CASE SERIES

Conservative Treatment Protocol for Pediatric Trigger Thumb

Pedro Martins Branco[1], Sérgio Figueiredo[2], João Monsanto[3], Joana Arcângelo[4], Joana Ovídio[4], Maria José Costa[5]

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Abstract

Introduction: Pediatric trigger thumb is an uncommon condition. The aim of this study was to evaluate the outcome of our conservative treatment protocol for pediatric trigger thumb.

Methods: Retrospective study on a group of children with trigger thumb who were treated by the same physiatrist. From 2008 to 2018, the same conservative treatment protocol was used for all the patients. It consisted of using a splint and passive exercises. Splint application terminated either when the patient gained full range of active motion without snapping or underwent surgical intervention.

Results: 126 trigger thumbs in 98 children were treated according to our protocol. Mean age at first observation was 33.0 ± 18.1 months. At diagnosis, 27.8% of the thumbs were grade 1, 60.3% were grade 2, and 11.9% were grade 3. The average follow-up was 10.8 ± 6.4 months. At the final visit, 71.4% of the thumbs were grade 0A and 17.5% were grade 0B. The remaining thumbs either could be extended actively despite triggering (7.9%) or only passively (2.4%). Just one case (0.8%) had complete blocking. Our treatment protocol presented a high rate of satisfactory results, with 93.7% of patients having complete symptom resolution. The success rate was higher in the younger group. Bilateral cases and initial grade 3 trigger thumb were not associated with worse outcomes.

Discussion: Conservative treatment of pediatric trigger thumb showed a high rate of success. This is important information to emphasize and be passed on to parents so that they may avoid unnecessary surgery in many cases.

Keywords: Child; Conservative Treatment; Exercise Therapy; Portugal; Treatment Outcome; Trigger Finger Disorder/therapy

Introduction

Trigger thumb is an uncommon condition in the pediatric population, with an estimated incidence of 0.05%[1] to 0.3%.[2] It represents about 2% of the congenital anomalies of the upper limb,[2-5] although certain authors suggest that it is an acquired rather than a congenital problem.[2,4,5]

The thumb is affected around 10 times more frequently than the other fingers.[6] Bilateral involvement is a rare condition,[7] which is sometimes associated with genetic disorders.[8]

It is believed that the pathological abnormality in trigger thumb is due to the thickening of the *flexor pollicis longus* sheath and consequent nodule formation - node of Notta - that obstructs the sliding mechanism on the A1 pulley.[9]

Good outcomes have been described with either conservative or surgical treatment. However, most of the studies included patients with pediatric trigger thumb at different stages of severity, and the critical assessment of the validity of those treatments has not been made.[10] This way, there is no consensus about the gold standard of treatment for this condition.

The purpose of this study was to assess the results of our conservative treatment protocol in children with trigger thumb and debate the real need for surgical intervention.

Methods

We performed a retrospective consecutive case series study of every patient admitted to our central pediatric hospital with the diagnosis of trigger thumb who had been treated conservatively. The treatment consisted of a specific rehabilitation protocol performed by the same physiatrist, between February of 2008 and October of 2018.

1. Department of Orthopedic Surgery, Hospital Distrital de Santarém, Santarém, Portugal
2. Department of Orthopedic Surgery, Hospital de Santo André, Centro Hospitalar de Leiria, Leiria, Portugal
3. Department of Physical Medicine and Rehabilitation, Hospital de São Francisco Xavier, Centro Hospitalar de Lisboa Ocidental, Lisboa, Portugal
4. Department of Pediatric Orthopedic Surgery, Hospital de Dona Estefânia, Centro Hospitalar Universitário de Lisboa Central, Lisboa, Portugal
5. Department of Pediatric Physical Medicine and Rehabilitation, Hospital de Dona Estefânia, Centro Hospitalar Universitário de Lisboa Central, Lisboa, Portugal
Corresponding Author
Pedro Martins Branco
https://orcid.org/0000-0003-4313-9718
pmartinsbranco@gmail.com
Serviço de Ortopedia, Hospital Distrital de Santarém, Avenida Bernardo Santareno, 2005-177 Santarém, Portugal
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The inclusion criteria for this study were the diagnosis of trigger thumb no later than 10 years of age and the ability to contact the parents again, at least six months after the first assessment.

The exclusion criteria included the presence of other associated syndromic, genetic, or neuromuscular conditions, refusal to participate in the study, patients who had been treated previously whether with conservative or surgical treatment and patients that did not complete our conservative treatment protocol.

A total of 98 children and 126 trigger thumbs met our inclusion and exclusion criteria. To our knowledge, this is the largest series of conservative treatment of trigger thumb described in the literature.

Trigger thumb severity was graded from 0 to 3 according to the thumb interphalangeal joint range of motion and triggering:

- Grade 0: Means that even with the presence of a node of Notta, the interphalangeal joint can be actively extended to at least 0º without triggering. There are two subgroups in grade 0: 0A for extension beyond 0º, and 0B for extension up to 0º.
- Grade 1: The interphalangeal joint can be actively extended but with triggering.
- Grade 2: Only passive extension is possible with triggering.
- Grade 3: The interphalangeal joint is fixed in a flexed or extended position and cannot be moved either actively or passively.

Our treatment protocol is based on immobilization/orthotic treatment and involves a series of steps (Fig. 1). At presentation, we explained the management method to the parents. The child is clinically evaluated to confirm the diagnosis and to assess the severity of the trigger thumb.

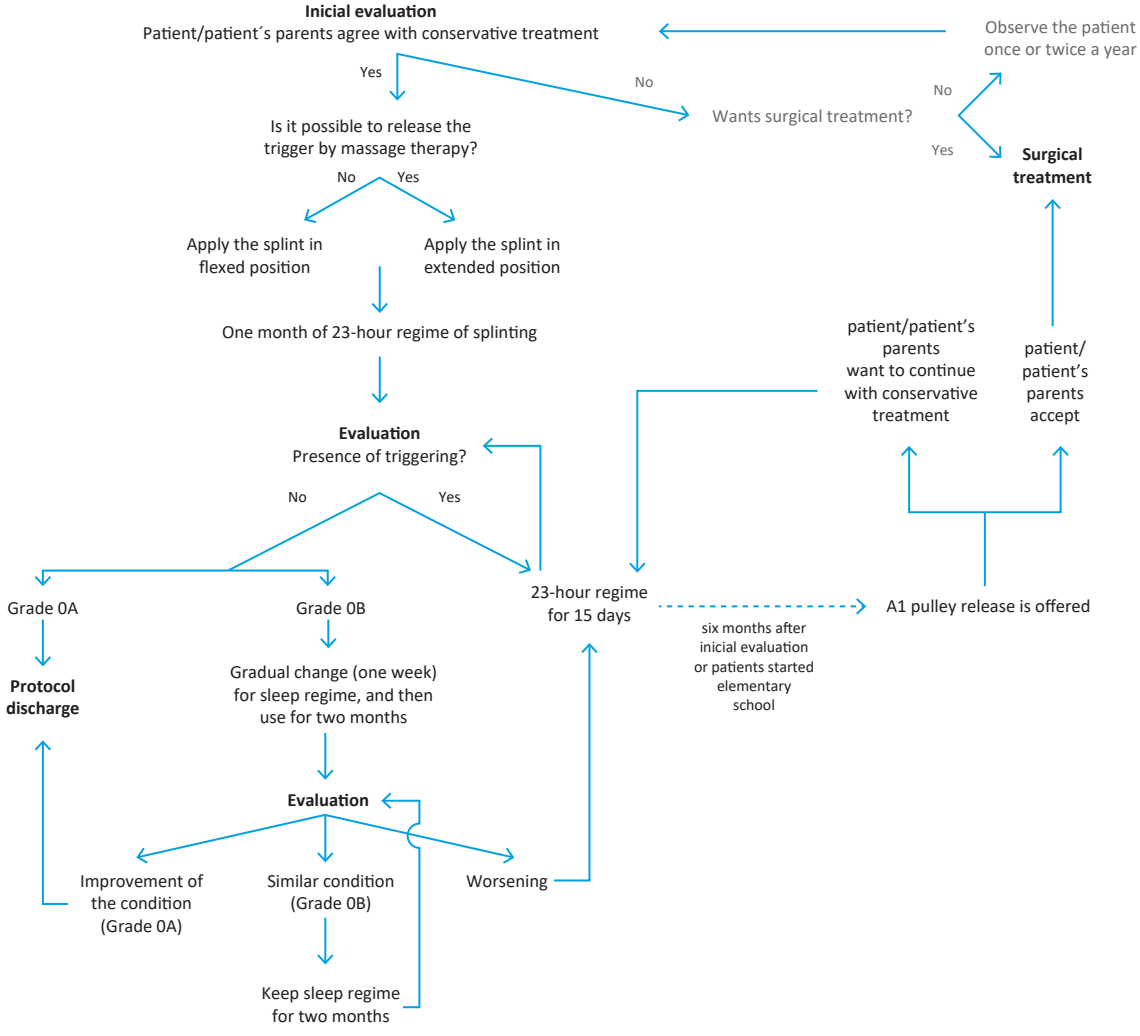

Figure 1. Treatment protocol.

Then, a tailor-made splint (Fig. 2) is made by our occupational therapy service. For the splint itself, we use a perforated thermomoldable plastic material. It is applied to the affected thumb, immobilizing it in a semi-extended semi-abducted position with the interphalangeal joint in the most extended position possible, preventing the hyperextension of the metacarpophalangeal joint (Fig. 3). The treatment rationale was to stretch out the A1 pulley gradually and continuously by the tendon nodule itself. For security, we apply the adhesive felt strip on the edges of the splint and then we cover it with self-adherent wrap to maintain a secure and comfortable fit. Parents are coached on how to place and remove the splint properly. Before placing the splint, the therapist applies massage therapy in the A1 pulley/Notta nodule region and passive mobilization of the thumb in order to release the trigger. The mobilization of the interphalangeal joint should be performed with the metacarpophalangeal joint in flexion. In this position, no pain is caused to the child. If it is painful, the mobilization stops, and the splint is applied in the flexed position.

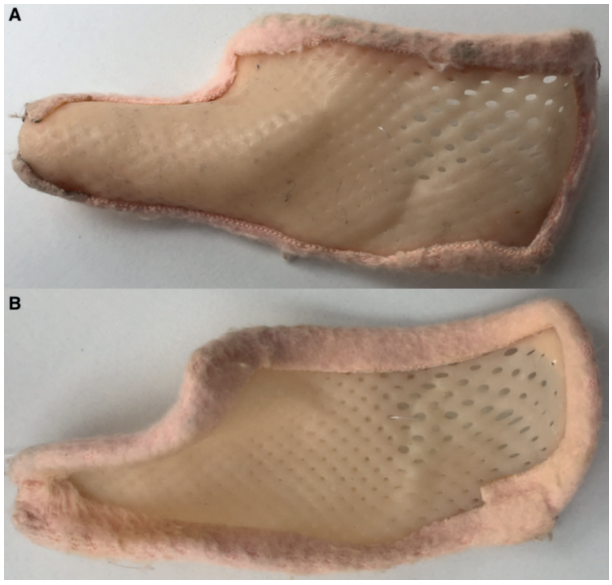

Figure 2. Tailor-made splint with perforated thermomoldable plastic material. Palmar (A) and dorsal (B) views.

Figure 3. The splint is applied to the affected thumb immobilizing it in a semi-extended semi-abducted position with the interphalangeal joint in the most extended position possible.

The splint must be used in a 23-hour regime and should only be removed for bathing and ludic activities (note that activities that excessively require repetitive flexion movements of the interphalangeal joint or strong gripping should be avoided).

After one month on a 23-hour regime, the children are reevaluated. To check for the outcome, we asked about triggering during the time spent without the splint. The thumb was then re-evaluated for the active and passive range of motion and the presence of triggering.

In our experience, immediately after removing the splint, no trigger is observed. However, after a few minutes it sometimes reappears. For that reason, we asked parents to remove the splint two hours before the medical appointment to better access the thumb.

If the child maintains triggering, we continue the 23-hour regime for another 15 days, and thereafter until they reach grade 0B. If the child is already in grade 0B, we change the regime for the sleep regime (the splint is applied only for sleeping whether if it is at night or in the afternoon). The regime change should be gradual over one week. The protocol discharge is decided if the trigger thumb improves to grade 0A.

After the beginning of the sleep regime, the children are reevaluated after two months. If the child condition is similar, we keep the sleep regime for another two months. If the child is worse (recurrence of triggering), we repeat the 23-hour regime for two weeks.

If the child trigger thumb does not improve to grade 0B after six months since the the initial evaluation, or if conservative treatment was ineffective until the patients started elementary school, an A1 pulley release is offered, unless the patients or parents want to continue with the conservative treatment for a longer period.

No time restriction was applied on patients with grade 0B in the sleep regime.

If the patients or parents refuse a splint, we follow-up the patients periodically once or twice per year.

How reliably and for how long the splint was applied could not be ascertained.

The result was satisfactory when the deformity had been corrected, either totally or partially (if the parents reported that sporadic joint blockage was present, but without any functional deficit). Therefore, for the patients with bilateral involvement, satisfactory results were considered when both thumbs had recovered. Unsatisfactory results represented situations of persistence of the deformity and residual snapping.

Our population size allowed us to rely on the central limit theorem, and thus the use of parametric testing on the influence of external factors (age at first visit, gender, and laterality). Statistical significance was considered

whenever we found a *p* value under 0.05. Analysis was performed using IBM SPSS Statistics version 20.0.0 (IBM Corporation, Armonk, NY, USA).

Results

Medical records of 201 children treated in accordance with the above-mentioned protocol were reviewed. Thirty-one patients were excluded due to the impossibility of contact for reassessment and 72 of the children were excluded because other treatment was performed before the application of the protocol. There were no refusals to participate in the study. None of the patients discontinued wearing the splint.

Consequently, 98 children were included in the study, with 126 thumbs involved (71 right thumbs and 55 left thumbs), mostly affecting girls (n = 68; 54%), with a mean age at the first consultation of 33.0 ± 18.1 months (range 2-98 months). The mean length of follow-up was 10.8 ± 6.4 months (range 6-36 months).

At presentation, 35 (27.8%) of the thumbs were grade 1, 76 (60.3%) were grade 2, and 15 (11.9%) were grade 3 (Fig. 4).

At final visit, 90 (71.4%) of the thumbs were grade 0A, and 22 (17.5%) were grade 0B. Thus, 112 (88.9%) could be extended fully. The remaining thumbs either could be extended actively despite triggering (n = 10, 7.9%) or only passively (n = 3, 2.4%), with just one case of complete blockade (0.8%). In all but seven cases, the symptoms improved ($p < 0.01$, paired samples *t* test).

The mean time from diagnosis to noticeable improvement was one month (ranging from one to four months), and the mean time taken for the patients to improve to grade 0B was one month (range 0-36 months).

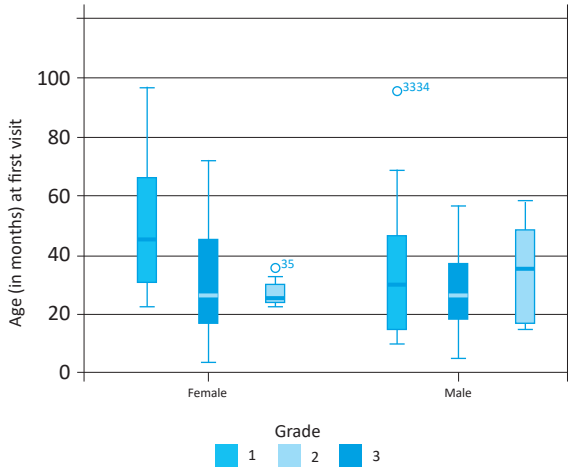

Figure 4. Distribution of trigger thumbs by grade, age at first visit, and gender.

The total time of splinting was six months or less in 53 patients, 7-12 months in 41 patients, 13-24 months in 26 patients, and more than 24 months in six patients. One patient wore a splint for more than 48 months because their parents requested nonsurgical treatment and the splint was well tolerated.

The success rate of conservative treatment decreased with increasing age, from 100% (five out of five cases) in the age group under 1 year-old, to 92.5% (37 out of 40 cases) in age group over 3 years-old, with statistically significant differences found between these two age groups ($p = 0.01$, Bonferroni *post-hoc* analysis of variance, ANOVA). Among the 126 trigger thumbs, 47 (37.3%) were diagnosed before the age of 24 months, and satisfactory results were achieved in nearly all these cases (n = 44, 93.6%). The same happened for the 79 cases in patients who were over the age of 24 months at the time of the diagnosis (n = 74, 93.7%) ($p = 1.00$; Pearson chi-square test).

Bilateral cases were associated with unsuccessful conservative treatment and the need for surgical release. Although bilateral cases were associated to an increased surgical need, the sample size was insufficient to achieve statistically significant differences ($p = 0.08$, Pearson chi-square test). All of these cases showed some symptom improvement during the follow-up period, albeit they did not achieve grade 0B.

The initial grade 3 trigger thumbs were also not associated with worse outcomes when compared with both grades 1 and 2 ($p = 0.16$, ANOVA) and each of these grades individually ($p = 1.00$ and $p = 0.89$, respectively, Bonferroni *post-hoc* analysis). There were also no statistically significant differences between the group of patients who improved to grade 0A or 0B and the group of patients who did not improve, with regards to mean age at first visit ($p = 0.92$).

All trigger thumbs submitted to the surgical release of the A1 pulley recovered fully and no residual contracture or deformity was observed postoperatively.

Of the remaining two patients who showed residual grade 1 triggering, and whose parents decided against surgical treatment, there was no functional impairment despite the residual triggering. No functional deficit was reported by the parents or patients even when the symptoms persisted after school age. These patients remain under observation.

Discussion

Trigger thumb is a relatively uncommon condition[11] with a simple clinical diagnosis. However, aspects of its natural history, evolution, and especially indications for

treatment are not fully known by surgeons, physiatrists, and pediatricians.[12]

Recently, much debate and discussion has focused on the effect of conservative treatment for pediatric trigger thumb.[13]

According to several authors, the incidence of spontaneous recovery of trigger thumb in children ranges from 24% to 50%.[4,14] Due to this reportedly low rate, many authors only considered surgical treatment in their studies.[15] Albeit A1 pulley release has an excellent outcome, there is some disagreement about the best timing and age for the operation.[10] Despite the fact that full motion is obtained in the immediate postoperative period,[14] it is an invasive procedure that requires general anesthesia in children,[5,6] and has some complications, such as nerve injury (0.02%), superficial skin infection (0.03%), partial dehiscence of the suture (0.06%),[16] and recurrence and residual contracture of the thumb after surgical release (4%).[14] Recurrence is generally secondary to the inadequate release of the flexor tendon sheath.[12]

In conservative treatment, one of the major concerns is the duration that a patient can be kept under this treatment. In our study, we found no relationship with the longer use of splints and any complication.

Another major concern about conservative treatment is the prognostic factors that should encourage early surgical release.[13] Previous reports have suggested that patients with bilateral trigger thumbs are not at a higher risk of residual triggering compared to children with unilateral trigger thumbs.[17,18] Our results also showed no relationship between poor prognosis and bilateral trigger thumb.

Some authors[19] noted that the cure rate for patients with severe trigger thumb (locked) at presentation is significantly lower than that for patients with a less severe disease. In our cohort, we could not relate the severity of triggering at presentation with worse outcomes.

Other authors[20] reported no connection between the patient onset age and outcome. In our cohort, the success rate appears to be higher in younger children and decreases with age.

The importance of this study was that it had a large group that was assessed, guided and followed up uniformly by a single physiatrist, and it used the same protocol. A very suitable length of follow-up was achieved (average follow-up was 10.8 ± 6.4 months).

Our study has some limitations. First, this study was retrospective in design and inevitably has inherent biases. Therefore, a prospective study is required to confirm the validity of the conclusions of this study.

Our study only enrolled Portuguese children and thus may not represent the general characteristics of pediatric trigger thumb in other populations.

We did not assess the compliance associated with conservative treatment. However, compliance in this type of situation is very difficult to analyze accurately, and has also not been analyzed in several studies recommending other treatments.

Our results corroborate the most recently published studies, showing that conservative treatment of trigger thumb with splinting presents a high rate of satisfactory results, with 93.7% of patients having complete symptom resolution, especially among children diagnosed up to 1 year-old (100% success rate), without the need for invasive procedures that are prone to complications. With our treatment protocol, there were no complications during or after splint fitting. This information should be given to parents to help deciding on the better approach to take. Another important factor in choosing this kind of treatment is that if the thumb continues to present the trigger deformity until late in childhood, this should not cause any functional harm or compromise the final result, and the surgical treatment can be performed after this age. Therefore, provided that compliance can be assured through adequate instruction and follow-up, splinting appears to be a safer and effective first treatment option.

WHAT THIS STUDY ADDS

- First conservative treatment protocol for pediatric trigger thumb published in the literature.
- Larger published case series, with quicker outcomes.
- Conservative treatment of trigger thumb with splinting presents a high rate of satisfactory results, without the need for invasive procedures.
- Treatment protocol without complications during or after splint fitting.
- Provided that compliance can be assured through adequate instruction and follow-up, splinting appears to be a safer and effective first treatment option.

Conflicts of Interest

The authors declare that there were no conflicts of interest in conducting this work.

Funding Sources

There were no external funding sources for the realization of this paper.

Protection of human and animal subjects

The authors declare that the procedures followed were in accordance with the regulations of the relevant clinical research ethics committee and with those of the Code of Ethics of the World Medical Association (Declaration of Helsinki).

Confidentiality of data

The authors declare that they have followed the protocols of their work center on the publication of patient data.

Provenance and peer review

Not commissioned; externally peer reviewed

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Protocolo de Tratamento Conservador para o Polegar em Gatilho em idade pediátrica

Introdução: O polegar em gatilho em idade pediátrica é uma condição clínica pouco comum. O objetivo do estudo foi avaliar os resultados do nosso protocolo de tratamento conservador para o polegar em gatilho em idade pediátrica.
Métodos: Trata-se de um estudo retrospetivo de um grupo de crianças com polegar em gatilho, tratadas pela mesma fisiatra. Entre 2008 e 2018, o mesmo protocolo de tratamento conservador foi usado em todas as crianças. Este consistia na utilização de uma ortótese e em exercícios de mobilização passiva. A utilização da ortótese terminava quando a criança atingia uma mobilidade ativa completa do polegar sem gatilho ou era submetida a tratamento cirúrgico.
Resultados: 126 polegares em gatilho de 98 crianças foram tratados segundo o nosso protocolo. A média de idades na primeira avaliação era de 33,0 ± 18,1 meses. Na altura do diagnóstico, 27,8% dos polegares era grau 1, 60,3% era grau 2 e 11,9% era grau 3. O *follow-up* médio foi de 10,8 ± 6,4 meses. Na última avaliação, 71,4% dos polegares era grau 0A e 17,5% era grau 0B. Os restantes polegares ou faziam extensão ativa completa apesar do gatilho (7,9%) ou apenas passivamente (2,4%). Apenas um caso (0,8%) apresentava um bloqueio completo. O nosso protocolo de tratamento apresentou uma elevada taxa de resultados satisfatórios, com 93,7% das crianças a apresentarem uma resolução completa da sintomatologia. A taxa de sucesso foi superior em idades mais precoces. Polegar em gatilho bilateral e grau 3 inicial não se relacionaram com piores resultados.
Discussão: O nosso protocolo de tratamento conservador apresentou uma elevada taxa de sucesso. Esta informação deve ser enfatizada e transmitida aos pais, podendo evitar o tratamento cirúrgico de muitos casos.
Keywords: Criança; Dedo em Gatilho/terapia; Portugal; Resultado do Tratamento; Terapia por Exercício; Tratamento Conservador