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## Clinical outcomes of operative repair of complete rupture of the proximal interphalangeal joint collateral ligament: Comparison with non-operative treatment<sup>☆</sup>

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### ABSTRACT

**Objectives:** The purpose of this study was to compare the outcomes of non-operative treatment and operative repair of grade III injuries with complete rupture of the collateral ligament of the proximal interphalangeal (PIP) joint.

**Patients and methods:** Seventeen patients with grade III injuries with at least 6 months of follow-up were included. Seven patients underwent non-operative treatment and 10 patients underwent operative treatment. We evaluated the following clinical outcomes after treatment: 1) range of motion of the PIP and distal interphalangeal (DIP) joints, 2) joint stability, 3) pain score, and 4) amount of fusiform deformity of the PIP joint.

**Results:** There was no instability in the lateral stress test in either group. The ranges of motion of the PIP and DIP joints were not statistically different between the two groups at final follow-up. However, the ranges of motion recovered more quickly in the operative group than the non-operative group within the first 3 months after treatment. Patients in the operative group had less pain and better cosmetic appearance of the PIP joint.

**Conclusion:** Our results suggest that operative repair of the PIP collateral ligament can provide good joint stability, rapid functional recovery, and minimize fusiform deformity of the PIP joint.

**Level of evidence:** Level III, Therapeutic study.

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### Introduction

Collateral ligament injury of the proximal interphalangeal (PIP) joint is a common injury encountered by orthopedic surgeons. The treatment goals of PIP joint collateral ligament injury are recovery of joint stability and achievement of normal ranges of motion. Patients also desire rapid functional recovery, limited pain during treatment, and good appearance of the PIP joint. The general consensus is that incomplete rupture of the PIP collateral ligament should not be treated operatively; however, for grade III injuries

with complete rupture of the ligament, treatment is more controversial. Non-operative treatment is often adopted even for complete rupture of the PIP collateral ligament.<sup>1–3</sup> However, some hand surgeons recommend operative repair for complete rupture of the PIP collateral ligament due to residual pain, instability, and weakness of pinch strength after non-operative treatment.<sup>4–7</sup> However, there is no convincing evidence that operative repair expedites healing or improves motion.<sup>2</sup> The purpose of this study was to evaluate clinical outcomes after operative repair of complete rupture of the PIP collateral ligament compared with those obtained by non-operative treatment.

<sup>☆</sup> Our institutional review board granted approval for this study (Konkuk University Medical Center IRB: KUH1060078).

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criteria were grade III collateral ligament injuries of the PIP joint with at least 6 months of follow-up. We defined grade III collateral ligament injury of the PIP joint as 1) patients who had no end point in a manual stress test of the PIP joint and 2) greater than  $20^\circ$  in the PA radiograph with lateral stress taken with the PIP joint at  $0^\circ$  of extension (Fig. 1).<sup>3–5</sup> We excluded patients with accompanying injury to the hand and wrist, or with diabetes, rheumatoid arthritis, or degenerative arthritis in the injured hand. Seventeen patients met our criteria, and all injuries were to the radial collateral ligaments. One hand fellowship-trained surgeon treated all patients. Among 17 patients, seven patients underwent non-operative treatment and 10 patients underwent operative repair. Patients' demographics are summarized in Table 1 according to treatment group.

#### Evaluation method and statistical analysis

We evaluated the following clinical outcomes after treatment: 1) range of motion of the PIP and distal interphalangeal (DIP) joints, 2) joint stability, 3) pain score, and 4) amount of fusiform deformity of the PIP joint. We measured the active ranges of motion of the PIP and DIP joints with a finger goniometer at 1, 2, 3, and 6 months after treatment. We assessed the stability of the PIP joint with a manual lateral stress test at final follow-up. Pain was assessed with a visual analog scale (VAS), where 0 indicated no pain and 10 the most severe pain. We assessed fusiform deformity of the PIP joint by measuring the difference between the maximal width of the same finger PIP joint on the contralateral hand and the injured PIP joint with electronic digital calipers (Woodcraft®, Parkersburg, WV, USA). We considered the maximal width as the distance from the



**Fig. 1.** Plain radiograph with lateral stress of the proximal interphalangeal (PIP) joint showing the angle between the axial line of the middle phalanx and proximal phalanx ( $\alpha$ ). This angle of more than  $20^\circ$  indicates a grade III lateral collateral ligament injury of the PIP joint.

**Table 1**  
Patients demographics.

	Non-operative group	Operative group
Number	7	10
Age (years)	26.7	26.7
Gender (M/F)	5/2	9/1
Volar plate avulsion (yes/no)	4/3	6/4
Injured finger		
Long	3	5
Ring	3	3
Little	1	2

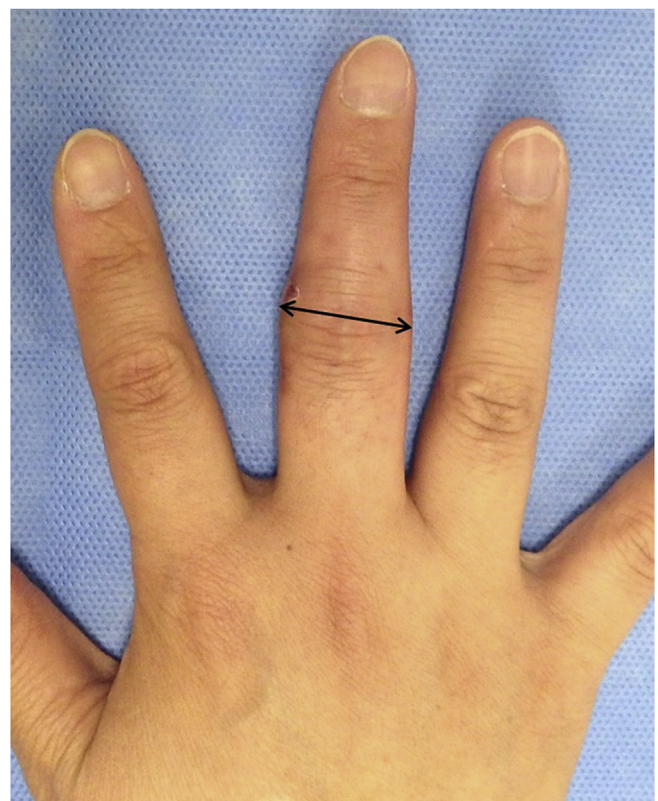
ulnar side apex to the radial side apex of the PIP joint (Fig. 2). One physician assistant, who was unaware of the radiographic results and independent of the treating surgeon, recorded VAS pain scores. She measured the maximal width of the PIP joint twice, and the average of two measurements was used to determine maximal PIP width. We used the Mann–Whitney U test to evaluate the significance of differences between the two groups. Statistical significance was accepted for P values of  $<0.05$ .

#### Non-operative treatment

The PIP joint of the injured finger was immobilized with a finger palmar splint for 1 week and was buddy-taped to the adjacent radial finger for an additional 3 weeks. Active mobilization of the finger began during buddy taping.

#### Operative repair

We made a midlateral skin incision of approximately 2 cm on the radial side of the PIP joint. The transverse retinacular ligament



**Fig. 2.** The maximal width of the proximal interphalangeal (PIP) joint was measured as the distance from the ulnar side apex to the radial side apex of the PIP joint.

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