

## Extra-articular Avulsion Fracture of the Distal Phalanx of the Ring Finger – a case report

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This report describes a rare case of extra-articular avulsion fracture of the flexor digitorum profundus tendon in a 59-year-old man is reported. A large avulsed fragment of bone was localized by radiography on the volar side of the middle phalanx. The avulsed bone fragment had torn the A4 pulley and had been caught by the C2 pulley. The fracture was extra-articular. The avulsed fragment was fixed using a fragment fixation screw. This case was classified as a subtype of type 3 according to Leddy's classification. Only 10 cases of type 3 injury have been reported, and none of them clearly involved an extra-articular fracture.

**Key words :** Extra-articular fracture, Avulsion fracture, Subcutaneous rupture, FDP tendon, Distal phalanx

### INTRODUCTION

Avulsion fracture involving the FDP tendon is a relatively rare injury. Generally, in avulsion fracture of the distal phalanx, which results from forced extension of a finger with maximal flexion at the DIP joint, a fragment of bone together with the volar plate becomes avulsed by the FDP tendon, and the resulting fracture is usually intra-articular. Therefore, an extra-articular avulsion fracture can be considered highly unusual. Here we report a case of extra-articular digital phalanx avulsion fracture in which a large fragment of the phalangeal shaft was avulsed to the volar side by the FDP tendon.

### CASE

The patient was a 59-year-old man who presented with pain and flexion disturbance in the right ring finger. The injury had occurred on June 27, 1998, when he had experienced giddiness on standing up and, as a result, he was forced to grasp his wife's pyjamas to prevent himself from falling. Because of the pain and limited motion in the affected finger, which became apparent immediately after the accident, he consulted the nearest hospital on the following day,

where a diagnosis of avulsion fracture of the distal phalanx of the right ring finger had been made. He was referred to our hospital on July 17.

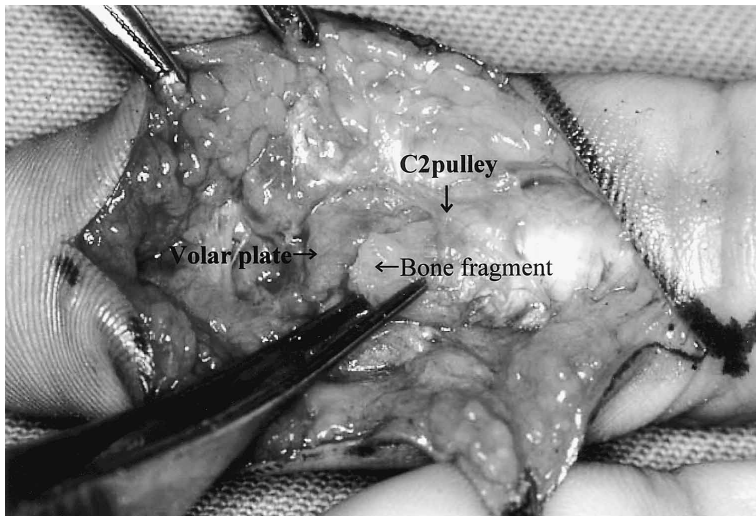
Initial examination revealed slight swelling and tenderness on the volar side of the middle portion of the right ring finger. The active range of motion was 0 degree extension and complete inability of flexion, and 0 degree extension and 45 degrees flexion at the distal interphalangeal (DIP) and proximal interphalangeal (PIP) joints, respectively; thus, the range was evidently limited.

Lateral radiographs taken at the time of initial examination revealed an avulsed fragment of bone, 11 × 6 mm in size, lying on the volar side at the level of the middle phalanx. A bone missing the same size of fragment was found on the volar side of the phalangeal shaft (Fig. 1). Based on a diagnosis of avulsion fracture due to the FDP tendon of the ring finger, surgery was performed on July 19, 1998.

Operative findings: The avulsed fragment of bone, which had torn the A4 pulley and had been caught by the C2 pulley band, was exposed through a volar zigzag incision in the right ring finger (Fig. 2). After distal traction of the bone fragment, the fragment



**Fig. 1** A lateral radiograph at the first examination shows a bony fragment 11 × 6 mm in size on the volar side of the right ring finger middle phalanx.

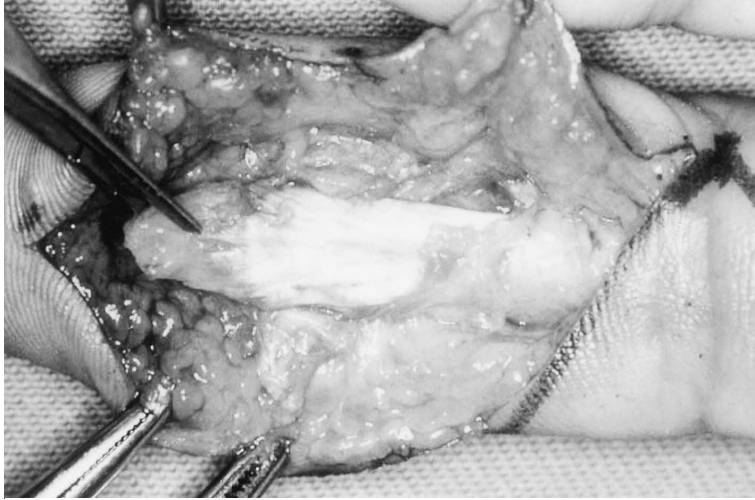


**Fig. 2** An avulsed bony fragment is attached to the C2 pulley together with avulsion of the A4 pulley.

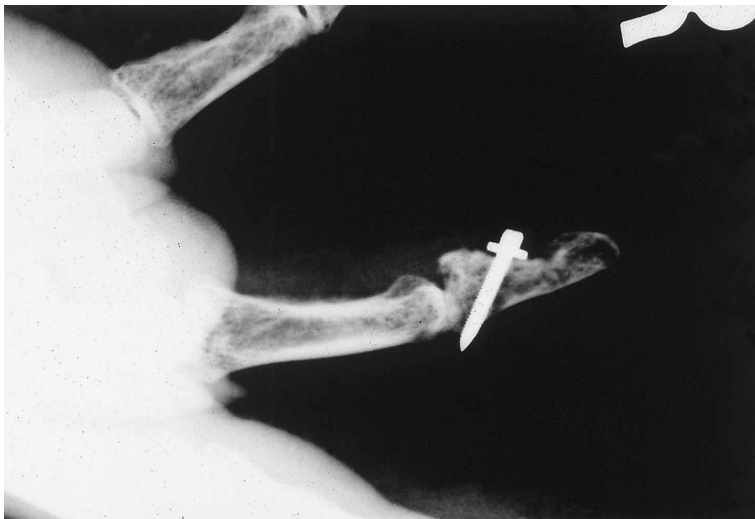
and the FDP tendon end were extracted (Fig. 3). The diagnosis of the extra-articular fracture was confirmed by examination of the fracture fragment, which lay on the volar side of the distal phalanx shaft. The volar plate remained intact and in the original location. Additionally, the FDP tendon was attached to the whole volar side of the bone fragment, and was not torn at its insertion. After curettage of the fractured surfaces, the

fracture was reduced with fragment fixation screws and the bone fragment was fixed in a direction which formed a sharp angle with the direction of the FDP tendon (Fig. 4). The hand was fixed in a “boxing glove” position, with a compression bandage.

Two weeks after the operation, active motion exercise was started. One year and 5 months after the surgery, the range of motion at the DIP joint extended from 0 to



**Fig. 3** Distal traction of the bony fragment has dragged out the fragment together with the flexor digitorum profundus tendon.



**Fig. 4** The bony fragment was repositioned and then fixed with a fragment fixation screw at an acute angle to the line of the flexor digitorum profundus tendon.

80 degrees. Complete fracture consolidation, observed on radiograms, was achieved 8 weeks after surgery.

#### DISCUSSION

Subcutaneous rupture of the FDP tendon is a relatively rare injury, comprising only 3-5% of all injuries to the flexor tendons. The fracture in our patient was the least frequency reported among all previous cases of subcutaneous FDP tendon avulsion and was

extra-articular. Leddy [5-7] proposed the classification of subcutaneous FDP tendon avulsion into 3 types according to the form of avulsion. In type 1, the avulsed tendon end without a bone fragment has retracted into the palm; in type 2, the avulsed tendon end lies at the level of the proximal interphalangeal joint; and in type 3, because a fragment of bone has been avulsed at the FDP tendon insertion, the tendon is unable to pass the A4 pulley. Smith [11] proposed

an additional type of FDP tendon avulsion injury (type 4), in which the profundus tendon has also been ablated from the fracture fragment; this was formerly included in type 3 of Leddy's classification. Our patient presented with a fracture in which the bone fragment had torn the A4 pulley and lay distally at the level of the C2 pulley. This fracture could not be precisely matched to any of Leddy's classification types, and was considered to be a subtype of type 3. Moreover, the fracture was extra-articular and the volar plate was not accompanied by a bone fragment. Excluding Leddy's reports, which did not show the number of patients classified into the type 3 group, there have been only 10 cases of this rare type 3 injury reported previously [1-4, 9-10].

Additionally, in almost all reported cases of type 3 avulsion injury, the fracture was intra-articular, and none of the reports clearly described an extra-articular avulsion fracture without volar plate disruption.

Regarding the mechanism of avulsion of the FDP tendon in the present case, the injury occurred when the ring finger of the patient flicked backwards when it was caught in the upper clothing of his wife. The patient attempted to flex his finger at the DIP joint, but contrary to his intention the finger became hyperextended. In other words, this injury could be included in the category of "jersey injuries" [8]. Although the reason why it became a type 3 avulsion fracture is unclear, the magnitude and velocity of the external force may have been involved in the injury mechanism.

With regard to treatment methods, avulsion fracture of the FDP tendon requires open reduction as early as possible, since

complaints such as pain and limited range of motion are persistent. Fixation by screws or wires is the usually recommended surgical remedy. In our patient, a fragment fixation screw was used, and in order to obtain a rigid fixation force and facilitate early rehabilitation, the screw was placed at a sharp angle to the direction of the FDP tendon. A favorable outcome was obtained and the method was considered useful.

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