Idiopathic avulsion of the flexor pollicis longus: Case report and review of the literature

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Introduction

Atraumatic closed rupture of the flexor pollicis longus (FPL) tendon is uncommon. When it occurs, it is usually associated with a recognizable pathologic etiology. Cited contributing factors for FPL tendon rupture include rheumatoid arthritis [3, 9, 29], Colles' fracture [6, 21, 27, 39], exostosis of the distal radius [10], scaphoid exostosis [10, 26, 29], ulnar metacarpophalangeal joint sesamoid osteophyte [36, 37], interphalangeal sesamoid osteophyte [34], scaphoid nonunion [7, 18, 19, 28, 32, 35, 40, 42], Kienböck's disease [14], lunate silicone replacement degradation [5], intratendinous corticosteroid injection [30], retained glass fragments [13], migration of a retained foreign body [41], intratendinous tumor proliferation [16], and mucopolysaccharidosis [38].

Rarely, a cause for atraumatic FPL tendon rupture cannot be found. Boyes defined a spontaneous flexor tendon rupture as an intratendinous disruption, which occurs with normal axial loading in the absence of any identifiable underlying abnormality [3]. Seven cases of spontaneous rupture of the FPL have been reported [3, 12, 20, 25, 30]. Only one case of idiopathic avulsion of the FPL tendon insertion was found in the literature [33]. A second case of idiopathic FPL avulsion is described followed by a literature review of spontaneous FPL tendon rupture and idiopathic FPL tendon avulsion. For the sake of consistency, we will use the term spontaneous for intratendinous FPL ruptures previously reported as such in

the literature. Idiopathic will be used when discussing unexplainable FPL tendon avulsions.

Case report

A 65-year-old, healthy left-hand dominant male presented with a history that 1 day previously, while putting on his shoes, he felt a pop, in his right thumb. Following this episode, the patient was unable to bend his right thumb at the interphalangeal joint. He had no systemic illnesses such as inflammatory arthritis and denied previous injury to the thumb. The only past medical history relating to his right thumb was treatment in our office 8 years previously for a symptomatic trigger thumb. The right thumb had an injection of a 1:1 mixture of 0.5 % lidocaine and 10 mg of triamcinolone given retrograde into the flexor tendon sheath in the midline at the level of the A1 pulley. The patient received no additional injections in his thumb. His triggering symptoms resolved and never returned. Physical examination was consistent with rupture of the FPL of the right thumb. We recommended and performed surgical reinsertion. The FPL tendon sheath was exposed using a volar Bruner incision [4]. We found no tendon distally. No stump of the tendon remained at the FPL insertion site. This finding was consistent with a peel-off avulsion injury. A carpal tunnel incision was subsequently performed. The FPL tendon had retracted proximally into zone IV (Fig. 1). Small firm white nodules, macroscopically similar in appearance to intra-articular deposits following steroid injection, were embedded in the avulsed tendon end. We removed these nodules and sent them to pathology. The distal tendon had no fraying. The rest of the tendon appeared grossly normal with no evidence of tenosynovitis or attrition. The FPL tendon was drawn back distally through the intact pulleys and reattached using a pullout wire technique. The wires were passed through drill holes exiting

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distal to the lunula and tied over a padded button on the dorsum of the thumb. The repair was protected for 4 weeks in a thumb spica cast. The metacarpophalangeal (MP) and interphalangeal (IP) joints were in 25° of flexion, and the wrist was flexed 15°. We removed the pullout wire at 1 month. Gentle passive and active MP and IP flexion was initiated. A dorsal extension block splint was used for an additional 2 weeks to prevent active thumb extension. Unprotected digital mobilization began 6 weeks postoperatively. Eight months postoperatively, the patient had 35° of active flexion at the thumb interphalangeal joint and could extend to -3°. He was asymptomatic and resumed his normal activities with no functional deficit. The pathology report identified the histology of the debrided nodules as degraded/degenerated steroid with minimal inflammatory response (Fig. 2a, b).

Discussion

A literature review found seven cases of spontaneous intratendinous FPL rupture [3, 12, 20, 25, 30] (Table 1). Despite the fact the tendon insertion is a weaker link than the tendon in the musculoskeletal chain [3, 22], only one case of idiopathic FPL tendon avulsion has been reported [33]. This difference may in part explained by the vascular anatomy of the FPL tendon. Azar's study on the blood supply of the FPL tendon identified abundant pre-digital intratendinous vascularity and sparse intratendinous vascularization in the intradigital area [1]. It can be postulated that with aging, an

increase in the paucity of the vascular supply to the intradigital area combined with increased collagen degradation may increase the risk of spontaneous intratendinous FPL rupture. This theory is supported by the observation that six of the seven spontaneous FPL tendon ruptures reported in the literature occurred in patients over 60 years of age. Other than age, no other comorbidities were documented except in the case reported by Imai. This 74-year-old patient had complete paresis of her left upper extremity due to a perinatal brachial plexus injury. She conducted all activities of daily living solely with her right hand [12].

In three of the seven spontaneous FPL tendon ruptures and in our patient's idiopathic FPL tendon avulsion, an audible snap or pop occurred. When the sudden inability to flex the thumb is preceded by an audible snap or pop, the probable diagnosis is a ruptured FPL tendon. However, when this sign does not occur, both spontaneous FPL tendon rupture and idiopathic FPL tendon avulsion can simulate anterior interosseous nerve entrapment. Incomplete palsy of the anterior interosseous nerve should be considered to avoid surgical exploration of an intact FPL tendon. Electrodiagnostic testing

Fig. 1 Avulsed FPL tendon

Fig. 2 a, b Histology of nodules removed from the distal end of the avulsed FPL tendon showing degraded/degenerated steroid with minimal inflammatory response

Table 1 Spontaneous FPL ruptures

Author	Year	No. of cases	Age	Sex	Associated activity	Zone	Affected side	Dominant hand	Pop/snap sign
Boyes [3]	1960	1	32	Male	Pinching a clamp	II	?	?	?
O'Dwyer [25]	1989	3	61	Female	Flexing against resistance	II	Left	?	Yes
			62	Male	Tightening a nut	II	Left	?	Yes
			62	Male	Lifting a milk bottle	II	Left	?	No
McLain [20]	1994	1	65	Male	Shoveling dirt	III	Right	Right	No
Taras [30]	1995	1	62	Female	Opening a filing drawer	II	Right	Right	Yes
Imai [12]	2004	1	74	Female	Washing face	III	Right	Right	No

[11], MRI scanning [8], and sonography [15] have all been used to differentiate between these conditions. Less costly are the simple reproducible clinical tests described by Melton [23] and Mody [24] to assess the continuity of the FPL tendon. Both tests utilize the tenodesis effect to confirm the presence or absence of an FPL tendon rupture.

Bois following his review of spontaneous flexor tendon ruptures of the hand concluded the etiology of spontaneous ruptures is probably not the result of one specific cause. Rather, it is most likely multifactorial, resulting from a combination of abnormalities such as vascular and anatomic variations and anomalies, repetitive stress, genetics, and other yet unidentifiable predisposing factors [2]. O'Dwyer who reported the largest series of spontaneous FPL tendon ruptures felt a spontaneous rupture is theoretically impossible. Believing a pathologic process must exist but cannot be identified, he

suggested a more appropriate term would be idiopathic rupture [25].

The only idiopathic FPL tendon avulsion reported in the literature occurred in a 52-year-old healthy female [33]. The FPL tendon avulsion occurred, while the patient was lifting a large box. Initially undergoing acupuncture, she presented to the authors 3 months after the FPL avulsion occurred. The avulsed tendon had retracted to zone IV. This was analogous to the Leddy and Packer type 1 avulsion injury of the flexor digitorum profundus [17]. Tendon reinsertion within 7 to 10 days for this type of injury minimizes the development of tendon necrosis and contracture. Both conditions were present in this delayed case, necessitating a “stepwise” lengthening of the FPL tendon to effect a successful repair. Ten months postoperatively, the patient's IP motion was limited to 20°.

In our case of idiopathic FPL tendon avulsion, the gross and histopathological findings suggested a possible causal relation between the corticosteroid from the previously injected trigger thumb and the subsequent FPL tendon avulsion. Intraoperatively, small white nodules were visualized, grossly similar in appearance to postinjection intra-articular or carpal tunnel corticosteroid deposits. They were at the distal end of the avulsed tendon. The pathology report concluded these deposits were histologically consistent with degraded/degenerated steroid. Webb reported a delayed case of intratendinous FPL rupture 7 years after a single triamcinolone injection for a triggering nodule in the thumb [37]. These authors, however, were able to identify an osteophyte of the ulnar sesamoid as an extrinsic cause of FPL tendon attrition. Taras et al. described a case of spontaneous FPL tendon rupture 4 years after two corticosteroid injections for a symptomatic trigger thumb [30]. These authors felt the steroid had no direct relationship to the rupture because of the long duration between the injections and the rupture. They did, however, opine it was conceivable an intratendinous corticosteroid injection may have contributed to collagen necrosis.

In order to identify the delivery site of steroid solution used to treat trigger digits, Taras et al. added radiopaque dye to the injection medium of 52 patients [31]. Using the standard

Fig. 3 **a, b** Confirmation of injection by X-ray. A contrast agent was added to the steroid injection to determine true delivery of the medication. **a** All the injection is within the tendon sheath. **b** Mixed dispersion of the injection into both the tendon sheath and the subcutaneous tissues (from [31], with permission)

palmar retrograde injection technique, they demonstrated in some patients, the treatment solution travelled all the way to the tendon insertion (Fig. 3a, b). Our identification of corticosteroid at the distal insertion of the flexor pollicis longus tendon following trigger thumb injection mirrored these findings. None of the other six reported spontaneous FPL tendon ruptures or the sole reported spontaneous FPL tendon avulsion documented a prior corticosteroid injection into the thumb.

All seven of the spontaneous FPL tendon ruptures as well as the sole reported idiopathic FPL tendon avulsion occurred following activities that did not require much force. Similarly, in our patient, the force associated with donning a shoe was not significant. Certainly, not of sufficient magnitude that it could be the primary cause of our patient's FPL tendon avulsion. The deposition of corticosteroid at the distal FPL tendon insertion in our patient may have contributed to its attrition over time. We believe, however, the 8-year delay makes it improbable that the corticosteroid was solely responsible for this FPL rupture. The patient was the owner of several funeral homes. He admitted to not wearing gloves while working with embalming fluids. Constant hand exposure to formaldehyde, methanol, and other solvents found in embalming fluids was considered as another possible contributing factor to the FPL avulsion. We could find no literature to support this theory. We agree with Bois and O'Dwyer that a combination of unidentified underlying factors probably contributed to this idiopathic FPL tendon avulsion.

Conflict of Interest IJB declares that he has no conflict of interest, commercial associations, or intent of financial gain regarding this article. JTB declares that he has no conflict of interest, commercial associations, or intent of financial gain regarding this article.

This article does not contain any studies with human or animal subjects. No patient identifying information was included in this article.

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