

Closed Rupture of Both Flexor Digitorum Profundus and Superficialis Tendons of the Small Finger in Zone II: Case Report

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We report a rare case of closed rupture of both flexor digitorum profundus (FDP) and flexor digitorum superficialis tendons in zone II in the small finger. We performed delayed, primary end-to-end suture of the FDP and excision of the flexor digitorum superficialis, because myostatic contracture of the FDP tendon was not severe and the FDP tendon remnants were not frayed. (*J Hand Surg* 2011;36A:121–124. Copyright © 2011 by the American Society for Surgery of the Hand. All rights reserved.)

Key words Closed flexor tendons rupture, flexor digitorum profundus and superficialis, zone II.

THE FLEXOR TENDONS of the hand generally do not rupture, unless weakened by a pathologic condition such as rheumatoid arthritis (RA),¹ gout,² old fracture,^{3–6} Kienböck's disease,⁷ or tumor.⁸ Because normal tendon has strong collagen fiber cross-links, the insertion, the musculotendinous junction, the muscle substance, or even the muscle origin will almost invariably give way before the tendon itself ruptures.⁹ According to a review article by Bois et al.,¹⁰ 80% of spontaneous flexor tendon ruptures occurred in zone III. In our literature review, only 3 cases of closed tendon substance ruptures of both flexor tendons in zone II were reported.^{11,12} We report a case of closed flexor tendon substance ruptures in zone II, involving both flexor digitorum profundus (FDP) and superficialis (FDS) tendons of the small finger. We performed delayed, primary end-to-end suture of the FDP and excision of the FDS, although in previous reports, 2-stage tendon grafting was performed.¹²

CASE REPORT

A 49-year-old, left-handed man was going up a flight of stairs when he fell, striking his left hand at the edge of a step. Immediately, his small finger became swollen. Because he could not flex either the distal interphalangeal or the proximal interphalangeal (PIP) joints, he was evaluated in the local orthopedic clinic and referred to our hospital 10 days after injury. Although there was diffuse swelling of the distal palmar crease, his small finger was not tender. He had no function of the FDP and FDS of the small finger (Fig. 1), but he had full passive range of motion.

Laboratory data did not indicate systemic disease. Radiographs of the hand and wrist were normal. We made a provisional diagnosis of FDS and FDP ruptures at the level of zone III due to the high frequency of spontaneous flexor tendon ruptures at that site.¹⁰ The patient was scheduled for tendon grafting or tendon transfer.

Surgical exploration was done 20 days after the injury. At the outlet of the carpal tunnel, at zone III, there was no tendon rupture. The proximal ends of the ruptured FDS and FDP, which had firmly adhered to the gliding floor and pulley, were identified under the A1 pulley. The distal end of the ruptured FDS, which was firmly adherent to the gliding floor and pulley, was identified under the distal A2 pulley. The distal end of the ruptured FDP, which appeared as though it had been

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FIGURE 1: Preoperative photograph showing loss of small finger flexion.

cut sharply, as with a knife, was not adherent to the A4 pulley and gliding floor and was under the proximal A4 pulley. The intratendinous ruptures had occurred in zone II (Fig. 2). A possible underlying cause for these ruptures was not found on gross inspection (Fig. 2). The A2 pulley was occupied with dense scar. Excision of the scar from under the A2 pulley resulted in a roughened gliding bed. Nevertheless, because myostatic contracture of FDP tendon was not severe and the FDP tendon remnants were not frayed, we decided to perform primary end-to-end suture of FDP by 6-strand core suture and peripheral epitendinous suture and resection of the FDS. We placed the sheath of the A2 pulley beneath the flexor tendon (Fig. 3).

One day after surgery, the patient was started on a controlled mobilization program using the modified Kleinert's method¹³ and Duran's method¹⁴ and "place and hold" flexion of the interphalangeal joint. Unprotected digital motion was allowed at 8 weeks. The patient returned to work at his preinjury level of activity 3 months later and has remained gainfully employed. Four months after the surgery, he gained active range of motion of (extension/flexion) 30°/80° hyperextension, 40°/85° loss of extension, and 5°/60° for the metacarpophalangeal, PIP, and distal interphalangeal joints, respectively. This patient was rated as good, using the



FIGURE 2: Surgical findings. The black arrow indicates the FDS proximal remnant. The black arrowhead indicates the FDS distal remnant. The white arrow indicates the FDP proximal remnant. The FDP distal remnant (white arrowhead) appears to have been cut sharply as with a knife. The A2 pulley sheath (between white arrow and black arrowhead) is occupied by dense scar.

Buck-Gramcko criteria, because a 40° loss of extension in the PIP joint remained (Figs. 4, 5).

DISCUSSION

Boyes et al.¹¹ examined 78 patients (80 ruptures) with closed flexor tendon ruptures collected over a 13-year period and described the incidence, etiology, mechanism of injury, expected site of rupture, and suggested treatment of this disorder. According to their report, in 68% (53/78) of the tendon ruptures, the ruptures were found at the insertion or the musculotendinous junction. In 32% (25/78), they occurred within the tendon substance. In 3% (2/78), both FDS and FDP ruptures occurred within the mid-segment of the digit, zone II. In our literature search, we found only one similar report of the double rupture of flexor tendons in zone II, reported by Matthews et al.¹² According to these case reports, the mechanisms of injury were direct blow, repeated blunt trauma, hyperextension force, and forced flexion against resistance. In our case, the possible

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