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Case Report

Extensor indicis proprius to extensor pollicis longus transfer in spontaneous rupture of extensor pollicis longus following non displaced fracture distal end radius

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ABSTRACT

Exact incidence of extensor pollicis longus (EPL) ruptures following distal radius fracture is not known. Peculiarly it's common in nondisplaced fracture of the distal radius with an incidence of EPL rupture of 0.2-5%. Cortical irregularities from distal radius fractures or osteophytes easily abrade the tendon, causing gradual attrition and ultimately rupture. Compromised blood supply is also related to EPL rupture which is supported by microcirculatory anatomic studies. We present a case of 49 year old female who presented with spontaneous rupture of the EPL following a nondisplaced fracture of the distal radius managed by extensor indicis proprius (EIP) transfer. EIP transfer gives promising outcome. Optimum tension of the tendon is crucial for good functional outcome. We recommend suturing the tendon with thumb in extension and wrist in neutral position for optimum tension of tendon to avoid extensor lag and to prevent loss of IP flexion.

Keywords: EPL rupture, EIP transfer, Non displaced distal radius fracture, Tendon tensioning, Thumb extension lag

INTRODUCTION

Spontaneous rupture of the EPL tendon is a rare problem following distal radius fracture and also the literature on this subject is scant.[1] Incidence of EPL ruptures after overall distal radius fractures is 0.07-0.88%. Surprisingly it's common in nondisplaced fracture of the distal radius with an incidence of EPL rupture of 0.2-5%.[2] Other etiological factors that have been reported in the literature include chronic inflammatory conditions such as rheumatoid arthritis, systemic or local steroid injections, and repetitive or excessive abnormal motion of the wrist.[3] Cortical irregularities from distal radius fractures or osteophytes easily abrade the tendon, causing gradual attrition and ultimately rupture.[4] Compromised blood supply is also related to EPL rupture which is supported by microcirculatory anatomic studies.[5] We report a case of spontaneous rupture of the EPL following a nondisplaced fracture of the distal radius managed by EIP transfer.

CASE REPORT

The 49 year old female presented to us with decreased range of movement of her left thumb following an injury to left wrist. She had an undisplaced fracture of distal radius of left wrist following a fall. She was initially managed at local hospital with a below elbow splint. Splint was removed after one month and she was allowed to do range of movement exercises. Two weeks after removal of splint she regained her thumb movements; however she noticed sudden loss of movements of her left thumb. On presentation to us after 6 weeks of index injury she had flexion attitude of MCP and IP joint of left thumb (Figure 1 A) unable to do active extension of thumb but her thumb passive range of movements were full. Her x ray showed a undisplaced united fracture of distal radius involving Listers tubercle (Figure 1 B). Hence the diagnosis was spontaneous rupture of EPL tendon. In view of chronic rupture of EPL and in view of degeneration of tendon we

planned for EIP transfer. Prerequisites include independent extension of the index finger which is tested by of EIP by fully flexing ulnar three fingers asking patient to extend index finger (Figure 1 C). One incision was made over the dorsum of second MCP joint and graft was harvested just proximal to the extensor hood level ulnar to EDC tendon (Figure 2 A and B). Second incision was made just distal to the extensor retinaculum (which allows the tendon to be delivered and then rerouted) (Figure 3 A). Third incision was made over the first MCP joint, and a subcutaneous tunnel was created to the retinacular incision and the tendon was then delivered through this tunnel (Figure 3 B). The most difficult and important part of the surgery is proper tensioning. Tension was adjusted with the thumb under full extension and the wrist in neutral position during the tendon suturing. The tendon was sutured to the distal stump using the Pulvertaft weave technique (Figure 4 A and B). Thumb was immobilized with a spica cast thumb in extension wrist in 20^0 extension for six weeks (Figure 4 C). Gentle range of motion exercise was begun at six weeks after removal of cast. At three months follow up, she had full extension and full flexion of thumb and full range of movements at wrist and fingers (Figure 5 A and C).

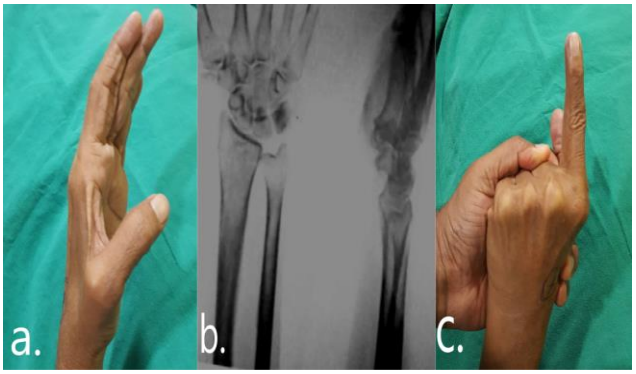

Figure 1 (A-C): Pre operative picture, plain X-ray and independent extension of the index finger, (A) unable to extend the thumb with flexion attitude of MCP and IP joint, 1 (B) X-ray showing nondisplaced fracture of distal radius with involvement of Lister's tubercle, (C) independent extension of the index finger (pre op. confirmation).

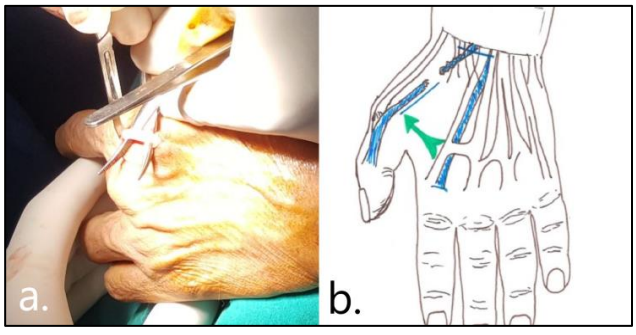

Figure 2 (A and B): Harvesting EIP ulnar to EDC tendon of index finger.

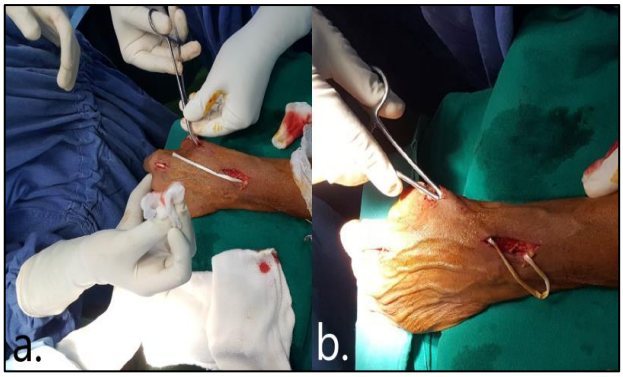

Figure 3: (A) EIP tendon delivered through retinacular incision, (B) subcutaneous tunnel created to the retinacular incision.

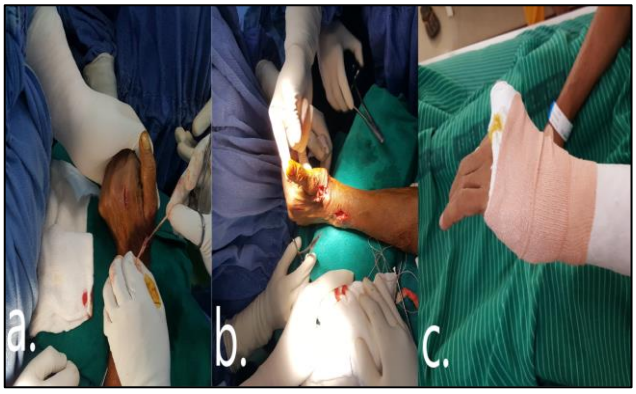

Figure 4: EIP suturing to EPL using the Pulvertaft weave technique, post op immobilization, (A and B) tendon was sutured to the distal stump using the pulvertaft weave technique and (C) post op immobilization.

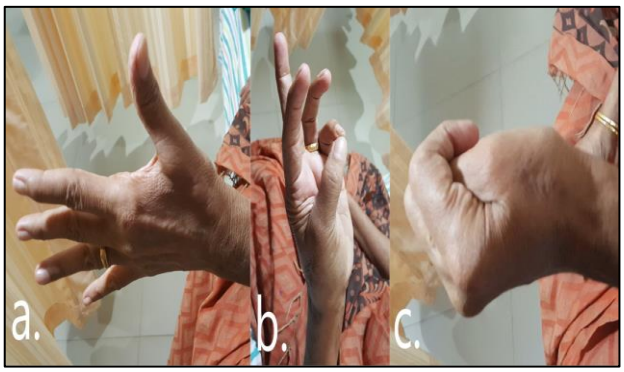

Figure 5: Figure 5-Follow up at 3 months, (A) thumb extension, (B) opposition and (C) thumb flexion.

DISCUSSION

Spontaneous EPL rupture is not a common presentation in orthopedic clinics and is particularly rare to a general orthopedic practitioner. Common causes of the spontaneous rupture of the EPL tendon include rheumatoid arthritis, steroid injection and tenosynovitis.[3,5] EPL tendon

rupture after distal radius fractures has been well described in the orthopaedic literature.[6] Incidence of EPL ruptures after overall distal radius fractures is 0.07% to 0.88%, usually occurring 1 to 3 months after the injury.[7] Minimally or non-displaced fractures have an increased incidence of EPL ruptures compared with markedly displaced fractures with an incidence of EPL rupture of 0.2-5%.[1,2,5] This may be because of the intact third extensor compartment which may, through increased fluid and hematoma pressure, prevent proper nutrition to the EPL. The EPL tendon could spontaneously rupture due to attrition of the tendon around Lister's tubercle.[8] Other potential cause of EPL rupture is penetration of hardware into the third extensor compartment at the level of Lister's tubercle.[9] Our patient also had an undisplaced fracture of the distal radius involving Lister's tubercle prior to development of EPL rupture which occurred 6 weeks after the injury. The theory is that blood extravasation and fracture debris can fill the third dorsal compartment, causing increased pressure and constriction of the EPL leading to late attritional rupture. Beneath the extensor retinaculam is 'watershed' zone of intrinsic vascular supply to the tendon, it is this zone if deficiency where rupture commonly occurs. Rupture can also occur from tendon rubbing on a bony prominence or callus.

The EPL tendon typically cannot be directly repaired because it is too frayed. Palmaris longus can be used to either augment a primary repair or can be used as a free tendon graft in order to bridge the gap between tendon edges. If a large portion of tendon edges appear degenerative, then we have to consider resecting tendon edges and then weaving palmaris longus between the edges to bridge gap. Tendon transfer using the abductor pollicis brevis, the extensor carpi radialis longus, and, principally, the EIP has been advocated for early and late EPL tendon rupture.[10] Extensor indicis transfer provides predictable outcome. Advantages include similar amplitude of excursion and direction of pull. Prerequisites include independent extension of the index finger. Potential complications for this procedure include injury to the extensor digitorum communis and loss of independent index finger extension.

Schaller et al compared the results of EIP to EPL transfers and free intercalated tendon grafts for isolated secondary reconstruction of the EPL tendon and found no significant differences between them, concluding that both surgical techniques can be considered as equal alternatives.[11] Correct tensioning is difficult due to myostatic contracture occurring in tendon grafting.[12] The biomechanical aspects were investigated in a study of routing the tendon through the subcutaneous and extensor pulley and found no differences between them.[13]

The most important factors affecting the functional outcome of EIP transfers are setting an appropriate tension and using a robust repair technique. Excessive tension causes loss of flexion of thumb and under tension can result in extensor lag. The standard tensioning position in EIP to EPL transfers is full extension of the thumb and a 30^0 angle of flexion of the wrist. However, an extension lag of the thumb has been reported after employing the standard tensioning technique. Wide-awake approach for EIP to EPL tendon transfer is appropriate in order to set the tension correctly.[14]

Low et al. reported that optimal tensioning is obtained with a neutral wrist and finger extension position (this also causes over tensioning).[15] This technique causes over tensioning of the transfer as compared to 30^0 flexion position of wrist in standard technique. Further he has done cadaveric study evaluated various wrist and thumb position combinations for tensioning the EIP to determine the optimal positions. According to their study, in an EIP to EPL transfer, the optimal tensioning position was with the thumb fully extended and the wrist in a neutral position. Therefore, using slightly more tensioning than the standard technique was our choice. In our case we opted for supraclavicular block and sutured EIP to EPL with thumb in full extension and wrist in neutral position using the Pulvertaft weave technique and fiber wire suture material. Immobilized thumb in extension wrist in 20^0 extension to avoid stretching of tendon post operatively. At 3 months follow up patient had full extension and flexion of thumb comparable to opposite side.

CONCLUSION

EPL rupture is a rare complication of distal radius fracture more commonly seen in undislpaced fractures. EIP transfer gives promising outcome. Optimum tension of the tendon is crucial for good functional outcome. We recommend suturing the tendon with thumb in extension and wrist in neutral position for optimum tension of tendon to avoid extensor lag and to prevent loss of IP flexion.

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