THE ISHIGURO EXTENSION BLOCK TECHNIQUE FOR THE TREATMENT OF MALLET FINGER FRACTURE: INDICATIONS AND CLINICAL RESULTS

L. PEGOLI, S. TOH, K. ARAI, A. FUKUDA, S. NISHIKAWA and I. G. VALLEJO

From the Department of Orthopaedic Surgery, Hirosaki University School of Medicine, Hirosaki, Aomori, Japan

The results of extension block Kirschner wire fixation for the treatment of mallet fractures of the distal phalanx were retrospectively assessed in 65 consecutive patients. The indications for this technique were the presence of a large bone fragment, and palmar subluxation or the loss of joint congruity of the distal interphalangeal joint. Using the Wehbe and Schneider classification there were 27 type IB, 19 type IIB, 17 type IA, and 2 type IIA fractures. According to the Crawford rating system there were 46% excellent, 32% good, 20% fair and 2% poor results. We believe that this technique, when properly applied, produces satisfactory results.


INTRODUCTION

The treatment options for mallet fractures of the distal phalanx range from splinting (Crawford, 1984), to surgical fixation using percutaneous pins (Kondo et al., 1998), pull-out wires (Damron and Engber, 1994), microscrews (Sakaue, 1986) or interosseous wires (Jupiter and Sheppard, 1987). Most of the surgical techniques have the disadvantages of open incisions and long rehabilitation times. While conservative treatment with splints is successful in most cases, many surgeons think that surgery should be considered when one third or more of the articular surface of the distal phalanx is involved.

This paper describes the results obtained using the extension block fixation technique which was first described by Ishiguro et al. (Ishiguro et al., 1997; Darder-Prats et al., 1998). The indications for this technique include the presence of a large bone fragment (Fig 1), palmar subluxation or loss of joint congruity of the distal interphalangeal joint or an extension lag of more than 30°. A relative indication is the presence of a fracture which is more than 5 weeks old, although the presence of a fracture which is more than 8 weeks old is a contraindication. In cases which present late we recommend that the fracture site is “freshened up” by percutaneous curettage with an 18 g needle.

PATIENTS AND METHODS

We were able to retrospectively review 65 of 76 consecutive patients, treated between June 1990 and February 2000. There were 45 men and 20 women, with an average age of 28 (range, 12–71) years. The right hand was involved in 45 cases and the left in 20. The involved digits were the little finger in 20 cases, the middle in 20, the ring in 15 and the index in 10. In 42 cases the initial injury was sustained during sporting activities, (14 in baseball, 11 basketball, four in each of volleyball, dodge ball, and softball, two in handball, and one each for soccer, squash and rugby). The other 23 cases occurred as a result of a fall, an injury or a fight. According to Wehbe and Schneider’s (1984) classification, which is based on the degree of subluxation of the distal phalanx and the size and displacement of the fracture fragment, there were 27 type IB, 19 type IIB, 17 type IA and 2 type IIA fractures.

Surgical Technique

Under digital or metacarpal block anesthesia, the distal and the proximal interphalangeal joints are held in maximum flexion (Fig 2). Using fluoroscopic imaging, a Kirschner wire is then inserted percutaneously through the terminal extensor tendon into the middle phalanx, 1–2 mm dorsal and proximal to the fracture fragment (Fig 3). The distal phalanx is then pulled distally and extended in order to reduce the fracture. Next the distal interphalangeal joint is immobilized with a second, oblique percutaneous Kirschner wire which runs palmar to the fracture. Following satisfactory fixation, the extension block wire is bent palmarly, so as to apply a compression force to the fracture site. A splint is then applied which maintains the distal interphalangeal joint in 30–40° flexion. Both wires are removed after 4–6
weeks, once there is radiological evidence of healing (Fig 3).

RESULTS

The average follow-up for all cases was 69 (range, 12–539) weeks. The Kirschner wires were removed after an average of 36 (range, 15–65) days. In one patient the wires were removed early (15 days) due to an infection. A palmar splint was worn at night to immobilize the distal interphalangeal joint for an average of a further 27 days (range, 3–68) in 21 of the 65 patients. This was used to correct flexion contractures of the distal interphalangeal joint.

According to Crawford’s evaluation criteria (1984), we obtained 30 excellent, 21 good, 13 fair and one poor result. The 13 fair results occurred following an initial poor reduction of the fracture which caused a diminished range of motion. The poor result was due to an angular deformity and a nail deformity.

A pin tract infection occurred in one finger and nail deformities occurred in two cases. However, one of these two nail deformities had resolved by the final follow-up.

Table 1—Crawford’s evaluation criteria (1984)

<table>
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<tr>
<th>Grade</th>
<th>Description</th>
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<tbody>
<tr>
<td>Excellent</td>
<td>full DIP joint extension, full flexion, no pain</td>
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<tr>
<td>Good</td>
<td>0° to 10° of extension deficit, full flexion, no pain</td>
</tr>
<tr>
<td>Fair</td>
<td>10° to 25° of extension deficit, any flexion loss, no pain</td>
</tr>
<tr>
<td>Poor</td>
<td>more than 25° of extension deficit, or persistent pain</td>
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DIP: distal interphalangeal.
5 years after the operation. The other nail deformity case was lost to follow up after 3 months.

Only six cases were treated more than 5 weeks following the initial injury, which was considered a relative contraindication for this procedure by the original author (Ishiguro et al., 1997). Three of these patients were treated after 6 weeks, two after 7 weeks and one after 8 weeks and three fair, two good and one excellent result were obtained.

**DISCUSSION**

The ideal treatment for a mallet finger fracture which involves more than one third of the articular surface remains controversial. We have found that the extension block technique is effective and minimally invasive, and it does not disrupt the remaining extensor mechanism. It is also a relatively easy to achieve an adequate reduction and good fixation under image intensification and it is a quicker than most open surgical procedures (Ishiguro et al., 1997). Furthermore, it allows an earlier mobilization of the involved joint (as soon as the pins are removed), making it a more suitable procedure for athletes or patients who require early use of the hand.

Potential disadvantages include articular cartilage damage leading to secondary osteoarthritis, especially if more than one attempt at pin insertion is needed. Also, delayed bone union and redislocation can occur if the initial reduction is not accurate (Ishiguro et al., 1997). Kang et al. (2001) reported that 41% of surgically treated mallet fractures developed postoperative complications such as marginal skin necrosis, recurrent extension lags, permanent nail deformities, and infections.

We consider that our 5% complication rate is acceptable, especially when the number of excellent and good results is considered.

This procedure is best used in acute injuries, but can also be used for cases, which present up to 5 weeks after injury. In more chronic cases, we consider that curettage should be performed percutaneously with an 18 g needle to freshen up the fracture site, after which this technique of fixation can be used. Satisfactory results were achieved in the six patients treated in this manner.

**References**


