

Open Versus Percutaneous Surgery for Trigger Thumb in Children

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Purpose. To compare open versus percutaneous surgery in the treatment of stenosing tenosynovitis of the thumb (trigger thumb) in a pediatric population.

Materials and methods. A retrospective study was performed comparing both surgical techniques by reviewing 108 patients (135 thumbs) with a follow-up period of 24 months.

Results. Six patients out of 92 (6.52%) were incapable of complete extension of the interphalangeal joint of the thumb after open surgery. When percutaneous surgery was performed there was recurrence in 15 thumbs of the 43 that underwent surgery (34.8%). No complications were seen related to lack of sensitivity, residual pain, nor alterations of thumb mobility in any of the patients in the two compared series.

Conclusions. Due to the percentage of recurrences seen, percutaneous surgery for trigger thumb is not recommended in a pediatric population.

Key words: trigger thumb, open thumb surgery, percutaneous thumb surgery, children.

Polectomía abierta frente a percutánea en el tratamiento de la tenosinovitis estenosante del pulgar en el niño

Objetivo. Comparar la técnica quirúrgica abierta con la percutánea para el tratamiento de la tenosinovitis estenosante del pulgar en la infancia.

Material y método. Se realizó un estudio retrospectivo donde se revisaron 108 pacientes (135 pulgares) con un período de seguimiento medio de 24 meses, comparando ambas técnicas quirúrgicas.

Resultados. Seis pacientes de 92 (6,52%) presentaban incapacidad para la extensión completa de la articulación interfalángica del primer dedo tras cirugía abierta. Mediante cirugía percutánea la recidiva ocurrió en 15 pulgares de 43 intervenidos (34,8%). No aparecieron complicaciones relacionadas con déficit de sensibilidad, dolor residual, ni alteraciones de la movilidad del primer dedo en ninguna de las dos series comparadas.

Conclusiones. El porcentaje de recidiva acontecido tras el tratamiento percutáneo del pulgar en resorte justifica no recomendar su utilización en la población infantil.

Palabras clave: pulgar en resorte, polectomía abierta, polectomía percutánea, niños.

Although stenosing tenosynovitis involving the flexor *pollicis longus* (trigger thumb) is rare during childhood, it

does feature as a relatively usual surgical condition in pediatric orthopedics units. In the different series published, the incidence of this pathology does not exceed 2% of all congenital alterations of the upper limb^{1,2}. As a result of the thickening of pulley A, the interphalangeal joint of the thumb is locked in flexion³. Proximal to the first pulley there may appear a tendinous thickening called Notta's nodule³. Occasionally a locking of the thumb in extension has been described⁴.

The causes that lead to stenosing tenosynovitis remain controversial⁵. Although a congenital etiology was suggested on the basis of its familial association and its appearance

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at birth¹, the theory that it is an acquired condition is the most widely accepted one at present⁶. Put forward by Sprecher⁷ in 1949, it is grounded on the position adopted by the thumb on the palm of the hand in the first few months of life. In many cases the condition may appear after trauma, which may lead doctors in the emergency room not to request an x-ray study⁸. Certain tumoral pathologies have been described as causes of trigger thumb in children^{9,10}.

Spontaneous recovery takes place in 30% of cases within the first year of life, which means that surgical treatment should be accomplished after that age^{1,5,11}. Dirham and Meggitt¹ recommend careful observation during the first 12 months if the condition is diagnosed at birth. Likewise, they report a 12% rate of spontaneous resolutions if diagnosis is made between 6 and 30 months, which in their view warrants a 6-month follow-up of patients in this age group. Since corrective splints have not shown themselves to be efficient, they are not normally part of the tools used to manage this pathology^{7,12}. If the lesion does not resolve spontaneously, the patient must be operated on before age three. Two different surgical techniques have been described for the treatment of trigger thumb.

Conventional surgery is based on a transverse incision on the anterior fold of the metacarpophalangeal joint. Once the digital nerves have been identified and duly protected, the proximal area of pulley A1 is accessed and longitudinally sectioned. Sometimes it is necessary to excise a segment of the pulley in order to ensure a better release of the tendon.

The percutaneous technique, first described by Lorthior¹³ in adult patients, has been proposed as an alternative to open surgery. Release of the flexor tendon is achieved by opening up the pulley with an intramuscular needle. Pulley placement is important in order to avoid nerve injuries¹⁴. In the thumb, the radial nerve runs diagonally through the flexor tendon from the ulnar to the radial side very proximally to the pulley.

The aim of our study was to compare the results obtained through surgical techniques as regards efficacy and complications rate in pediatric patients.

MATERIALS AND METHODS

A retrospective study was carried out, in which in addition to epidemiological data a record was made of the range of motion of the metacarpophalangeal and interphalangeal joints of the thumbs operated with both techniques. The assessment of deformity was carried out by means of a goniometer, measuring the degrees of flexion of the interphalangeal joint (Fig. 1). Recurrent cases were identified and consideration was given to those in which the patient was incapable of full extension of the interphalangeal joint after surgery. The presence of post-op complications was also

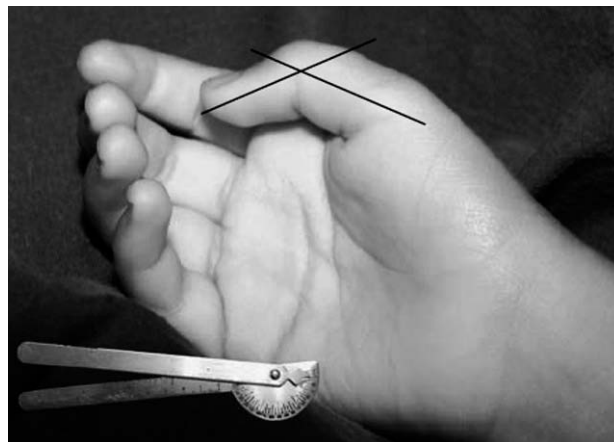


Figure 1. Goniometer-based assessment of the flexion contracture of the thumb's interphalangeal joint..



Figure 2. Open surgery (incision).

identified. Sensitivity was assessed through response to contact of an intramuscular needle with the ulnar and radial area of the thumb.

We found 135 trigger thumbs belonging to 108 patients in our hospital in the period between December 1998 and February 2004. The surgical technique used for each patient was up to the surgeon, no specific variable being considered. All cases were operated with general anesthesia. In 92 cases the procedure consisted in a transverse incision on the volar aspect of the metacarpophalangeal joint followed by a release of the flexor tendon through a longitudinal incision of the pulley, which in some cases (but not all) was resected (Figs. 2 and 3).

In 43 cases, the percutaneous pulley was sectioned and placed with the thumb in abduction and the wrist slightly flexed. The intramuscular needle was placed distal to the nodule on top of the annular structure A1, causing the pulley to tear on extending the interphalangeal joint (Fig. 4).

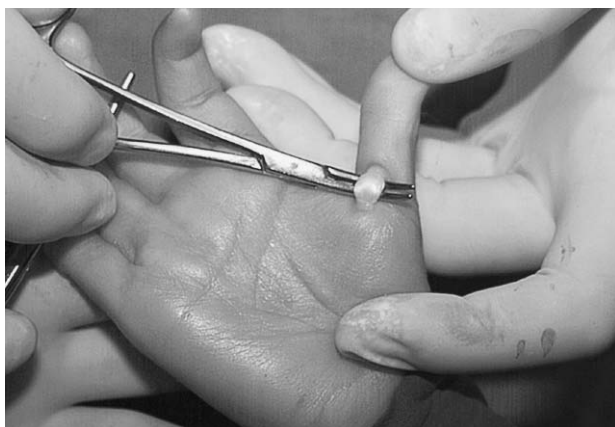


Figure 3. Release of the thumb flexor tendon.



Figure 4. Percutaneous surgery.

Ordinary post-op for both series consisted in placing a compressive bandage for a week with the thumb in extension, recommending the use of non-steroidal anti-inflammatory drugs. All patients were examined at 2, 7, 14 and 30 days with a mean follow-up of 24 months (range: 4- 60 months).

A descriptive study was made in order to calculate the mean and the standard deviation of the quantitative variables. The inferential statistical analysis was made using the SPSS v10 software, which permits the comparison of percentages using chi square. Values of $p < 0,05$ were considered statistically significant. The *odds ratio* was used to determine the patients' probability to have a recurrence.

RESULTS

Of the 108 patients, 57 were girls and 51 boys. The mean age at which surgery was performed was 24 months (range: 15-72 months). As regards the side involved, there were 40 right-sided cases, 41 left-sided and 27 bilateral.

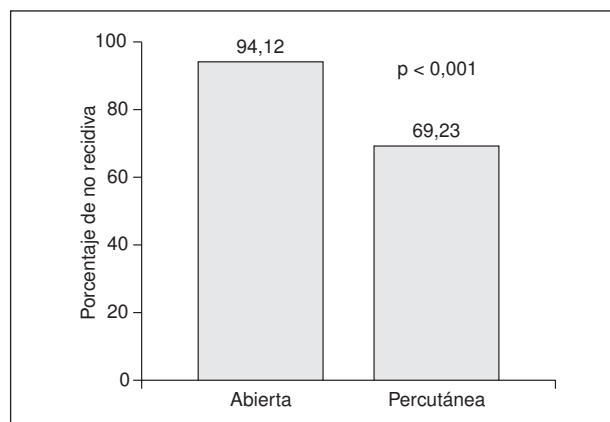


Figure 5. Non-recurrence percentage with both surgical techniques.

Before surgery, the affected thumbs presented with a flexion contracture of the interphalangeal joint of 30° on average, with full mobility of the metacarpophalangeal joint. Six patients of the 92 operated on with the open technique had a reduced extension of the interphalangeal joint (15° on average). This points to a recurrence rate of 6.52%.

With the use of percutaneous surgery, cases of decreased extension of the interphalangeal joint in recurring cases were 20° on average. This happened in 15 thumbs of the 43 operated with this technique (recurrence rate: 34.8%). This means that of patients operated with a transverse incision 93.48% had no recurrence, whereas in those in which percutaneous surgery was performed this value fell to 65.23% (Fig. 5).

As regards the ratio between open surgery and lack of recurrence, the *odds ratio* was 6.0 with a 95% confidence interval (CI) (1.76-21.49), which indicates that in cases of open surgery the recurrence risk is six times lower.

As far as post-op infections during follow-up, they only appeared in two cases of open surgery; they were superficial infections that resolved with oral antibiotic therapy (amoxicillin- clavulanic acid). After that, no recurrences of trigger thumb were recorded. No complications were found associated with decreased sensitivity, residual pain, flexor tendon injury, hyperextension of the metacarpophalangeal joint or alterations in the mobility of the interphalangeal joint in either of the two series compared.

DISCUSSION

The development of percutaneous techniques as alternatives to an open incision for the treatment of trigger thumb in adults¹⁵⁻¹⁷ has been followed by their use in the pediatric population. In spite of the articles that report excellent results in adults^{15,16}, there are few series that study differences between both techniques in children.

In the case of percutaneous surgery, the main concern is the risk to injure the collateral nerves since they cannot be visualized during the surgical procedure^{14,18}. The radial digital nerve runs diagonally through the flexor hallucis longus tendon from the ulnar to the radial side, proximally to the metacarpophalangeal joint. Distally, the nerve is in the lateral region of the thumb¹⁹. In our technique, the intramuscular needle is placed in the middle and distal area of the pulley and not proximally to the metacarpophalangeal joint as preconized by other authors^{13,19}. In the 43 thumbs reviewed we found no alterations in sensitivity, which means that ours is a safe technique. Injuries to the flexor tendon, another complication described for the percutaneous technique^{16,20}, were not seen in our series.

As regards the effectiveness of the technique, we can say that a relapse rate of 34.8% prevents us from characterizing it as effective for the pediatric population, in contrast to the satisfactory results recently reported by Wang et al²¹. Arguments such as the non-use of ischemia and the need for less OR time as in favor of the closed over the open technique do not seem convincing enough to justify the use of this technique given the high relapse rate and the need to use general anesthesia with both techniques. This constitutes an added risk that cannot be avoided in children; in adults the situation is different since the percutaneous technique is carried out with local anesthesia¹⁴.

The higher relapse rate of the percutaneous technique in children could be related to their greater ability of would-healing and of recovering *ad integrum* the sectioned anatomic structures. Also, while with adults rehabilitation is begun early after surgery¹⁷, in our series we had a one-week immobilization period, which could have been responsible for the higher relapse rate.

In contrast, the open technique makes it possible to identify and detach the collateral nerve. Like us, McAdams³ recommends a transverse incision on the metacarpophalangeal joint to release the nerve; this contrasts with the longitudinal skin incision proposed by other authors, which would reduce the risk of a nerve lesion²². Up to 17% residual pain has been described in adults after open surgery; but we have found no would-healing alterations or pain in our series¹⁹.

Another advantage of open surgery is to resect a band of the A1 pulley and consider the thinning of the nodule to guarantee the result. Doyle and Blythe²³ show a decrease in the mobility of the interphalangeal joint and an increased mobility in the metacarpophalangeal joint when both pulley A1 and the oblique pulley are sectioned. We have not detected any variation in joint mobility as a result of an excessive opening of the distal pulley to the A1 pulley.

Another factor that might tip the scales in favor of open surgery would be cases secondary to a tumor, which might

make it possible to release the flexor hallucis longus tendon^{9,10}. Regarding the superficial infection rate of 2.2%, this figure is comparable to that of other published open surgery series^{5,21}, cases of relapse being inexistent. In contrast to the good results published with the percutaneous technique in adults^{14,17}, we did not find any advantages that justify its use in pediatric patients.

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