

—Report on Experiments and Clinical Cases—

A Report of Two Cases of Volar and Dorsal Fractures
of the Middle Phalanx Caused by a BasketballRyouichi Murashige¹, Yoshihito Nakayama¹, Kaoru Kobayashi¹, Shinji Uesaka¹
Kouichi Tanaka¹, Hiromoto Ito², Takuya Sawaizumi² and Kiyoshi Yoshihara²¹Department of Orthopaedic Surgery, Nippon Medical School Second Hospital²Department of Orthopaedic Surgery, Nippon Medical School**Abstract**

We present two rare cases of volar and dorsal fractures of the middle phalanx at the proximal interphalangeal joint (PIPJ). The first case was a 16-year-old girl. She hurt her middle finger while playing basketball. A lateral radiograph revealed volar and dorsal fractures of the middle phalanx. She underwent external immobilization of the PIPJ in 30° of flexion with a splint for 3 weeks. The fractures healed 7 weeks after the injury with neither tenderness nor limitation of range of motion. The second case was a 16-year-old boy. He injured his index finger while playing basketball, and underwent immobilization of the PIPJ for 3 weeks. At 10 weeks after the injury, the dorsal fracture was almost healed, but the displacement of the volar fragment had worsened. At a 3-year follow-up, the dorsal fragment was healed, but the volar fragment remained in a site of nonunion. However, there was neither residual deformity nor restriction of movement. (J Nippon Med Sch 2002; 69: 376–378)

Key words: sports injury, finger fracture, middle phalanx, children

Introduction

The injuries sustained during ball games are frequently seen in the upper limbs, especially in the interphalangeal joint¹. The most common type of injury in children is a fracture of the distal phalanx at the distal interphalangeal joint (DIPJ)^{2,3}. On the other hand, in ball games using a large-sized ball, middle phalanx fractures are occasionally caused by hyperextension of the proximal interphalangeal joint (PIPJ)⁴. However, such fractures usually occur on either the dorsal or volar side of the phalanx, and rarely occur simultaneously. We present two adolescent cases of volar and dorsal fractures of the middle phalanx, which occurred while playing basketball.

Case Report

Case 1: a 16-year-old girl

She was hurt during a game of basketball, and visited our hospital complaining of pain in the middle finger in August 1998. On physical examination, there was swelling and tenderness on both the volar and dorsal sides of the PIPJ. A lateral radiograph revealed volar and dorsal fractures of the middle phalanx, and the volar fragment was larger than the dorsal one (**Fig. 1 a**). She was treated by immobilization of the PIPJ in 30° of flexion with an aluminum splint. Three weeks after the injury, the dorsal fracture was almost healed, and a callus formation was observed on the volar fracture (**Fig. 1 b**). Subsequently, the splint was removed, and 7 weeks later, the

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Fig. 1 Case 1: a 16-year-old girl
Volar and dorsal fractures were observed in the middle phalanx at the PIPJ.
a: at the time of injury, b: 3 weeks after injury, c: 7 weeks after injury



Fig. 2 Case 2: a 16-year-old boy
Salter-Harris type III fractures were observed in the middle phalanx on the volar and dorsal sides of the epiphysis.
a: at the time of injury, b: 10 weeks after injury, c: 3 years after injury

volar and dorsal fractures had healed with neither tenderness nor limitation of range of motion (**Fig. 1c**).

Case 2: a 16-year-old boy

He was injured while playing basketball and came to our hospital complaining of index finger pain in March 1995. There was tenderness on both the volar and dorsal sides of the PIPJ. Plain radiographs showed Salter-Harris type III injuries of the volar and dorsal sides of the epiphysis (**Fig. 2a**). He was treated by a 3-week immobilization of the PIPJ in 30° of flexion with a splint. The dorsal fracture

was almost healed 10 weeks after the injury, but the displacement of the volar fragment had worsened, compared with radiographic findings at the time of the injury (**Fig. 2b**). However, there was neither tenderness nor limitation of range of motion. Three years after the injury, a lateral radiograph showed a complete epiphyseal closure of the middle phalanx. The dorsal fragment had healed, but the volar fragment remained in a state of nonunion (**Fig. 2c**). However, there was neither residual deformity nor restriction of movement.

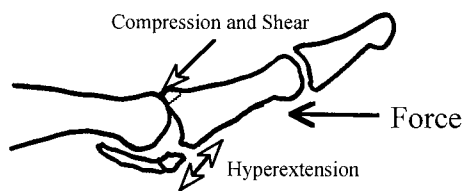


Fig. 3 The mechanism of injury

Discussion

Fischer et al.⁵ reviewed the patterns of finger injury in 1,021 children, and reported that 75% of middle phalangeal fractures occurred between 12 and 16 years old, and that the Salter-Harris type III injury was more common in the PIPJ than in other joints. They also stated that volar and dorsal fractures of the middle phalanx were seen in only 3 cases (0.3%) and that this uncommon fracture had not been previously reported. Additionally, as presented in our cases, because the dorsal fragment tends to be smaller than the volar one, it is important not to miss the dorsal fracture in X-ray diagnosis.

The exact mechanism of injury in our cases is unknown. We believe that when catching a ball, the PIPJ may be forcibly extended as shown in **Fig. 3**. In our cases, tension stress is concentrated along the volar aspect of the PIPJ, resulting in the volar fracture of the middle phalanx. Additionally, forcible compression and shear stresses against the dorsum may cause the dorsal fracture of the middle phalanx.

Anatomically, the interphalangeal joint itself is small. A prolonged soft tissue swelling often leads to a limitation of range of motion. Therefore, early and proper fixation of the fracture is needed for a rapid reduction of the swelling. Many authors⁷⁻⁹ have described that the majority of finger fractures, except for highly displaced fractures and fracture-

dislocations, can be treated successfully by conservative methods. Thus, in our cases, an aluminum splint was used for fixation of the fractures.

With respect to fixation position, priority was given to repairing the volar plate mechanism, so the PIPJ was immobilized in 30° of flexion for 3 weeks. In case 1, the volar and dorsal fractures healed completely. However, in case 2, the volar fracture failed to heal, but there was no functional deficit. These results suggest that in most cases with both volar and dorsal fractures, a good outcome can be expected by simple closed methods.

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