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Surgical technique

Derotation of the mallet piece: A crucial point in mallet fracture surgery

Dérotation du fragment osseux d'un doigt en maillet : un point crucial dans la chirurgie de la mallet-fracture

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ABSTRACT

Mallet fracture is an avulsion of the extensor tendon and fracture of the dorsal rim of the articular surface of distal phalanx at the same time. If a part of the mallet fracture is angled or rotated to such a degree that prevents full anatomic reduction, malunion and deformities may occur as a result. The objective of this study was to describe a new surgical technique to provide derotation of the mallet fracture. A 22G or 21G needle is used like a joystick to reduce the mallet fracture with small, gentle movements. The extension block pinning technique described by Ishiguro was applied after proper alignment had been achieved. Bony union was achieved for all patients 6 weeks later. Derotation of type 2 and 3 mallet pieces with closed reduction to prevent surgical failure is simple but effective.

RÉSUMÉ

La mallet-fracture est l'avulsion du tendon extenseur et la fracture simultanée du rebord dorsal de la surface articulaire de la phalange distale. Si le fragment osseux de la mallet-fracture est incliné ou tourné d'un degré qui empêche la réduction anatomique complète, il peut en résulter un cal vicieux et une déformation. L'objectif dans cette étude était de décrire une nouvelle technique chirurgicale permettant la dérotation de la mallet-fracture. Une aiguille de 22G ou 21G est utilisée. L'aiguille est utilisée comme un joystick pour réduire la mallet-fracture avec des mouvements doux et légers. La technique de bloc d'extension décrite par Ishiguro a été appliquée après alignement correct. La consolidation a été obtenue pour tous les patients six semaines plus tard. La dérotation du fragment osseux dans les mallet-fractures de type 2 et 3 avec réduction à foyer fermé est simple mais efficace pour prévenir l'échec de la chirurgie.

1. Introduction

Mallet finger is a disruption of a digit's extensor mechanism from the base of distal phalanx. Mallet fracture is an avulsion of the extensor tendon and fracture of the dorsal rim of the articular surface of distal phalanx at the same time [1]. Mallet deformity results from damage to either the extensor tendon or the tendon and bone together. If a mallet finger deformity is neglected, swan neck deformity and extension lag may develop [2].

We named the osseous part and extensor portion of the mallet fracture as the "mallet piece". If the mallet piece is angled or rotated to such a degree that it prevents full anatomic reduction, malunion and deformities may occur. Treatment must reduce and derotate the mallet piece.

Treatment options are divided into two groups: conservative or surgical. There are many surgical techniques like distal interphalangeal (DIP) joint pinning, compression pin fixation, tension band

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Fig. 1. Anteroposterior (a) and lateral (b) views of bony mallet fractures with rotation of bony part.

wiring, screw fixation or extension block pinning to reduce the fracture, but the rotated mallet piece is always ignored.

Our objective in this study was to describe a new surgical technique to derotate the mallet piece.

2. Surgical technique

We used this technique for acute bony mallet fractures in which the bony fragment and extensor tendon are rotated. Surgical indications included fractures involving more than one third of the articular surface and fractures with irreducible subluxation of the distal phalanx. Anteroposterior and lateral radiographs of the injured digit were obtained preoperatively to determine the articular fragment size and subluxation. We used the Wehbé and Schneider classification based on subluxation and articular fragment size on lateral radiographs. We operated on types 2b and 2c [2] (Fig. 1 and Table 1).

All surgical procedures were performed with a digital nerve block by the same surgeon (CT). First-generation cephalosporin (1 g cefazolin) was given 1 hour preoperatively. Using fluoroscopic imaging and the preoperative radiographs, we carefully investigated whether or not the mallet piece was rotated (Fig. 2a).

A 22G black or 21G green needle was used. The tip of the needle was located at the center of the mallet piece with continuous C-arm fluoroscopy images (Fig. 2b). The needle was used like a joystick to reset the mallet piece with small, gentle movements. All movements were performed under fluoroscopy guidance. The mallet piece was replaced at its original site while paying attention to rotation. After checking proper alignment of the mallet piece, we continued surgery as defined by Tetik et al. [3] because indirect anatomic reduction of fractured fragments as described by Ishiguro et al. [4] may cause a few degrees of extensor lag and terminal tendon tightening.

Reduction was obtained with the distal phalanx in maximum flexion. A 0.8 or 1 mm K-wire was inserted just proximal to the fractured fragment. The distal and proximal interphalangeal joints were held in maximum flexion as in Ishiguro's original technique [4]. Then the K-wire was angled 45 degrees distal to proximal and dorsal to volar direction towards the bony fragment. At the

Table 1
Wehbe and Schneider classification for mallet finger; DIP: distal interphalangeal.

Type of the fracture	Description
I	No DIP joint subluxation
II	DIP joint subluxation
III	Epiphyseal & physeal injuries

Fragment size	Articular involvement
A, %	< 33
B, %	33–66
C, %	> 66

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