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- Objective** To evaluate results from surgical release of trigger thumbs in children in a regional hospital cluster in Hong Kong.
- Design** Descriptive case series.
- Setting** A regional hospital cluster, Hong Kong.
- Patients** Data from 1993 to 2009 on 180 children with 209 trigger thumbs were collected. Analyses into gender, predominance of thumb, age of onset, associated abnormalities and family history, symptoms and signs, surgical outcomes, and postoperative complications were carried out retrospectively.
- Results** There were 92 girls and 88 boys having trigger thumbs (1.05:1). In all, 29 (16%) of the children presented with bilateral trigger thumbs, while the right thumb was singly involved in 81 (45%) and the left thumb in 70 (39%) of the children. The mean age of onset was 19 months; only 20% were diagnosed before the age of 1 year. Only nine (5%) of the children were associated with congenital diseases and none had a positive family history of trigger thumb. Flexion deformity was the major presenting feature, other than triggering or pain. A nodule and flexion deformity were very commonly observed during physical examination. More than 95% of the operated thumbs with transverse incision acquired a good range of movement with a scarcely apparent scar. A residual flexion deformity was evident in only 4%, mostly in children who underwent surgical release under the age of 1 year.
- Conclusion** Surgical release is recommended for children with trigger thumbs aged more than 1 year, which attains satisfactory results with minimal complications.

New knowledge added by this study

- Outcomes following surgical release of trigger thumbs in a large sample of children.

Implications for clinical practice or policy

- Timing of the procedure is important; better results and fewer complications ensue if surgical release is deferred till the age of 1 year.

Introduction

Key words
Bone diseases; Child; Congenital abnormalities; Thumb; Trigger finger disorder

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Trigger thumbs in children are uncommon. A point prevalence of 1 in 2000 was reported among all children admitted to an orthopaedics service, while it was 2.2% among those with congenital upper limb anomalies.^{1,2} Triggering in the thumb was more frequent than in other digits. According to recent reports, it occurred in 3.3 per 1000 live births.³

There continue to be controversies about the aetiology and proper treatment of this entity. Dinham and Meggitt⁴ reported spontaneous resolution of trigger thumbs in children. Management recommendations included: (1) observation for spontaneous resolution (in about 30% of patients diagnosed at birth) up to the age of 12 months; (2) for those diagnosed between the ages of 6 and 12 months, 6 months' observation could be offered; (3) surgical release was suggested for children diagnosed after the age of 3 years, as the chance of spontaneous resolution was minimal and there was a potential for residual contracture. More recent papers suggested that conservative treatment was effective in stage-2 trigger thumbs and surgical therapy for stage-3 thumbs before the age of 3 years in order to avoid flexion deformity.⁵ Furthermore, in a prospective study, Baek et al⁶ observed that 63% of the trigger thumbs resolved spontaneously.

On the contrary, several reports suggested surgical treatment.^{1,7-12} Some also claimed that conservative treatment did not work.¹⁹ The latter studies proposed that no spontaneous resolution ensued, even in children diagnosed at birth and that surgery was the treatment of choice. Concerning the age of surgical intervention, Kakel et al¹³ recommended paediatric trigger thumb responded predictably with A1 pulley release, preferably before the age of 4 years, although milder cases might resolve spontaneously; while Han et al¹⁴ commented that surgical release for children aged more than 5 years resulted in the successful resolution of trigger thumbs.

Although there were several studies regarding the treatment of choice, the numbers studied by various groups ranged from only 15 to 105. The purpose of this retrospective study was to evaluate the results of trigger thumb surgical release based on a larger sample size.

Methods

From 1993 to 2009, 180 children with trigger thumbs were encountered in our cluster (two hospitals serving 900 000 inhabitants). They presented with 209 trigger thumbs, and were bilateral in 29 subjects. The patients were referred by general practitioners and the Department of Paediatrics, and seen by orthopaedics specialists who confirmed the clinical diagnosis. Data were collected with respect to gender, predominance of thumb, age of onset, associated abnormalities, known family history of trigger thumb, symptoms and signs, method of treatment, surgical outcomes, and postoperative complications. The findings were analysed in two categories: infantile (age of onset <1 year) and childhood (age of onset ≥1 year).

Results

There were 48 and 161 trigger thumbs in the infantile and childhood categories, respectively. In all, 92 were girls and 88 were boys, amounting to a slight female predominance (1.05:1), whilst 29 (16%) of the children presented with bilateral trigger thumbs; the right thumb was singly involved in 81 (45%) of the children and the left thumb in 70 (39%), revealing a slight right-sided predominance.

According to the parents, the ages of onset (Fig 1) ranged from 1 month to 6 years, with a mean of 19 months. Only 20% of the patients were diagnosed before the age of 1 year. None of the patients with trigger thumb presented at birth.

Most patients presented as an isolated problem without any associated abnormality. Only nine (5%) children had other congenital disorders, which included: ventricular septal defect, inguinal hernia,

扳機拇指小兒患者進行鬆解手術的結果

- 目的** 評估香港一所分區醫院聯網中，為扳機拇指小兒患者進行鬆解手術的結果。
- 設計** 描述性病例系列。
- 安排** 香港一所分區醫院聯網。
- 患者** 1993年至2009年期間因扳機拇指而求診的180名小童，共209只拇指。本文搜集患者的資料，並針對以下幾方面進行分析：患者性別、慣用拇指、發病年齡、相關的發育異常及家族史、症狀和徵兆、手術結果及術後併發症。
- 結果** 共92名女童和88名男童被納入研究範圍，男女比例為1:1.05。29名（16%）小兒雙手均有扳機拇指，另81名（45%）只涉及右手，70名（39%）只涉及左手。平均發病年齡為19個月，只有20%的患者於一歲前被確診。所有患者並無扳機拇指的家族史，只有9人（5%）患有其他先天性疾病。症狀大多為拇指呈屈曲畸形，僅有少數出現彈響及痛楚的現象。身體檢查普遍發現患者有結節及拇指屈曲畸形的情況。超過95%的患者接受橫切口手術後，拇指肌腱可自由滑動，甚少留有疤痕。只有4%患者術後還有少許屈曲畸形，而當中大部分患者都是在一歲前接受鬆解手術的。
- 結論** 扳機拇指小兒患者最好在一歲後才接受鬆解手術。手術結果令人滿意，並很少有併發症。

torticollis, Erb's palsy due to birth injury, toe gait in two, and cerebral palsy in three. There was no known positive family history of trigger thumb in the 180 patients.

Concerning the symptoms and signs, the most common feature was a flexion deformity of the thumb at the interphalangeal joint (IPJ), and yet, triggering and snapping was rather uncommon in children and only occurred in 32 (15%) of the thumbs. In the majority of cases (90%), parents complained that their

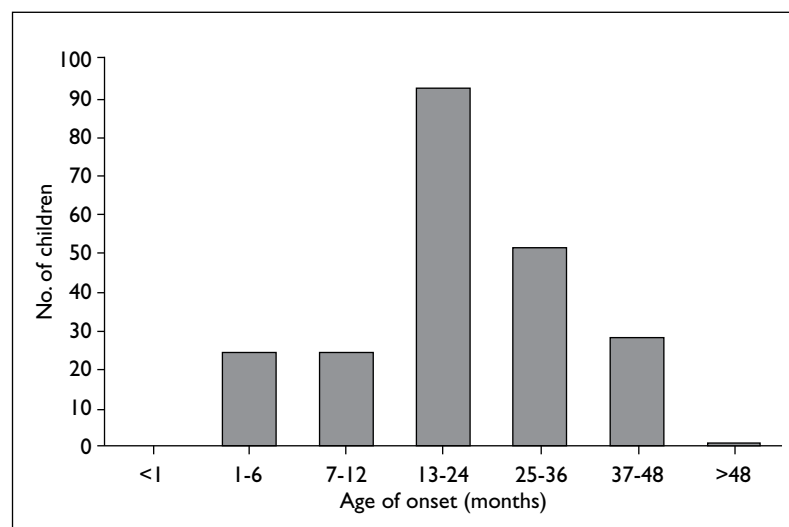


FIG 1. Age of onset of symptoms

TABLE 1. Symptoms of trigger thumbs in children

| Symptom | No. (%) of trigger thumbs |
|------------------------|---------------------------|
| Flexion deformity | 188 (90%) |
| Triggering or snapping | 32 (15%) |
| Nodules | 15 (7%) |
| Pain | 3 (1%) |
| Associated with injury | 3 (1%) |

TABLE 2. Signs of trigger thumbs in children

| Sign | No. (%) of trigger thumbs |
|-------------------|---------------------------|
| Flexion deformity | 172 (82%) |
| Nodules | 200 (96%) |
| Triggering | 17 (8%) |

TABLE 3. Results of surgical release

| Results | No. (%) of trigger thumbs |
|----------------------------|---------------------------|
| Full range of movement | 193 (95%) |
| Residual flexion deformity | 9 (4%) |
| Hypertrophic scar | 3 (1%) |
| Pain | 0 |
| Wound infection | 0 |
| Re-operation rate | 5 (2%) |

child's thumb could not be fully extended. Moreover, 15 (7%) of the cases were noted to have nodules over the thumb base, but pain or any association with injury were unusual (Table 1).

At presentation, most patients had a flexion deformity (82%) and nodules (96%) noted at the metacarpophalangeal (MCP) joint; triggering was an infrequent sign, present in only 8% (Table 2).

As this was a retrospective study, there was no definite protocol for patient management. In all, 55 trigger thumbs were treated with physiotherapy and splintage for a mean of 8 months, including those presenting before the age of 1 year and those whose parents elected a trial of conservative treatment. Surgical release was opted for in children presenting after the age of 1 year or if they showed no response to the conservative therapy. Eventually 97% of these 180 patients underwent surgery while the remaining 3% (six patients) defaulted follow-up in the out-patient clinic, leaving 203 trigger thumbs that could be reviewed.

Regarding surgical technique, we chose a transverse incision following the skin crease at the volar side of MCP joint of the thumb, while adequate exposure of the A1 pulley and protection of the neurovascular bundle was achieved with retractors at both sides. Longitudinal split of the pulley was followed by adhesiolysis with an artery forceps to ensure the smooth sliding of tendons.

All the patients (48 and 161 in the infantile and childhood categories, respectively) whose trigger thumbs were treated by surgical release were followed up in the specialist out-patient clinic for a mean of 5 months (range, 3-29 months). The range of movement (ROM) of the operated thumbs, any residual deformity, and wound condition were examined by orthopaedics surgeons.

During follow-ups, 193 (95%) operated thumbs had full active ROM and none had pain or triggering. Only nine (4%) were complicated with residual flexion deformity and three (1%) had a hypertrophic scar, whilst none suffered any wound infection (Table 3).

Nine cases (4 from infantile [8%] and 5 from the childhood group [3%]) with remaining flexion deformities received a course of physiotherapy. Among them, six (3 each from the infantile and childhood groups) were considered failures, five (2%) of whom underwent re-operation (reluctantly in the case of one child). Intra-operatively, inadequate release of the A1 pulleys was noted in three cases and adhesions were identified as the cause in the remaining two. None of the children had a residual flexion deformity at the IPJ or any other complication from the revision operation.

Discussion

Concerning the nomenclature, several authors have found no instances of 'congenital' trigger thumbs at birth.^{3,15,16} The term 'congenital trigger thumb' was therefore commented on as a misnomer¹⁷ and should be discouraged. Nor were any of the cases in our series diagnosed as being present at birth. The earliest presentation was at the age of 1 month. Moreover, only a small percentage of patients had any congenital abnormalities or family history. Thus, evidence tends to suggest that trigger thumb

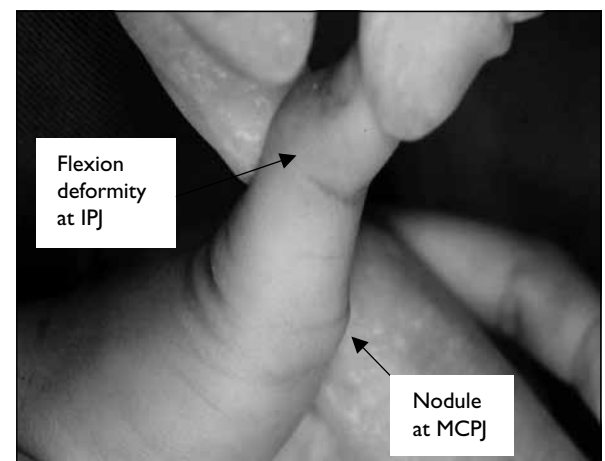


FIG 2. Flexion deformity at interphalangeal joint (IPJ) and nodule at metacarpophalangeal joint (MCPJ) of trigger thumb in a child

in children is an acquired, rather than a congenital, condition.

In the present series, a slight female predominance with right thumb triggering was noted while bilateral involvement occurred in 16%. Unlike trigger digits in adult, children presented with a predominantly flexion deformity and nodules during examination, rather than triggering and pain (Fig 2).

As for the results of surgical release, more than 95% of the operated thumbs enjoyed a good ROM with no apparent scar, which was also compatible with other reports.^{7,8,10-12} Though some authors suggested the use of a longitudinal incision to avoid damaging digital nerves,¹ our transverse incisions resulted in no neurovascular damage, which was also more physiologically and cosmetically superior.

Concerning the timing of surgery, several authors recommend early release at presentation,^{8,10} while others propose successful resolution with release even after the age of 5 years.¹⁴ If the deformity is unaddressed for a long time however, there is a risk of flexion contracture; according to one report this complication ensued before the age of 4 years in up to 50% of cases.⁴ In the current study, flexion deformity persisting postoperatively was noted in a greater percentage of the infantile (8%) than the childhood (3%) groups. Possible reasons include a higher chance of incomplete release in very tiny infantile thumbs, or due to adhesions. In addition to having lower anaesthesia risks, residual deformity was encountered less frequently in subjects older than 1

year. In summary, surgery should proceed after the child is 1 year old, while splinting is recommended for the period of conservative treatment.

Limitations of the present study included its retrospective design, and the relatively short mean follow-up period. Nevertheless, all the patients regained satisfactory ROM before discharge from our care without other complications, and none was re-referred for recurrence of symptoms. Last but not least, there was risk of referral bias in the sample. Patients referred to our clinic represented a hospital-based cohort, which might have omitted asymptomatic patients, those without adequate access to medical care, and those who refused to be seen. Further randomised control studies are needed to compare the efficiency of surgical and conservative treatment of trigger thumbs in children.

Conclusion

Trigger thumbs in children predominantly present with flexion deformity and a nodule at the MCP joint. Surgical release with a transverse incision and splitting of the A1 pulley achieves good cosmesis and attains a satisfactory ROM with minimal complications. Furthermore, the prognosis is good, for both infantile- and childhood-onset groups. To balance the risk of anaesthesia and a higher chance of residual flexion deformity in the very young, surgical release should be deferred till the age of 1 year, while prior to surgery, splinting is a suitable supportive treatment.

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