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Case Report

FDP Avulsion - A Simple Reliable Technique for Fixation

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Abstract

Flexor Digitorum Profundus injuries or 'Jersey finger' results from forceful hyperextension of DIPJ with the FDP in maximal contraction. This case report examines bilateral sequential FDP avulsion fractures and focuses on a novel surgical repair using a 1.3mm Synthes LC-DCP in a hook plate fashion which achieved anatomical reduction, healing and full return of function.

Our patient had excellent outcomes following his injury and subsequent surgery to near normal functional levels. Normal PIPJ range of motion and near normal DIPJ range of motion. He achieved a grip strength of 52kg in his dominant hand and reported minimal pain throughout the entire process.

Whilst the hook plate is not a new technique for hand-based avulsion injuries, suffering sequential bilateral FDP avulsions within seconds of each other was something not seen in the literature. The authors believe simple non comminated FDP avulsions can be treated successfully with simple hook plating alone and further fixation is not required.

Keywords: Flexor Digitorum Profundus; Avulsion; Jersey Finger; Hook Plate

Abbreviations

FDP: Flexor Digitorum Profundus; DIPJ: Distal Inter Phalangeal Joint; LC-DCP: Limited Contact Dynamic Compression Plate; PIPJ: Proximal Interphalangeal Joint

Introduction

Flexor digitorum profundus injuries or 'Jersey finger' results from forceful hyperextension of DIP joint with the FDP in maximal contraction; classic examples include patients injured by the sudden jerk of a rope, such as starting a lawnmower or restraining an animal. The tendon may rupture directly from its insertion into bone, or it may avulse bone fragments from the base of the distal phalanx. The ring finger is most often involved (75%) this is due to a weaker insertion and a common flexor muscle belly of the middle, ring, and little fingers [1].

This case report examines a bilateral sequential FDP avulsion fracture cause by the patient using the rip cord on a motor boat engine and focuses on a novel surgical repair using a 1.3mm Synthes LC-DCP in a hook plate fashion which achieved anatomical reduction, healing and full return of function.

Case Description

Our patient, a 41-year-old right-handed electrician, was attempting to start a boat engine using a ripcord, he initially used his right hand and during the starting motion had acute increased pain in his ring finger. Impulsively, he switched to using the left hand and again developed equivalent sharp pain. He presented with sequential bilateral ring finger FDP avulsions as shown in figure 1.

CT scans were obtained to identify any comminution and our patient had simple type III injuries (Leddy and Packer classification). The patient then underwent surgical fixation using a novel technique outlined below. The patient was then splinted for 6 weeks with consecutive hand therapy with active range of motion measurements during that period.

Novel surgical approach

Hook plate methodology for repair of structures throughout the body is well documented [2,3]. The decision to perform this tech-

nique was based on a simple type III fracture patterns and good patient anatomy.

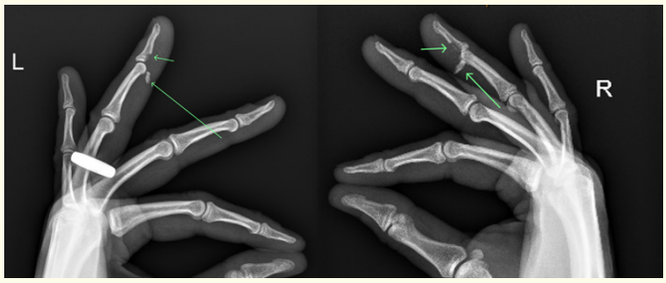

Figure 1: Demonstrating Bilateral FDP avulsions.

The patient underwent a general anaesthetic with additional regional analgesia. A volar Brunner approach was made and a digital nerve neurolysis was performed, the fragments were reduced with a small crab claw reduction forcep and reduction held with a size 1 nylon tie over, a Synthes 1.3mm LC-DCP plate was cut midhole and the ends bent to fashion a hook plate which was used for definitive fixation. Figure 2.

Figure 2: Demonstrating hook plate surgical fixation.

Small operative difficulties were mainly due to hook plate alignment which was assisted through the use of intraoperative image intensifier, furthermore grasping the bony fragment was challenging but certainly achievable.

At three months post fixation, union was demonstrated but the metal work of one finger was the distal screw was slightly too long and irritating the nail bed. There were no persistent nail deformities at follow up.

Patient outcomes

Our patient had excellent outcomes following his injury and subsequent surgery, as outlined in table 1. At the 3-month post op review our patient had Synthes LC-DCP range of motion and near normal DIPJ range of motion. He achieved a grip strength of 52kg in his dominant hand and reported minimal pain throughout the entire process.

AROM - extension/flexion		12 weeks post op
Right	DIPJ	5/70
	PIPJ	0/108
Left	DIPJ	22/56
	PIPJ	0/105

Table 1

Discussion

Traditional surgical approaches for this type of avulsion fracture have included K-wire fixation, cerclage wiring, pullout sutures and lag screws [3,4] describes the use or hook plates compared to dorsal blocking pinning in mallet injuries and showed hook plates had a functional advantage with an earlier return to work with less secondary degenerative changes. The disadvantages of a percutaneous pinning are due to less compression across the fracture whilst also hindering flexibility across a joint. Pull-out sutures offer precise application of a compressive force however, like K-wires, are susceptible to infection and often result in poor cosmetic outcome to the nail bed. Lag screws deliver a compressive force internally, this approach however is limited in small avulsion fractures as a substantial portion of healthy cortex is required to allow purchase. Additionally, a fragment width of at least three times the lag screw diameter is required to avoid further osseous fragmentation [5].

Jersy fingers are complicated by the pull of tendons, limited access and small size. Hook plates have emerged as an approach that address the above limitations through superior biomechanics. Whilst acting as a buttress, the Hook plate transfers the deforming pull of FDP into a perpendicular compressive force across the fracture line. The use of two hooks, as opposed to a single lag screw, spreads tensile forces across the fragment whilst being placed precisely under direct vision of the surgeon.

Conclusion

Whilst the hook plate is not a new technique for hand-based avulsion injuries we believe our patients story was one worth telling. Suffering sequential FDP avulsions within seconds of each other was something not seen in the literature and its bilateral nature highlights the need for swift management. Our patient had to

undergo a second surgery to remove metal work, and whilst this is undesirable, other case series have found that this solves most of the complications seen in hook plate use [6].

Fashioning the hook plate offers customisation to the individual's anatomy and is a viable option where prefabricated hook plates are not available. Where more than one screw is used, one should be cognisant of the risks posed by nail bed irritation distally and FDP tendon damage proximally. The authors believe simple non comminated FDP avulsions can be treated successfully with simple hook plating alone and further fixation is not required.

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