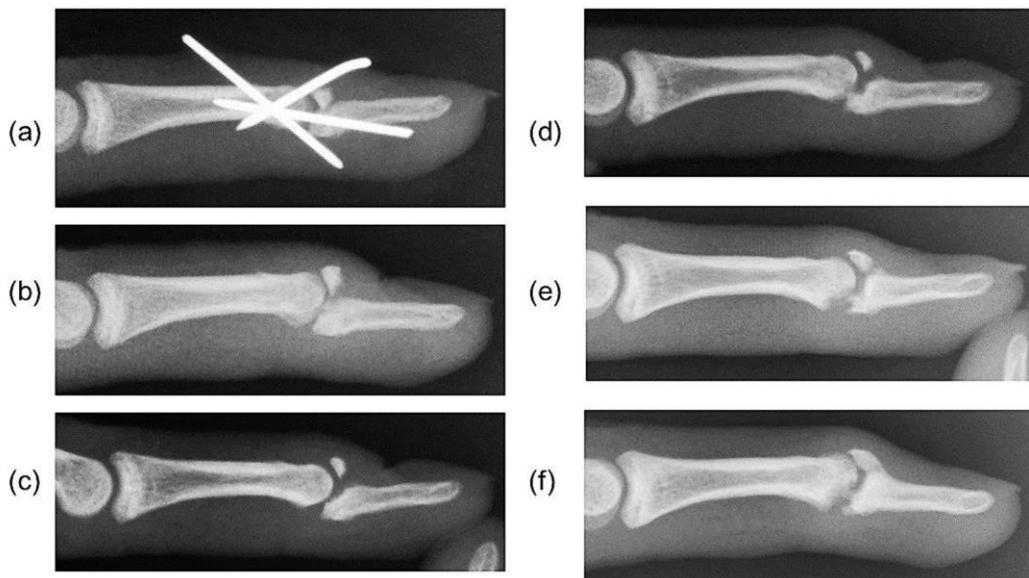


Fig-2:

- (a) At 6 weeks after the operation, volar subluxation of the distal phalanx and a rotated fragment were seen.
- (b) At 8 weeks after the operation, volar subluxation of the distal phalanx and fracture gap were apparent.
- (c) At 3 months after the operation, the volar subluxation of the distal phalanx had progressed, and a fracture gap was clearly seen, which appeared to represent nonunion.
- (d) At 4 months after the operation, volar subluxation was still present, although the fracture gap had slightly diminished.
- (e) At 7 months after the operation, the fragment and distal phalanx approximated each other, and the volar subluxation had slightly reduced.
- (f) At 8 months after the operation, the fracture was united, although the head of the middle phalanx was irregular.

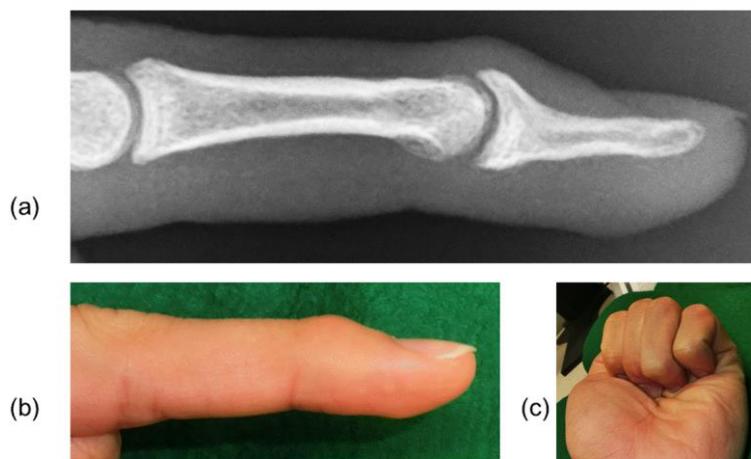


Fig-3:

- (a) At 27 months after the operation, the fracture was fully united and the distal interphalangeal joint surface had remodeled. Volar subluxation was substantively reduced.
- (b) Long finger extension was -10 degree.
- (c) Long finger flexion was full.

Crawford [5] reported using a molded polythene splint for mallet fingers. Patients with subluxation who had failed reduction attempts, however, required operative treatment.

The few reports on the treatment of chronic bony mallet fingers [6,7] have recommended prompt surgery even in chronic cases. Takase et al [6] reported treating chronic bony mallet finger with a

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dorsal extension block and pinning with percutaneous curettage. Open reduction and internal fixation has been recommended in chronic cases because satisfactory reduction is difficult if fibrous tissue is present at the fracture site. If palmar subluxation of the distal phalanx cannot be anatomically reduced, open reduction should be considered to avoid secondary osteoarthritis.

Lee et al [7] reported good results for chronic bony mallet finger deformity after failed extension block pinning by using a modified pull-out wire suture technique with transarticular K-wire fixation. Wehbe and Schneider [4] reported that most mallet finger fractures can be treated conservatively, regardless of their size, joint subluxation, or amount of displacement of the bone fragment. Kalainov et al [8] reported 22 cases of nonsurgical treatment of mallet finger fractures that involved more than one-third of the articular surface. They were treated with continuous extension splinting of the DIP joint. All fractures healed.

There is a potential for these mallet-finger patients to develop degenerative joint change, a dorsal joint prominence, extensor lag, and/or swan-neck deformity, particularly in those with palmar subluxation of the distal phalanx. Subluxation of the DIP joint remains essentially unchanged from the pretreatment condition.

In our patient, the initial operative treatment with dorsal extension block pinning and volar flexion block pinning with percutaneous curettage at the fracture site failed. The fragment had been displaced and the DIP joint had become subluxated, indicated nonunion. The patient was then treated by splinting, and the fracture finally healed. In addition, the joint surface remodeled, and subluxation was reduced without degenerative change. We thus concluded that, even when operative treatment of a mallet fracture fails, it can be united with remodeling so long as the patient continues conservative treatment such as splinting.

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