Transtendinous Wiring of Mallet Finger Fractures Presenting Late

Hyun-Joo Lee, MD, In-Ho Jeon, MD, Poong-Taek Kim, MD, Chang-Wug Oh, MD, Maria Florencia Deslivia, MD, Suk-Joong Lee, MD

Purpose To determine if transtendinous wiring was an effective late treatment for bony mallet injuries.

Methods Between 2005 and 2011, 19 consecutive patients (13 men, 6 women) with a mean age of 29 years (range, 13−52 y) were treated late for mallet finger fractures. The mean interval from injury to initial operation was 57 days (range, 28−141 d).

Results Fifteen of 18 mallet fractures demonstrated evidence of radiographic healing after an average of 6 weeks (range, 5−10 wk). One patient developed ankylosis, and 3 patients failed to achieve bone union at the final follow-up. The mean motion of the distal interphalangeal joint was 73° (range, 35°−95°), and the mean extension lag was 7° (range, 0°−25°).

Conclusions Transtendinous wiring was an effective late treatment for mallet fractures, demonstrating satisfactory fixation, allowing early mobilization, and showing good functional results while avoiding salvage operations. *(J Hand Surg Am. 2014;39(12):2383−2389.*

Type of study/level of evidence Therapeutic IV.

Key words Mallet fracture, delayed presentation, transtendinous wiring.

Advocates for nonoperative treatment of mallet fractures recommend fabricating an orthosis, even for fractures with volar subluxation or delayed presentation.[1−3] However, surgery is often advised if the fracture involves more than one-third of the articular surface combined with subluxation.[4−7]

From the Kyungpook National University Hospital, Daegu; the Daegu Park Hospital, Daegu; the University of Ulsan, Asan Medical Center, Seoul; the Korea Institute of Science and Technology, Seoul; and the Gunsan Medical Center, Gunsan, South Korea.

Received for publication December 4, 2013; accepted in revised form July 10, 2014.

No benefits in any form have been received or will be received related directly or indirectly to the subject of this article.

This work was supported by the Global Frontier R&D Program on Human-Centered Interaction for Coexistence funded by the National Research Foundation of Korea grant funded by the Korean Government (MSIP) (NRF-M1AXA003-2010-0029748).

Corresponding author: In-Ho Jeon, MD, Department of Orthopaedic Surgery, Asan Medical Center, 88, Olympic-ro, 43-Gil, Songpa-gu, Seoul, South Korea 138-736; e-mail: jeonchoi@gmail.com.

0363-5023/14/3912-0005$36.00/0
http://dx.doi.org/10.1016/j.jhsa.2014.07.016

Even though closed reduction and an extension block K-wire technique is a popular treatment with a high success rate for early treatment,[8−12] there is a limited number of studies regarding late treatment. The extension block technique is challenging owing to difficulties in achieving percutaneous anatomical reduction in the presence of scar tissue[13] and in achieving fixation.

Sonoda et al[14] used a transtendinous wire technique to achieve bone to bone contact, which involved a direct approach to the fracture site and debridement of the fibrous tissue. The technique was developed in part to reduce surgical morbidity to the bone fragment, overlying skin, and nail germinal matrix. Our study aimed to determine if the surgical technique was effective when applied late.

MATERIALS AND METHODS

We retrospectively reviewed the records of 19 consecutive patients who received late surgical treatment between 2005 and 2011 for mallet finger fracture after

TABLE 1. Classification of Mallet Fractures (Wehbé and Schneider[1])

Classification	n
Type I (no joint subluxation)	11
Subtype A	2
Subtype B	9
Subtype C	0
Type II (subluxation of the joint)	8
Subtype A	0
Subtype B	7
Subtype C	1
Type III (physis of the distal phalanx involved)	0
Subtype A	0
Subtype B	0
Subtype C	0

Subtype A: dorsal fracture fragment less than one-third of the articular surface; subtype B: dorsal fracture fragment one-third to one-half of the articular surface; subtype C: dorsal fracture fragment greater than two-thirds of the articular surface.

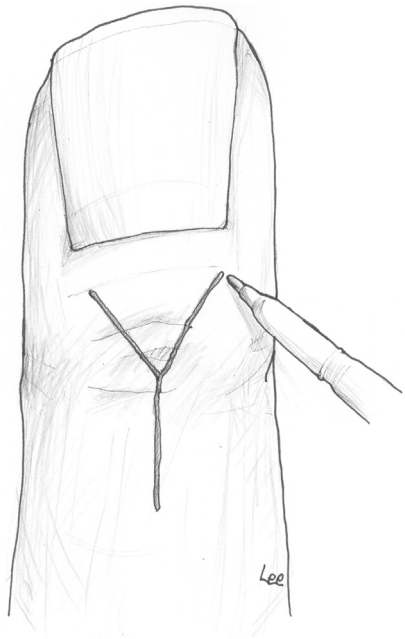

FIGURE 1: Y-shaped skin incision was made over the DIP joint.

an approval from our institutional review board. There were 13 men and 6 women with a mean age of 29 years (range, 13−52 y). There were 8 little fingers, 2 ring fingers, and 9 middle fingers. Nine were in the dominant hand. Seven injuries were sports related, 4 resulted from closing door injuries, 5 resulted from falls, and 3 resulted from fights.

The surgical indications were deformity and functional impairment due to a nonunited mallet fracture at least 4 weeks after injury and a dorsal fracture fragment that was greater than 30% of the articular joint surface as seen on lateral x-ray or with subluxation of the main distal phalanx fragment. We excluded any patients with open fractures or previous operation for mallet fracture. Two patients who complained about their extension lag were also included even though the dorsal fragments was less than 30% of the articular joint surface. Each fracture was classified according to the Wehbé and Schneider classification (Table 1).[1] The mean interval from injury to operation was 57 days (range, 28−141 d).

Surgical technique

The surgical procedure was similar to that described by Sonoda et al[14] and was performed under digital block anesthesia using a digital tourniquet. A dorsal Y-shaped incision was made at the distal interphalangeal (DIP) joint. The base of the Y was wide enough not to directly reach the nail bed (Fig. 1). The extensor tendon and the fracture fragment were then exposed. To avoid surgical trauma to the germinal matrix, the dissection was limited distally to within 1 cm of the fracture site.[5] The scar tissue around the nonunion was gently debrided to expose both fracture surfaces and articular cartilage. We then made a longitudinal incision on the digital pulp. Everting the proximal fragment, both ends of a 0.22-mm wire were passed through the extensor tendon at the junction between the terminal tendon and the fragment from deep to superficial (Fig. 2). We made a loop on the deep side of the extensor tendon and pulled out 2 ends of the metal wire through the extensor tendon without puncturing the proximal bony fragment, which remained attached to the extensor tendon. Using K-wires, we made drill holes obliquely through the distal phalanx at an angle between 45° and 60° to create passages for the metal wire distal to the insertion of the flexor digitorum profundus. The wires were then passed from dorsal/proximal to volar/distal with a starting point distal to the fracture defect and proximal to the nail fold. The wire ends were pulled through the volar cortex as the fragment was reduced. The fracture fragment was reduced and held with forceps as the wire was tightened on the volar side of the distal phalanx. The tip of the twisted wires was cut so that only two and one-half twists remained, and they were then bent flat onto the volar surface of the phalanx distal to the flexor digitorum profundus insertion (Fig. 3). A transarticular K-wire was then introduced to stabilize the DIP joint at extension. The indication for the transarticular K-wire