

Case Report

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Technical challenges in chronic zone 2 flexor tendon reconstruction and analysis of function in toddler: A rare case Report

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Abstract

Introduction: Flexor tendon injury in zone 2 is challenging to treat, when child was presented late. As flexor tendon are smaller in size, the repair or reconstruction technique along with rehabilitation becomes very challenging. We report a technical challenge in chronic zone 2 flexor tendon reconstruction in toddler presented two month post accidental glass cut injury. **Case presentation:** An 18-month-old male toddler presented with inability to flex left little finger after two-months post accidental glass cut injury proximal to proximal interphalangeal (PIP) joint in zone two of left index finger. The passive range of motion (RoM) of DIP was zero degree to 60 degrees and PIP joint RoM was zero to 95 degrees. Child was unable to do active flexion of PIP and DIP joint movement. The parents of child were counselled for exploration and staged reconstruction of flexor digitorum profundus (FDP) tendon using either flexor superficialis (FDS) slip or palmaris longus. One slip of FDS graft was harvested and utilised to reconstruct FDP. At two years follow up, the injured index finger was normal in cosmesis and function. The active DIP joint movement was 50 degrees with complete healing of surgical site. **Conclusion:** Zone two flexor tendon injury in toddlers needs thorough clinical judgement and assessment by ultrasonography to locate the cut ends of tendons. Reconstruction of pulley, FDP reconstruction using FDS slip and supervised rehabilitation is recommended surgical option to achieve excellent function.

Keywords: Flexor tendon injury, zone 2, toddler, Flexor tendon reconstruction.

INTRODUCTION

Flexor tendon injuries affect 3.6 in 100,000 children per year ^[1]. Flexor tendon anatomy including pulley system in children similar to anatomy in hand of adults ^[2] but, size of tendon being smaller, the repair or reconstruction technique along with rehabilitation becomes very challenging. Post-surgery, cooperation with physiotherapist for rehabilitation can be difficult in children ^[3].

The repair technique in case of acute flexor tendon injuries in zone 2 is well described in literature. But it remains a great technical challenge to treat chronic injuries of more than six weeks old in toddlers. The delay in diagnosis, challenging surgery to reconstruct the retracted flexor tendons and immobilization in children can lead to adhesion formation and compromised function.

CASE REPORT

We report a case of two-months post accidental glass cut injury proximal to proximal interphalangeal (PIP) joint in zone two of left index finger causing complete rupture of both flexor digitorum superficialis (FDS) and flexor digitorum profundus (FDP) in an 18-month-old toddler. The child brought by parents at two months post injury with complaints of inability to flex left index finger (Fig 1). There was settled scar of puncture wound on palmar aspect proximal phalanx.

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Figure 1: The child presented after 2 months with unable to flex left index finger.

On examination, the left index finger was in extension attitude. The capillary filling was normal. The sensation could not be tested as child was uncooperative. The passive flexion and active extension of the proximal interphalangeal joint (PIP) and distal interphalangeal joint (DIP) were normal. The passive range of motion (RoM) of DIP was zero degree to 60 degrees and PIP joint RoM was zero to 95 degrees. Child was unable to do active flexion of PIP and DIP joint movement. The Ultrasonography of index finger showed that proximal ends of the ends of FDS and FDP were distal to A1 pulley (Fig 2). The distal stump size of FDP was 0.8cm and both slips of FDS were not found due to chronic nature of injury.

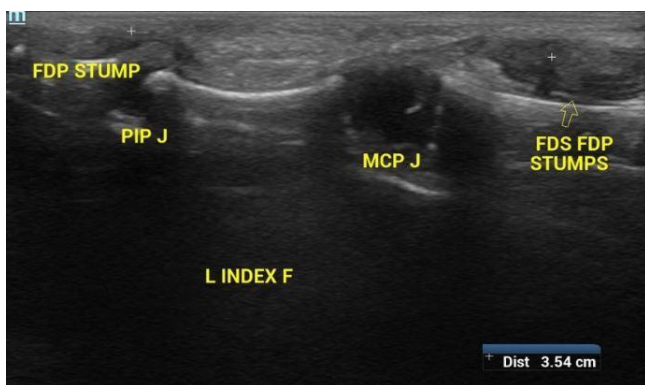


Figure 2: USG shows both ends of FDS and FDP was at distal to A1 pulley.

The parents of child were counselled for exploration and staged reconstruction of FDP tendon using either FDS slip or palmaris longus. The possibility of formation of adhesions and impaired function was explained in detail to parents. Surgery was performed under general and regional anaesthesia. Exploration of left index finger from DIP to carpal tunnel was done. Both digital neurovascular bundles were found to be intact. Both proximal ends of FDP and FDS were found to be distal to the A1 pulley (Fig 3). Since the FDS repair was not possible, one slip of FDS graft was harvested and utilised to reconstruct FDP. One end of FDS tendon graft was sutured to the distal stump of FDP and proximal end was sutured with non-absorbable suture material. The tension at the suture site was adjusted by maintaining cascade of the fingers, keeping index finger with 70 degree of MCP and PIP joint flexion and DIP joint 60 degrees of flexion (Fig 4). There was bowstringing of the tendon graft at A2 pulley site. The piece of flexor retinaculum was harvested from volar distal part of wrist to reconstruct A2 pulley the middle phalanx.



Figure 3: Distal stump of FDP and proximal part of tendons showing the gap.



Figure 4: Reconstruction of FDP and A2 pulley was done using FDS graft and flexor retinaculum.

Post operatively the child was given above elbow dorsal slab for four weeks. The parents were taught to do passive mobilisation of DIP and PIP joint from one week onwards. At four weeks, dorsal below elbow thermoplastic splint was given. The child was allowed to use his operated hand intermittently by removing splint. At eight weeks, parents were taught to passive extension of DIP joint.

The child regained 90 degrees of movement at MCP and PIP joints of the left index finger at six weeks postoperatively. The distal interphalangeal (DIP) joint movement was assessed at every three months. At two years follow up (Fig.5), the injured index finger was normal in cosmesis and function. The active DIP joint movement was 50 degrees with complete healing of surgical site.



Figure 5: At two years follow up, the injured index finger was normal in cosmesis and function.

DISCUSSION

Restoration of a flexor tendon function in a chronic injury is a challenge and requires skilful effort from both the surgeon and the parents to achieve a good result in toddlers. The rationale of tendon grafting is to create tenorrhaphy sites outside zone II, where adhesions do not interfere with function. Two-stage flexor tendon reconstruction using silicone rod in the first stage and a free tendon graft through the pseudo-sheath formed around the silicone in the second stage, as described by Hunter ^[4], is the most widely accepted treatment but have shown compromised in patients (Boyes grades II–IV) ^[5-9].

Abdul-kader and Amin ^[10] confirmed the usefulness of two-stage flexor tendon reconstruction using the combined technique by using silicone rod and pedicled sublimis tendon graft as a salvage procedure to restore flexor tendon function with a few complications. In general, children heal better than adults as they have a greater proportional blood supply to their flexor tendons, and hence an enhanced ability to remodel scar tissue ^[11]. Further, as they grow, they may rupture tendon adhesions that have formed ^[12]. It is accepted that early primary repair results in better functional outcome compared with secondary tendon repair (more than 3 weeks after the primary injury) ^[13].

Tuncay *et al.* ^[14] reported that twenty flexor tendons in 13 children were treated by primary suture as both tendons were repaired in 12 digits and only FDP in 8 (40%) with excision of FDS. In the 12 fingers with FDS repair, the results were excellent in 2, good in 4, fair in 3 and poor in 3. In the 8 fingers with FDS excision, 2 rated excellent, 5 good and 1 poor. In conclusion, author reports only reconstruction of FDP using FDS tendon graft is less morbid procedure and gives excellent result.

Cooper *et al.* ^[15] reported as Sixty-three fingers and 99 tendons repair in 57 children in which 35% were in zone 2. Early active mobilization in slab under supervision of parents is a practical and safe way to rehabilitate children after flexor tendon repair, without increasing chances of ruptures or adhesions.

Learning Points

Proper analysis of injury by clinical examination and dynamic ultrasonography is necessary to locate the rupture ends of tendons in chronic cases. The decision to reconstruct only distal flexor tendon by using FDS and pulley reconstruction is essential in children. Rehabilitation under supervision of parents and surgeon can give predictable functional outcome.

CONCLUSION

Zone two flexor tendon injury in toddlers needs thorough clinical judgement and assessment by ultrasonography to locate the cut ends of tendons. The phenomena of bowstringing is also possible in children. Therefore, reconstruction of pulley, FDP reconstruction using FDS slip and supervised rehabilitation is recommended surgical option to achieve excellent function.

Inform consent

Informed consent was obtained from patients for being included in the study.

Competing interests

Dr. Parag Lad and Dr. Sanket Tanpure declare that they have no competing interests.

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