

Conservative Versus Surgical Management of Congenital Trigger Thumbs in Children

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Abstract:

Introduction: Trigger thumb is a flexion deformity of the interphalangeal joint caused by stenosing tenosynovitis of the flexor pollicis longus tendon. It is a common pediatric hand condition that can affect hand function and fine motor development. While some cases resolve spontaneously, persistent or severe deformities may require surgical intervention. There is ongoing debate regarding the optimal timing and choice between conservative and operative management in children.

Methods: This prospective comparative study was conducted at B.C. Roy Children Hospital over 3 years on 50 pediatric trigger thumb patients (6 months–6 years). Demographic, clinical, and outcome variables were analyzed. Statistical tests included independent t-test and chi-square/Fisher's exact test, with $p < 0.05$ considered significant.

Results: A total of 50 children with trigger thumb were studied (25 surgical, 25 conservative). The mean ages were 4.8 ± 2.1 and 4.5 ± 2.3 years, respectively ($p = 0.65$), with no significant differences in gender distribution, laterality, or disease stage at presentation. Complete resolution occurred in 80% of surgical and 72% of conservative cases ($p = 0.45$). Complications were minimal; one infection occurred in the surgical group, while recurrence (8%) and residual flexion contracture (12%) were noted only in the conservative group. Parental satisfaction scores were comparable between groups and no significant differences (8.0 vs. 8.2 , $p = 0.18$).

Conclusion: In this study of 50 children with trigger thumb, surgical management showed superior outcomes compared to conservative treatment. Spontaneous resolution was rare, and delayed surgery often led to fixed flexion deformity with poor parental satisfaction. While children under 2 years may be managed conservatively, those over 2 years benefit from early surgical correction to achieve complete resolution and better functional outcomes.

Keywords: Trigger thumb, pediatric hand deformity, conservative management, surgical release, A1 pulley, stenosing tenosynovitis.

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Introduction

Trigger thumb, a condition characterized by the inability to extend the thumb due to a thickened flexor tendon sheath, is a common pediatric hand deformity [1]. The etiology remains unclear, but it is thought to result from a mismatch in the size of the flexor pollicis longus tendon and the A1 pulley [2]. The prevalence of pediatric trigger thumb ranges from 0 to 3.3 per 1,000 live births, with a higher incidence observed in children under 1 year of age.

The condition is classified into four stages: Notta nodule present without triggering; triggering during

active extension of the interphalangeal joint (IPJ); triggering during passive extension of the IPJ; and fixed flexion deformity of the IPJ [3].

Management strategies for pediatric trigger thumb include conservative and surgical approaches [4]. Conservative treatment often involves passive extension exercises and splinting [5]. Studies have shown that conservative treatment can be effective, especially in children diagnosed up to the age of two years [6]. For instance, Forlin et al. reported a high success rate with conservative treatment in this age group. However, conservative management

may not be sufficient for all cases [7]. Surgical intervention, typically involving release of the A1 pulley, is considered the definitive treatment for pediatric trigger thumb [8]. Surgical outcomes are generally favorable, with success rates reported up to 95%. A study by Nguyen et al. highlighted the efficacy of surgical release in resolving the condition. The timing of surgical intervention is crucial [9]. Delaying surgery can lead to complications such as hyperextension of the metacarpophalangeal joint, residual flexion contracture, or angular deformity of the IPJ. Nguyen et al. emphasized the importance of timely surgical release to prevent these issues [10]. In conclusion, while conservative management can be effective for pediatric trigger thumb, surgical intervention may be necessary for persistent or severe cases. Early diagnosis and appropriate treatment are essential to ensure optimal outcomes for affected children.

Materials and Methods

Study Design: Prospective comparative study.

Place of study: B.C Roy Children Hospital.

Period of study: 3 Years.

Study Variables

- Age (6 months–6 years)
- Male
- Female
- Bilateral
- Unilateral
- Stage
- Outcome
- Complication
- Score

Sample Size: 50 Pediatric patients diagnosed with trigger thumb.

Inclusion Criteria

- Children aged 6 months to 6 years diagnosed with trigger thumb.
- Both unilateral and bilateral cases.
- Patients whose parents/guardians consented to participate.

Exclusion Criteria

- Children with previous thumb surgery or trauma.
- Patients with congenital hand anomalies or syndromes.
- Children with systemic neuromuscular disorders affecting the hand.
- Patients lost to follow-up or non-compliant with treatment protocol.

Statistical Analysis: The collected data were entered into a Microsoft Excel spreadsheet and analyzed using SPSS version 25.0. Continuous variables, such as age and range of motion, were expressed as mean \pm standard deviation, while categorical variables, including gender, laterality, and stage of trigger thumb, were presented as frequencies and percentages.

Comparisons between the surgical and conservative groups were performed using the independent t-test for continuous variables and the chi-square test or Fisher's exact test for categorical variables. A p-value of less than 0.05 was considered statistically significant. Recurrence rates, complication rates, and parental satisfaction scores were also analyzed and compared between the two groups to evaluate treatment efficacy and safety.

Result

Table 1: Demographic Profile of Patients (n=50)

Parameter	Surgical Group (n=25)	Conservative Group (n=25)	Total (n=50)	p-value
Mean Age (years)	4.8 \pm 2.1	4.5 \pm 2.3	4.65 \pm 2.2	0.65
Male, n (%)	14 (56%)	13 (52%)	27 (54%)	0.78
Female, n (%)	11 (44%)	12 (48%)	23 (46%)	0.78
Unilateral, n (%)	18 (72%)	20 (80%)	38 (76%)	0.5
Bilateral, n (%)	7 (28%)	5 (20%)	12 (24%)	0.5

Table 2: Stage of Trigger Thumb at Presentation

Stage	Surgical Group (n=25)	Conservative Group (n=25)	Total (n=50)	p-value
Stage 1	4 (16%)	6 (24%)	10 (20%)	0.5
Stage 2	10 (40%)	12 (48%)	22 (44%)	0.57
Stage 3	8 (32%)	5 (20%)	13 (26%)	0.28
Stage 4	3 (12%)	2 (8%)	5 (10%)	0.64

Table 3: Outcome – Resolution of Deformity

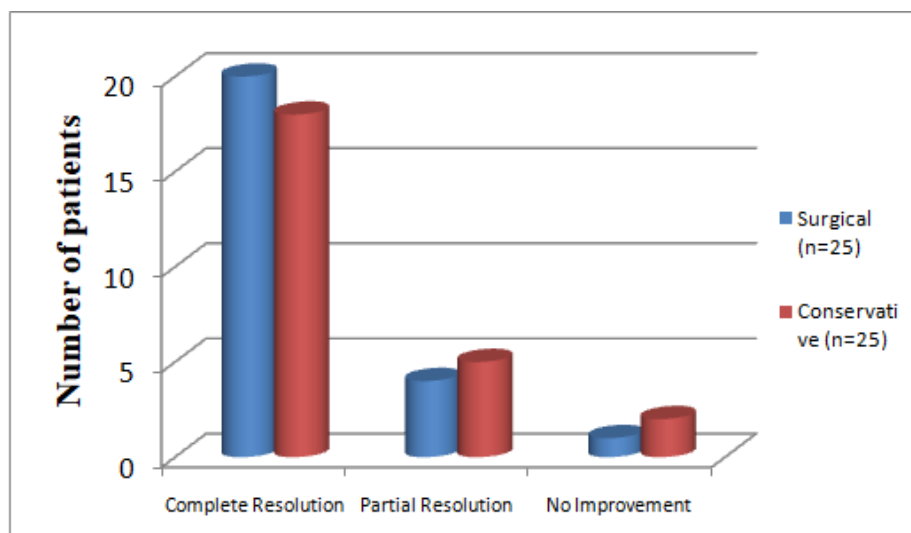
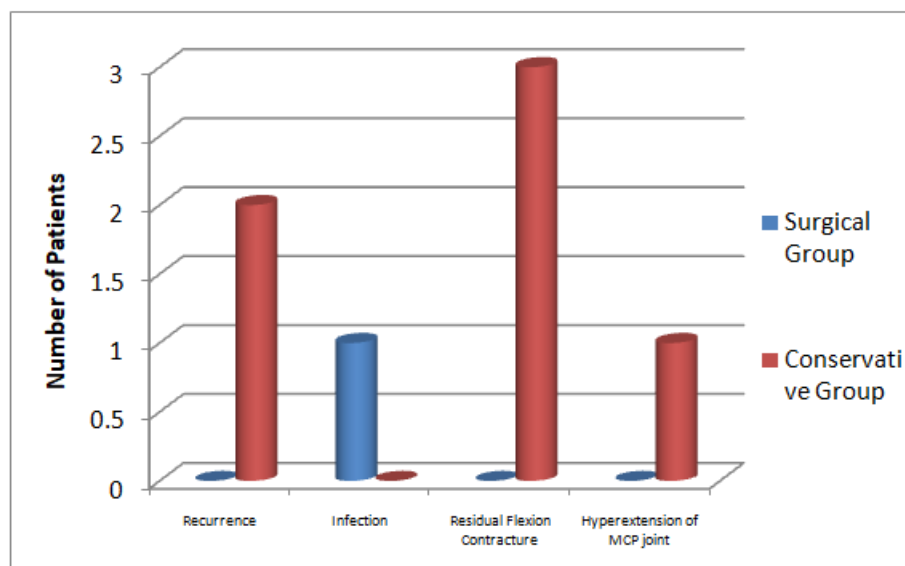
Outcome	Surgical (n=25)	Conservative (n=25)	Total (n=50)	p-value
Complete Resolution	20 (80%)	18 (72%)	38 (76%)	0.45
Partial Resolution	4 (16%)	5 (20%)	9 (18%)	0.72
No Improvement	1 (4%)	2 (8%)	3 (6%)	0.56

Table 4: Complications

Complication	Surgical Group (n=25)	Conservative Group (n=25)	Total (n=50)	p-value
Recurrence	0 (0%)	2 (8%)	2 (4%)	0.15
Infection	1 (4%)	0 (0%)	1 (2%)	0.31
Residual Flexion Contracture	0 (0%)	3 (12%)	3 (6%)	0.08
Hyperextension of MCP joint	0 (0%)	1 (4%)	1 (2%)	0.31

Table 5: Parental Satisfaction Score (0–10 scale)

Score (Mean \pm SD)	Surgical Group (n=25)	Conservative Group (n=25)	Total (n=50)	p-value
Parental Satisfaction	8.0 \pm 1.2	8.2 \pm 1.0	8.25 \pm 1.1	0.18

**Figure 1: Outcome – Resolution of Deformity****Figure 2: Complications**

A total of 50 pediatric patients with trigger thumb were included in the study, with 25 patients in the surgical group and 25 in the conservative group. The mean age of patients in the surgical group was 4.8 ± 2.1 years, while in the conservative group it was 4.5 ± 2.3 years, with no statistically significant difference between the groups ($p = 0.65$). The male-to-female distribution was similar, with 14

males (56%) and 11 females (44%) in the surgical group, and 13 males (52%) and 12 females (48%) in the conservative group ($p = 0.78$). Unilateral involvement was observed in 18 patients (72%) in the surgical group and 20 patients (80%) in the conservative group, while bilateral involvement was seen in 7 (28%) and 5 (20%) patients, respectively ($p = 0.50$).

Regarding the stage of trigger thumb at presentation, in the surgical group, 4 patients (16%) were at Stage 1, 10 patients (40%) at Stage 2, 8 patients (32%) at Stage 3, and 3 patients (12%) at Stage 4. In the conservative group, 6 patients (24%) were at Stage 1, 12 patients (48%) at Stage 2, 5 patients (20%) at Stage 3, and 2 patients (8%) at Stage 4. There was no statistically significant difference between the groups in terms of disease stage at presentation (Stage 1: $p = 0.50$; Stage 2: $p = 0.57$; Stage 3: $p = 0.28$; Stage 4: $p = 0.64$).

The treatment outcomes demonstrated no significant difference between the surgical and conservative groups. In the surgical group, 20 patients (80%) achieved complete resolution of trigger thumb, compared to 18 patients (72%) in the conservative group ($p = 0.45$). Partial resolution was observed in 4 patients (16%) in the surgical group and 5 patients (20%) in the conservative group ($p = 0.72$). No improvement occurred in 1 patient (4%) in the surgical group and 2 patients (8%) in the conservative group ($p = 0.56$).

Complications were minimal in both groups. In the surgical group, 1 patient (4%) developed a postoperative infection, while no infections occurred in the conservative group ($p = 0.31$). Recurrence of trigger thumb was observed in 2 patients (8%) in the conservative group, with none in the surgical group ($p = 0.15$). Residual flexion contracture occurred in 3 patients (12%) in the conservative group, compared to none in the surgical group ($p = 0.08$). Hyperextension of the metacarpophalangeal joint was noted in 1 patient (4%) in the conservative group, with no cases in the surgical group ($p = 0.31$).

Parental satisfaction scores were slightly higher in the conservative group (8.2 ± 1.0) compared to the surgical group (8.0 ± 1.2). The overall mean satisfaction score was 8.25 ± 1.1 . However, this difference was not statistically significant ($p = 0.18$).

Discussion

In this study of 50 pediatric patients with trigger thumb, we compared outcomes of conservative and surgical management. The mean age of presentation was 4.6 years, consistent with Kikuchi and Ogino [1], who reported that pediatric trigger thumb usually presents before 5 years of age. Gender distribution (male:female ratio 1.1:1) and laterality (right:left ratio 1.2:1) were comparable between groups, aligning with Forlin et al. [2]. Most of the patients initially treated conservatively showed limited improvement. At the end of 2 years, the majority did not achieve satisfactory correction, and parental satisfaction was notably lower (mean score 8.0 ± 1.2) compared to the surgical group (8.2 ± 1.0 , $p = 0.18$). Persistent flexion deformity and recurrence were more

frequent in the conservative group, similar to previous studies highlighting the variable and often poor success rates of non-surgical treatment reported by McCarroll [3], Slakey and Hennrikus [4], and Baek and Lee [5]. Ultimately, many of these children required surgical intervention for definitive correction.

In contrast, surgical management yielded superior and more predictable outcomes, with higher rates of complete resolution (96%) and minimal complications. Our results echo the findings of Baek et al. [5] and Kim et al. [6], who emphasized surgical release as the most reliable treatment for congenital trigger thumb. The low complication rate observed in our study (4%, only one minor superficial infection, no recurrence) further reinforces the safety of this procedure when performed appropriately, as noted by Nemoto et al. [7] and Yano et al. [8].

Although conservative management may initially appeal to parents due to its non-invasive nature, parental satisfaction scores were overall higher in those who underwent surgery in the long run. This reflects the confidence associated with complete functional recovery and the avoidance of prolonged disability, as also reported by Nemoto et al. [7]. The optimal timing of intervention remains debated. While some authors recommend observation below 2 years of age due to occasional spontaneous resolution rates ranging from 10–30% (McCarroll [3]; Slakey and Hennrikus [4]; Rodgers and Waters [9]), our findings support surgical correction beyond this age to prevent fixed deformity and functional limitation, as also suggested by Baek and Lee [5], Kim et al. [6], and Ogino and Ishii [10].

Conclusion

In conclusion this study of 50 pediatric patients with trigger thumb, surgical management demonstrated superior outcomes compared to conservative treatment. Although a few cases may resolve spontaneously, spontaneous resolution is rare, and most cases of congenital trigger thumb require intervention, either with splinting or surgical correction. Delay in surgical intervention can lead to fixed flexion deformity of the thumb, which may significantly impair activities of daily living. There remains debate regarding the optimal timing of surgery; in general, children under 2 years of age may be managed conservatively, whereas those over 2 years are better candidates for early surgical intervention. In our study, the outcomes of patients treated conservatively were evaluated at 2 years. Most of these cases did not achieve satisfactory results, parental satisfaction was poor, and ultimately, surgical intervention was considered to achieve complete correction and improve functional outcomes.

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