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Original Article

Functional Outcome of Surgical Management of Congenital Trigger Thumb – A Prospective Study

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Abstract

Introduction: Congenital trigger thumb is an uncommon anomaly of children. Its management is controversial, ranging from observation to extensive release.

Aim: The aim of the study was to study the functional outcome of surgical management of the congenital trigger thumb in children.

Materials and Methods: In this prospective study, 26 thumbs (21 pediatrics) underwent surgical release of the trigger thumb. Surgery was performed under general anesthesia with a tourniquet.

Results: The prospective study demonstrated that pre-operative range of motion (ROM) averaged 36° loss of extension (range, 0°–90°; standard deviation [SD], 22°); and post-operative ROM averaged 1° loss of extension (range, 0°–30°; SD, 7°) at 3 years follow-up. There were no secondary surgeries. The children were being followed up for 3 years. All of them are found to have a good functional outcome and free of any complications until follow-up for 3 years.

Conclusion: Congenital trigger thumb is a rare anomaly which is noticed by the parents around the age of 1½ years. As conservative treatment invariably failed to give good results, all children are managed surgically with better cosmetic and functional results.

Key words: Congenital trigger thumb, First annular Pulley, Notta's nodule, Flexor pollicis longus

INTRODUCTION

Congenital trigger thumb is a rare anomaly found in children. It is observed in approximately 3.3 infants out of 1000. Bilateral involvement is present approximately 25–30% of children. The term "congenital trigger thumb" is thought to be a misnomer by many surgeons, as the condition is almost never seen at birth.[1]

In hand, the annular ligaments of finger often referred to as A pulleys are the annular part of the fibrous sheaths of the fingers. Four or five such annular pulleys and three cruciate pulleys form a fibro-osseous tunnel on the palmar aspect of fingers of the hand through which the superficial and deep flexor tendons pass. These pulleys providing a critical constraint to the flexor tendons to prevent bowstringing on contraction and excursion of extrinsic flexor musculotendinous unit.[2,3]

Thumb is entirely different from fingers; here, the pulley system is one oblique pulley originates at proximal half of proximal phalanx, two annular pulleys A1 at the level of the volar plate at metacarpophalangeal (MCP) joint, and A2 pulley at the distal part of the proximal phalanx. Another annular variable (Av) pulley may present between A1 and oblique pulley. Bowstring of flexor pollicis longus (FPL) will occur if both A1 and oblique pulley are cut. Trigger thumb is due to stenosing tenosynovitis of FPL at the level of the first annular pulley. The tendon also shows the corresponding thickening called Notta's nodule just proximal to the stenosis in the sheath. Due to these, the child develops triggering, pain, and later flexion deformity of inter-phalangeal (IP) joint of the thumb. If these are neglected, the child may develop joint MCP laxity with hyperextension deformity.

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If the joint laxity is not diagnosed and corrected, it will be exacerbated postoperatively. No further diagnostics are necessary, as the history and physical examination are pathognomonic for trigger thumb. Literature does not provide any strong evidence between thumb sucking and congenital trigger thumb.[4,5]

Conservative treatment is tried between 0 and 3 years, with observation alone or with stretching exercises and splints. Surgery is recommended if the child presents after 3 years of age or if conservative treatment fails. Surgery is not preferred in children aged <1 year, as the rate of recurrence is higher with surgical release at this age. Good results are obtained if surgery is done in children <4 years. The release of A1 pulley alone is sufficient to relieve the trigger thumb in most of the patients and any adhesions around FPL tendon were done both proximally and distally. However, in some children, another constricting annular pulley Av may be presenting just distal to A1. It should be identified and split to attain a complete extension of the IP joint.[6]

Aim

The aim of the study was to study the functional outcome of the surgical management of congenital trigger thumb in children.

MATERIALS AND METHODS

All children attending the Paediatric Orthopaedic Clinic Government Rajaji Hospital Madurai and clinically diagnosed as trigger thumb from May 2015 to April 2018 were included in this prospective study. Initially, a course of conservative treatment tried. After a period of 3 months of conservative treatment with the informed consent from parents, the children were taken up for surgical release and followed up for 3 years.

All surgeries are done under general anesthesia and tourniquet control under loop magnification. A transverse skin incision was made opposite the MCP joint crease. Deep dissection carried out in a longitudinal direction, the neurovascular bundles were identified and retracted carefully on either side. The thickened A1 pulley was identified and split longitudinally, and full IP joint extension was obtained immediately on the table. Adhesions around FPL were released both proximally and distally. Complete active extension of IP joint was possible postoperatively. To avoid the tendency to go for flexion of IP Joint, a removable extension splint was given and the parent was given instructions to do passive stretching of IP Joint of operated thumb at-least thrice a day by removing the splint. Suture removal was done under anesthesia and at the time passive stretching and manipulation performed. The splint was removed at this juncture, and the parents

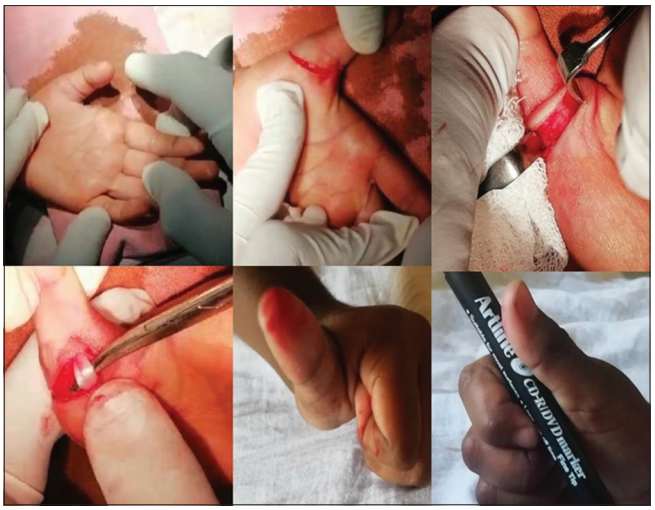

Figure 1: Pre-operative, intraoperative, and post-operative picture of congenital trigger thumb

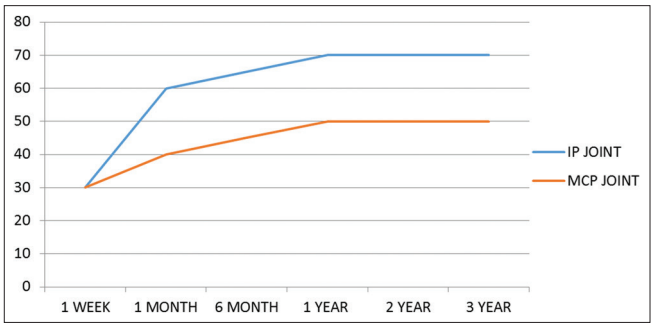

Figure 2: Outcome

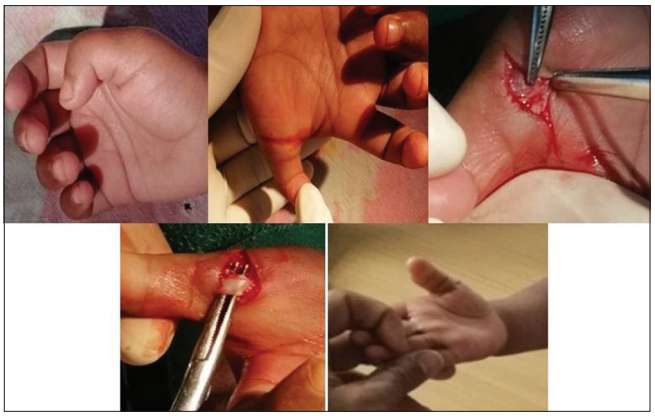

Figure 3: Pre-operative, intraoperative, and post-operative picture of congenital trigger thumb

were encouraged to do passive stretching to the affected thumb daily. The physiotherapy was continued for 2 months, and the baby was periodically followed for 3 years. The neurovascular function was intact. After 2 months of physiotherapy, the patient had near full range of movements: At every follow-up, the degree of deformity and range of motion (ROM) of IP joint movements were clinically and recorded.

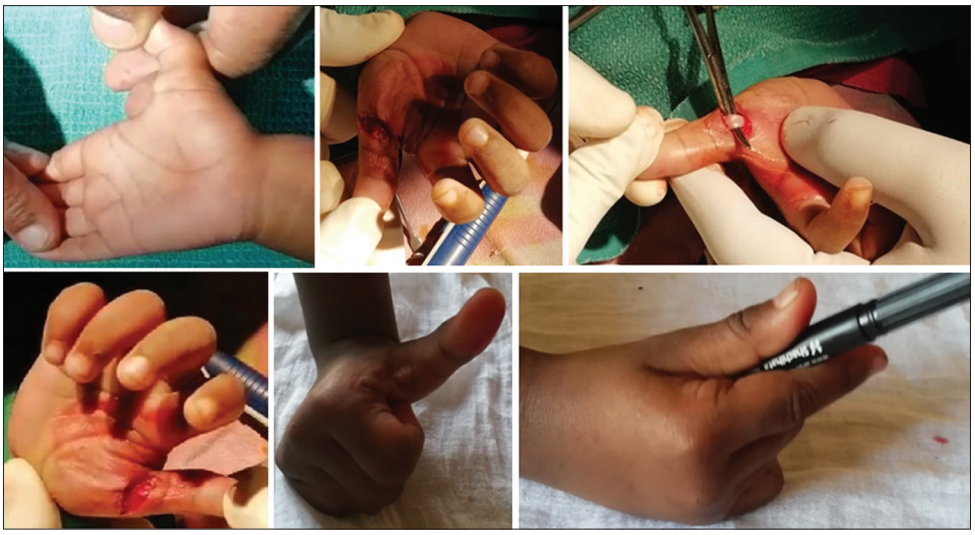

Figure 4: Pre-operative, intraoperative, and post-operative picture of congenital trigger thumb

RESULTS

In this prospective study of 21 patients with 26 trigger thumb (5 patient having B/L presentation). All cases are tried for conservative management before proceeding for open release. Mean age of deformity noticed by the parents was between 12 and 18 months. Average flexion deformity of IP joint at the time of presentation was around 40°. All of them are not associated with any other congenital anomaly. There was no history of trigger thumb in siblings and maternal or paternal families and also no history of injury in those patients. Pre-operative loss of passive and active extension was 36° (range, 0°–90°; SD, 22°). Mean tourniquet time was 5 min (range, 2–10 min). At the last follow-up, all 25 thumbs achieved full extension and 1 thumb hyperextended. Two thumbs had minor complications (superficial infection and wound dehiscence) that did not require additional surgery and responded to conservative wound management. No patient had a digital nerve injury. There were no major complications. No secondary surgeries were performed at our institution. The physiotherapy was continued for 2 months and the baby was periodically followed for 3 years. The neurovascular function was intact. After 2 months of physiotherapy, the patient had a near full range of movements: At every follow-up, the degree of deformity and ROM of IP joint movements were clinically and recorded. All children had a complete correction of deformity and full ROM of IP and MCP joints postoperatively [Figures 1-4].

DISCUSSION

The term "congenital trigger thumb" is thought to be a misnomer by many surgeons, as the condition is almost never seen at birth.

Slakey and Hennrikus screened 4719 newborn infants for the presence of trigger thumb and noted no cases of triggering, locking, nodule formation, or fixed flexion contracture.[6] Moon examined 7700 neonates within first few days of life, and Kikuchi and Ogino examined 1116 babies within 14 days after birth and noted no trigger thumbs.[7,8] Literature does not provide any strong evidence between thumb sucking and congenital trigger thumb.

A confounding factor is a fact that infants posture with their thumb in flexion, which may delay detection. All cases are brought by the parents with deformity of thumb noticed mostly between 12 and 18 months after birth. Patients clinically presented with flexion deformity of IP joints of thumb and prominent Notta's nodule.

Smet *et al.* saw ten patients with a total of 15 trigger fingers – two index, eight middle and five ring – over a 6 year period between 1990 and 1996.[9] Two patients had a spontaneous recovery of the triggering finger, and 13 patients had an A1 pulley release through a transverse incision. All patients in this study had a resolution of triggering symptoms and no patients required follow-up surgery. One limitation of this study is that it was a mixed study of trigger thumbs and trigger fingers, with the majority of cases being trigger thumbs.

Kraemer *et al.* saw a total of 183 patients with 253 trigger digits over a 7 year period between 1978 and 1985; however, of these, only three were trigger fingers – one middle, one ring, and one little. All three trigger fingers received an A1 pulley release through a transverse incision. All three patients had a resolution of triggering symptoms, and no fingers required follow-up surgery. This study reported a mix of trigger thumbs and trigger fingers, with the majority of the cases being trigger thumbs. As such, it was not

possible to derive the actual number of patients involved with trigger fingers.[10]

Moon *et al.*[7] saw a total of 40 patients with 43 trigger digits over a 3 year period between 1995 and 1998; however, of these, only eight were trigger fingers – one index, five middle and two ring fingers. All eight fingers had spontaneous resolution of triggering symptoms, and no fingers required follow-up surgery. Furthermore, a limitation of this study was that it, too, was a mixed study of trigger thumbs and trigger fingers; therefore, it was impossible to derive the number of patients with only triggering fingers. Ultrasound imaging of pediatric trigger thumbs shows a normal echo of the FPL without evidence of any inflammation or trauma. Triggering occurs only when the cross-sectional area of the FPL exceeds the cross-sectional area of A1 pulley (size mismatch). Triggering resolves when the size disparity eliminated. No further diagnostics are necessary, as the history and physical examination are pathognomonic for trigger thumb.[11]

Since it develops later, they termed it as "developmental trigger thumb." However, trigger thumb reported in twins and siblings shows congenital etiology to some extent. The etiology of trigger thumb is not well understood. The stenosed sheath and Notta's nodule are biopsied earlier, but no definite pathology can be established.

Management of trigger thumb is controversial. In a study of the treatment of trigger thumb, Dinham and Meggitt reported that approximately 30% of trigger thumbs diagnosed before 1 year resolved, and about 10% diagnosed at between 6 months, and 1 year of age resolved spontaneously.[12] Sugimoto also found that during an observation period of between 7 months and 12 years, spontaneous resolution occurred in over one-third of patients.[13]

Dunsmuir and Sherlock showed 11% of trigger thumbs referred to them had a spontaneous recovery.[14] Baek *et al.* reported spontaneous recovery in 63% of patients.[15] Lee *et al.* showed passive stretching exercises and splinting to be effective than observation alone.[16]

The precise timing of surgery is dependent on multiple factors, including the age of the child, the degree of deformity, patience of the family, and surgeon's preference.

Surgery is performed under general anesthesia, tourniquet control, and loupe magnification. Make a horizontal (transverse) incision over the first annular pulley was done by many surgeons, but few advocated longitudinal incision to prevent neurovascular injury. However, if the neurovascular structures are properly isolated and protected, the incidence of injury is found to be very less, even with the horizontal incision. The scar of vertical incision will be unsightly to the patients in later life.

Incise only skin, spread in a longitudinal fashion through subcutaneous tissue. Identify and protect the radial digital nerve and isolate the A1 annular pulley and release it to expose the FPL. Adequate care should be taken to prevent splitting of the oblique pulley. If it is cut along with A1, bowstringing of FPL will result, causing decreased IP joint flexion. Do not address the nodular thickening (Notta's nodule) of FPL. Inspect the proximal and distal sides to ensure that no further adhesions on flexion and extension of the thumb. Percutaneous release of A1 pulley is also advocated, but the risk of damaging digital nerves is high.

Even though the complete active and passive extension is possible postoperatively, thumbs tended to be in flexion of approximately 20° due to long-standing deformity. Complete active extension of IP joint was possible postoperatively. To avoid the tendency to go for flexion of IP Joint, a removable extension splint was given and the parent was given instructions to do passive stretching of IP Joint of operated thumb at least thrice a day by removing the splint. Suture removal was done under anesthesia and at the time passive stretching and manipulation performed. The splint was removed at this juncture, and the parents were encouraged to do passive stretching to the affected thumb daily. The physiotherapy was continued for 2 months.

In long-standing cases, flexion deformity of IP joint may lead to MCP joint laxity and hyperextension. It is corrected by the advancement of MCP volar plate and temporary pinning of MP joint. If it is not identified and corrected, MCP joint laxity will be exacerbated. There is no MCP joint laxity in our case.

Phalangeal osteotomy may also be required if the child has flexion deformity of IP joint for 10 years or above. Recurrence of trigger thumb is noted in 4% of children, especially if the child is aged <1 year. It is due to inadequate release of the pulley in the small thumb.

Trigger thumb release is uniformly successful, and recurrences are rare. The literature reports that the short-term and long-term results of surgical treatment of pediatric trigger thumb have been excellent.[17]

CONCLUSION

Congenital trigger thumb is a rare anomaly which is noticed by the parents around the age of 1½ years. As conservative treatment invariably failed to give good results, all children

are managed surgically with better cosmetic and functional results.

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