Umbrella handle technique for fixation of FDP avulsion fracture

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ABSTRACT

We present the treatment course of a 29-year-old male patient with for a Type 3 FDP avulsion (Jersey’s finger) of a fifth finger treated with umbrella handle technique. The patient had a volar base fracture of distal phalanx with dorsal subluxation of DIP joint after a fall. Following open reduction of the FDP avulsion fracture and fixation was achieved with a 0.9 mm one edge hooked Kirschner wire under fluoroscopy control. The straight edge of the wire was driven out in a central position in sterile nail matrix just distal to lunula. The wire was removed at the fifth week when the complete union of the fracture was observed. The patient achieved full flexion in DIP joint without an extension lag.

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Introduction

Distal phalanx tendon avulsions include some common conditions like bony mallet finger, also uncommon types like Jersey finger. Mallet finger injuries can usually be treated with conservative methods. On the other hand, cases presenting subluxation of DIP joint with a fracture involving more than 1/3 of distal phalanx base require surgical fixation. Various fixation techniques are popularized for these conditions including extension block fixations, suture anchors, pull-out fixations or tendon graft repairs through bone tunnels, hook plate fixations and umbrella handle or fish hook technique.1–3 We used this technique for a Type 3 FDP avulsion (Jersey finger) of a fifth finger. As far as we know, this is the first case report of umbrella technique for FDP avulsion.

Case report

The patient was a 29 year old male admitted with pain, swelling and loss of DIP joint flexion of left fifth finger after a fall. Radiographs showed a volar base fracture of distal phalanx with dorsal subluxation of DIP joint (Fig. 1). The patient was planned to be treated surgically. Under axillary block anaesthesia and with pneumatic tourniquet; a volar Brunner incision was performed. Avulsed part of the FDP was identified, the site of bony avulsion was debrided, the fragment was reduced without pulley excision and with avoiding further fragmentation. A 0.9 mm Kirschner wire was driven via antegrade direction through the avulsed fragment and taken off from dorsal side of the finger. Proximal edge of the wire was hooked and positioned with gentle pulls from the distal edge to compress the avulsed fragment in to its base under scopy control. The straight distal edge of the wire was driven out in a central position in sterile nail matrix just distal to lunula. This part of the wire was protected with a plastic catheter cover after shortened to approximately 1 cm and will able to be removed from volar edge easily. A long arm cast was applied for 3 weeks and the wire was removed at the fifth week when complete union of the fracture was observed (Fig. 2). The patient followed hand therapy as flexor tendon injuries and achieved full flexion in DIP joint without an extension lag (Figs. 3 and 4).

Discussion

Surgical treatments of distal phalanx dorsal avulsion fracture have their own treatment modalities such as; extension block fixation for bony mallet (Ishiguro T;1988), open reduction hook plate fixation or anchor fixation.4 Although they lead to satisfying bony union and finger function, they are usually not helpful for volar avulsions (Jersey Finger).
The pull-out suture procedure has also been one of the most common surgical treatments for distal phalanx avulsions. A tendon suture has been passed through bone tunnels and externally tied over a button around nail plate. Suture failure, skin necrosis and nail bed damage are among the complications of these techniques.

Suture anchors have been popularised because of the undesired complications of pullout repairs and can be applied for both dorsal and volar avulsions. On the other hand they can have their own pullout failure in elderly weak bones when incorrectly applied and when suture reaction occurs to non-absorbable material. In case of little or no tendon remaining in avulsed bone and also for chronic injuries tendon grafts can be a good indication for reconstruction for regaining function. However excessive bone damage while tunnelling is a disadvantage. More cautious physiotherapy should also be followed to prevent rupture and therefore a complete compliance of patient is needed.

Hook plate and screw fixation can be an effective treatment as they can achieve anatomical reduction and superior biomechanic fixation as well as bone to bone healing of the phalanx avulsions. Chronic tenderness and pain caused by prominence of the plate is a common problem.

Umbrella handle technique can also be performed for the same range of indications like other mentioned surgical options with significant lower costs. It needs a second intervention for wire removal but it is much easier than such other hardware removals as can be performed with local anaesthesia. Wire loosening or pull out is rare as the nail acts as a stopper if the wire is centrally driven out on it.

The umbrella handle technique was first described by Fanfani et al in 1998. Later they published their experiences of this treatment for 48 patients with bony mallet finger injury. They detected 46 excellent and good results according to Crawford's criteria with percutaneous umbrella handle fixation supported with 6 weeks volar thermoplastic splint and immediate postoperative mobilisation of DIP joint. Badia and Riano mentioned to combine the
umbrella technique with extension lock for more stable fixation of the fracture. They hold the DIP joint in extension with another wire prior to fracture fixation. They collected their results of 16 patients with this technique and reported no residual deformity of DIP joint and no residual pain after an average follow-up of 22 months. Kim DH et al also combined umbrella or as they called fish hook method with transarticular fixation. They transfixed the DIP joint after they reduced the fracture with hooked wire. They achieved 25 excellent and good results among 26 patients which were treated with this method.

We performed the umbrella fixation for a Jersey finger injury; different from mallet finger cases as a sufficient reliable and low cost method for FDP avulsion fracture. We performed open reduction because it is much more difficult to percutaneously reduce these volar base fractures as there is no possible supportive method such as extension lock as for mallet finger injuries. After reduction with hooked edge we aimed to drive out the straight edge of the wire at central location in sterile matrix distal to lunula to avoid early loosening. We think the protection of wire and splint support is optional according to patient cooperation.

We should also emphasize that the indication of umbrella technique is closely related to bony fragment integrity and Jersey finger classification type.

Conclusion

Our case achieved bony union after 5 weeks and full active motion after 3 weeks of hand therapy. This result encouraged us that umbrella handle method can also be a reliable, sufficient treatment with low cost also for FDP avulsion fractures. We aim to collect and share further data about this treatment.

Declaration of interest

Nothing to declare.

Acknowledgement

Nothing to declare.

References

1. Badia A, Riano F. A simple fixation method for unstable bony mallet finger. J Hand Surg Am. 2004;29:1051—1055. https://doi.org/10.1016/j.jhsa.2004.06.015. PMID: 15576214.
2. Rocchi L, Genitiempo M, Fanfani F. Percutaneous fixation of mallet fractures by the “umbrella handle” technique. J Hand Surg Br. 2006;31:407—412. PMID: 16766102. https://doi.org/10.1016/j.jhsb.2006.04.014.
3. Kim DH, Kang HJ, Choi JW. The “fish hook” technique for bony mallet finger. Orthopedics. 2016;39:295—298. PMID: 27248339. https://doi.org/10.3928/01477447-20160526-01.
4. Ishiguro T, Itoh Y, Yabe Y, Hashizume N. Extension block with Kirschner wire for fracture dislocation of the distal interphalangeal joint. Tech Hand Up Extrem Surg. 1997;1:95—102. PMID: 16609513.
5. Patrick N, Weinheimer K, Darowish M. A novel technique for the treatment of Jersey fingers. Am J Orthop. 2018;47. PMID: 29883502. https://doi.org/10.12788/ajo.2018.0026.
6. Tempelaere C, Brun M, Doursouman L, Feron JM. Traumatic avulsion of the flexor digitorum profundus tendon, Jersey finger. A 29 cases report. Hand Surg Rehabil. 2017;36:368—372. PMID: 28694076. https://doi.org/10.1016/j.hansur.2017.06.002.