Collateral Ligament Reconstruction of the Proximal Interphalangeal Joint

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Proximal interphalangeal joint collateral ligament injuries are common; however, chronic instability of this joint is rare. In such cases, however, there is no consensus on optimal management. Various repairs and reconstructions have been devised, although the literature on outcomes remains scant. We present a method of reconstruction of the proximal interphalangeal joint collateral ligament using a distally based slip of the flexor digitorum superficialis tendon. *(J Hand Surg Am. 2016;41(1):129–132. Copyright © 2016 by the American Society for Surgery of the Hand. All rights reserved.)*

Key words Collateral ligament, digitorum superficialis, distally based slip, proximal interphalangeal joint, reconstruction.

PROXIMAL INTERPHALANGEAL (PIP) joint collateral ligament injuries are common work- or sports-related injuries.[1] Injuries may range from sprains and partial tears to complete tears and result in pain, swelling, stiffness, and instability of the joint. Lasting instability of the PIP joint is rare; stiffness rather than instability is the more common outcome. Therefore, most surgeons would agree that acute partial and complete injuries can be managed nonoperatively with good results, although some report persistent dysfunction in these patients.[2] Short-term surgical management of these injuries by reattaching the collateral ligament has also yielded good results.[2–4] Chronic injuries may be amenable to repair, with outcomes noted to be excellent in 2 little finger PIP joints.[5] However, most chronic injuries are associated with degeneration, fibrosis, and shrinkage of the collateral ligament, which makes the tissue unsuitable for repair. In this case, collateral ligament reconstructions using a free tendon have been devised.[6,7] Mantovani et al[6] described passing a palmaris longus tendon autograft in a U-fashion through drill holes in the middle and proximal phalanges. They secured the reconstruction with 2 suture anchors on the contralateral side and reconstructed the accessory portion of the collateral with the remaining suture limb. Lee et al[7] described a 3-limbed reconstruction using a palmaris longus autograft secured with 3 suture anchors, but they reported on only 2 PIP joints. Lane[8] reported using both limbs of the flexor digitorum superficialis (FDS) passed through drill holes on the proximal phalanx to reconstruct the collateral ligament and volar plate with the entire FDS tendon, addressing volar plate and collateral insufficiency.

Drawing on described reconstructions of the central slip with a distally based slip of FDS,[9] we performed PIP collateral ligament reconstructions using a distally based slip of the FDS tendon routed through a drill hole in the base of the middle phalanx and secured with a single suture anchor.

We have found that this reconstruction offers advantages over previously described techniques. This technique avoids the need for a free tendon graft and additional incisions required for tendon harvest. Another advantage of the technique is that the FDS insertion serves as a strong anchor point distally. Having only one point of fixation with a suture anchor at the ligament origin site simplifies the reconstruction, minimizes potential points of failure, and requires fewer anchoring implants. The technique is versatile.

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Received for publication January 12, 2015; accepted in revised form October 15, 2015.

No benefits in any form have been received or will be received related directly or indirectly to the subject of this article.

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0363-5023/16/4101-0026$36.00/0
http://dx.doi.org/10.1016/j.jhsa.2015.10.007

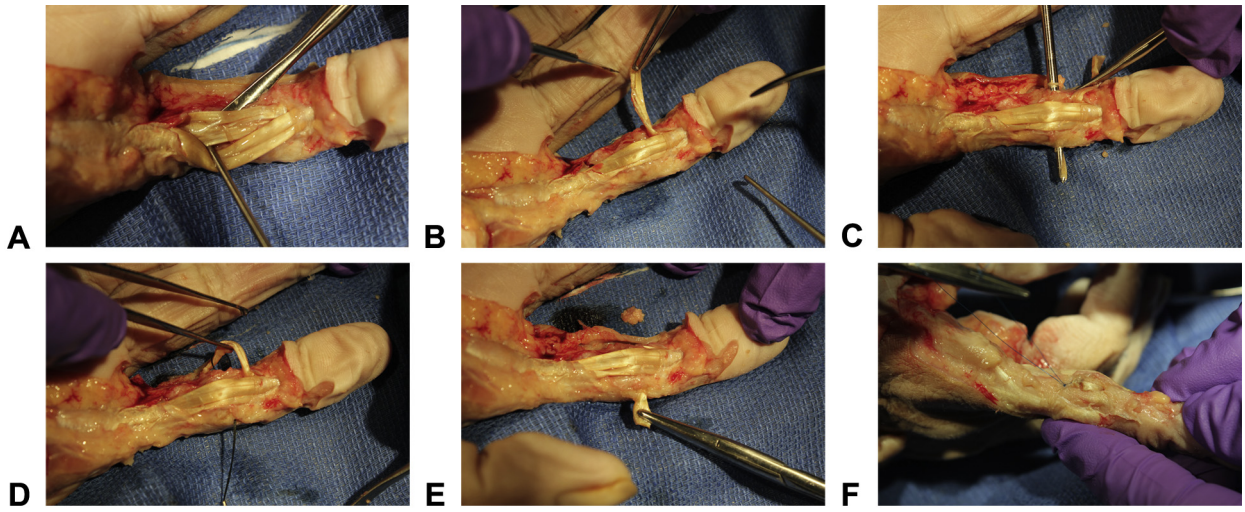

FIGURE 1: **A** After exposure between A2 and A4 pulleys, FDP is retracted, showing both FDS slips. **B** After proximal dissection, a 3- to 4-cm, distally based FDS slip is harvested on the side contralateral to the deficient ligament. **C** A drill hole is made at the base of the middle phalanx at the approximate insertion site of the ligament to be reconstructed. **D** The collateral ligament tendon is retrieved with a Hewson suture passer. **E** Appearance after the tendon is retrieved. **F** After anchor placement at the ligament origin, a horizontal mattress suture is used to complete ligament reconstruction.

Although we describe a midaxial approach, the technique can also be performed via a volar approach. Several fixation options are possible (suture anchor, interference screw, pull-out stitch, and local tissue). It is possible to combine the technique with silicone PIP arthroplasty, extending indications to include unstable joints with degenerative joint disease.

INDICATIONS AND CONTRAINDICATIONS

Indications for PIP collateral ligament reconstruction include chronic, symptomatic instability of any finger PIP joint resulting from collateral ligament deficiency that has otherwise failed nonoperative management with placement of an orthosis or immobilization. Static coronal plane deformity may be addressed as long as it is passively correctible. Contraindications to ligament reconstruction include advanced arthrosis, fixed joint deformity, instability owing to articular or bony deformity, or instability resulting from inflammatory conditions. In these situations arthrodesis is a viable option, although concurrent silicone implant arthroplasty and collateral ligament reconstruction may be an alternative.

SURGICAL ANATOMY

The PIP joint is a bicondylar hinge joint. It is stabilized on the radial and ulnar sides by a collateral ligament complex composed of proper and accessory portions. Cadaver studies have shown that the proper collateral ligament originates from a crescent-shaped area just dorsal and proximal to the concavity on either side of the head of the proximal phalanx. It travels longitudinally and also fans volarly to insert broadly on the lateral aspect of the middle phalanx base.[10] The accessory collateral ligament is a thin structure lying volar to the proper portion and inserting on the volar plate. The volar plate forms the floor of the joint. Superficial to the collateral ligament is the transverse retinacular ligament, a band of fascia joining the conjoint lateral band tendon and the flexor tendon sheath.

SURGICAL TECHNIQUE

A midaxial approach to the PIP joint is performed, centered on the side of the deficient collateral ligament. Inadequate quality or length of the collateral ligament to allow anatomic repair indicates irreparability of the collateral ligament. The remaining ligament is released to allow inspection of the joint. On the contralateral side of the joint, another midaxial incision is centered over the PIP joint. The neurovascular bundle is identified and protected. A window is made between the A2 and A4 pulleys. Both slips of the FDS tendon are identified (Fig. 1A). Dissection is carried proximally and distally to separate the slips. The FDS slip contralateral to the deficient collateral ligament is pulled distally and cut proximally, leaving a 3- to 4-cm distally based slip (Fig. 1B). An incision can be added between the A1 and A2 pulleys for additional tendon length if needed. The slip is retrieved distally. A hole is drilled transversely from the base of the middle phalanx at the insertion of the deficient collateral to the opposite