Trigger Fingers After Open Carpal Tunnel Release

Le doigt à ressort après une libération ouverte du canal carpien

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Abstract

Trigger finger (TF) and carpal tunnel syndrome (CTS) are common conditions often occurring together with an unclear relationship. While some studies conclude that TFs occur as a result of carpal tunnel release (CTR), others have not established a causal relationship. Our purpose was to evaluate the prevalence and timing of TF development in the same hand after open CTR in our population. This was a retrospective review of 497 patients undergoing open CTR by a single surgeon. Two hundred twenty-nine charts were analysed for age, gender, handedness, BMI, workers' compensation status, and background disease. We analysed the specific digit involved and timing to development of triggering after CTR. Thirty-one patients developed triggering after CTR (13.5%). Mean age was 52.5 (14.0) years. Follow-up ranged from 1 to 53 months with a median follow-up of 6 months (interquartile range = 2-13). The thumb was the most common to trigger (42.22%), followed by the ring 24.44%, middle 22.22%, little 8.89%, and index fingers 2.22%. Trigger thumb occurred at 3.5 months (3.6) post-operatively, while other digits triggered at 7.5 months (4-10.25) after surgery ($P = .022$). No risk factors were associated with TF development. Our results suggest that a trigger thumb develops more frequently and earlier than other trigger digits after an open CTR. Further study is needed to clarify the mechanisms involved and may enable specific treatment such as local anti-inflammatory medication following CTR. We suggest educating prospective carpal tunnel surgery patients to high risk of triggering following CTR.

Résumé

Le doigt à ressort et le syndrome du canal carpien sont des affections courantes et souvent conjuguées, sans qu'on en comprenne exactement le lien. Selon certaines études, le doigt à ressort se produit après une libération du canal carpien (LCC), mais selon d'autres, ce lien n'existe pas. Les chercheurs ont voulu évaluer la prévalence et le moment d'apparition des doigts à ressort après une LCC de la même main au sein de leur population. Les chercheurs ont réalisé la présente étude rétrospective auprès de 497 patients chez qui le même chirurgien avait effectué une LCC ouverte. Ils ont examiné 229 dossiers pour tenir compte de l'âge, du genre, de la manualité, de l'indice de masse corporelle, du droit ou non à l'indemnisation des travailleurs et des maladies sous-jacentes. Ils ont analysé le doigt touché et le moment de l'apparition du problème après la LCC. Trente et un patients, d'un âge moyen de 52,5 ans (14,0), ont présenté un doigt à ressort après une LCC (13,5 %). Les suivis ont duré de un à 53 mois, pour une médiane de six mois (intervalle interquartile = 2 et 13). Le pouce était le plus touché (42,22 %), succédé par l'annulaire, à 24,44 %, le majeur, à 22,22 %, l'auriculaire, à 8,89 %, et l'index, à 2,22 %. Le pouce à ressort se déclarait 3,5 mois (3 et 6) après l'opération, mais les autres doigts étaient touchés 7,5 mois (4 et 10,25) après l'opération ($P = 0,022$). Aucun facteur de risque n'a été associé à

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l'apparition du doigt à ressort. Selon les résultats, le pouce à ressort est le plus fréquent après une LCC ouverte, plus tôt que les autres doigts. Des études plus approfondies pourraient révéler le mécanisme d'occurrence conjuguée et favoriser l'utilisation d'un traitement particulier, comme une médication anti-inflammatoire localisée après la LCC. Les chercheurs proposent d'informer les patients candidats à une LCC du risque élevé de doigt à ressort après l'intervention.

Keywords

carpal tunnel release, occurrence, surgery, timing, trigger finger

Introduction

Trigger finger and carpal tunnel syndrome (CTS) are common hand conditions that often occur together with an unclear relationship.^{1,2} Although the etiology of each condition is often unknown and likely multifactorial, they occur concomitantly at varying time intervals. While some studies conclude that TFs occur as a result of carpal tunnel release (CTR), others found that they present concurrently.³ Goshtasby et al found that TFs seemed to develop more often following endoscopic CTR and in the presence of osteoarthritis, while Zhang et al found that older age, female sex, higher body mass index (BMI), and TF were associated with CTR but did not document a clear causal relationship between the TF and CTR.^{2,4} Recently Lin et al in a retrospective study found that CTR was significantly associated with the subsequent development of trigger digits in the post-operative 6 months. They did not document the presence of TFs at the time of CTS diagnosis.^{5,6} It seems that while patients with CTS often go on to develop TF, the reverse is also true: patients with TF have an increase in risk of developing CTS.⁷ In an analysis of 8 observational studies, Lin et al found a post-operative incidence of TF of 5.2% to 31.7%. The time to development of trigger digits was approximately 6 months post-operatively⁶; however, a recent study by Zhang et al on 1386 hands concluded that although there is a predisposition for these conditions to present in the same hand, CTR did not seem to cause any new incidence of TF in the operative hand.⁸

It is therefore difficult to counsel patients in the clinic prior to conservative or surgical treatment for TF or CTS since the literature provides limited guidance as to natural history and timing of these 2 very common conditions. The purpose of this study was to examine the timeline for the development of a TF after open carpal tunnel surgery and the patient characteristics of those developing TF after surgery in our population.

Materials and Methods

We conducted a retrospective study of patients who had open CTR by a single surgeon between January 1, 2010, and December 31, 2013. The appropriate ethical committee approved the research protocol in line with the Declaration of Helsinki 1975, revised Hong Kong 1989.

All adult patients undergoing surgery for CTR were reviewed for eligibility for the study. Exclusion criteria included patients who (1) had a previous or concurrent

diagnosis of TF, (2) had presented for revision carpal tunnel surgery, (3) had a corticosteroid injection for either CTS or TF, or (4) had CTR for traumatic reasons. No patients with concurrent procedures in the same limb at any time were included.

All CTRs were performed by the same surgeon, typically under brief sedation with tourniquet control. An open technique was employed, including limited mobilization of the ulnar neurovascular bundle prior to a distal to proximal release of the transverse carpal ligament along its ulnar margin. A limited epineurolysis was undertaken but no internal neurolysis or synovectomy. 0.5% Marcaine was added at the end of the case for postoperative pain. Skin was closed with nylon prior to application of a bulky compressive dressing. The latter was removed at day 2 to 3 for early mobilization, and sutures were removed at 2 weeks.

A total of 497 patients (current procedural terminology (CPT) code 64721 neuroplasty and/or transposition of median nerve at the carpal tunnel) were identified. We excluded 268 patients who did not fit the inclusion criteria, and the remaining 229 patients' charts were included in the study.

Data Collection

The primary outcome measure was whether or not there was subsequent development of TF after open carpal tunnel surgery in the operated hand. For those with TF, the involved digit and the timing of onset of TF after the release were noted. In addition, all cases were reviewed for age, handedness, BMI, workers' compensation status, and medical history, including diabetes and hypothyroidism, to assess for potential risk factors for the development of a post-carpal tunnel TF.

Data Analysis

All of the dichotomous potential risk factors (except age and BMI) were compared for the 2 groups (trigger/no trigger) using χ^2 tests of proportion or Fisher exact tests when expected frequencies were too low. Age was compared using *t* test for independent groups. Both BMI and time to occurrence were analysed using Wilcoxon ranked sum test, as their distributions did not meet the assumptions of normality. For those with trigger occurrences, similar analyses were run comparing thumb and fingers as the involved digit.

Table 1. Population Characteristics: Comparison Between Those With Trigger Fingers and the Group That Did Not Develop Triggering.

	Total population (N = 229)	Population with post-operative trigger fingers (n = 31)	Population without post-operative trigger fingers (n = 198)	P value
Gender: males, n (%)	80 (34.9%)	9 (29.0%)	71 (35.9%)	.459
Age (years), mean (SD)	52.5 (14.0)	55.7 (9.1)	52.0 (14.5)	.059
BMI, median (IQR)	29.3 (25.8-34.0)	31.4 (27.8-35.5)	29.3 (25.6-34.0)	.091
Handedness, n (%)	Left: 18 (7.9%); right: 207 (90.4%); ambidextrous: 4 (1.7%)	Left: 3 (9.7%); right: 28 (90.3%); ambidextrous: 0 (0.0%)	Left: 15 (7.6%); right: 179 (90.4%); ambidextrous: 4 (2.0%)	.845
DM, n (%)	22 (9.6%)	5 (16.1%)	17 (8.6%)	.192
Hypothyroidism, n (%)	26 (11.4%)	4 (12.9%)	22 (11.1%)	.762
Workers' compensation, n (%)	92 (40.2%)	14 (45.2%)	78 (39.4%)	.542
Follow-up, median (IQR)	6 months (2-13)	15.5 (12-24)	5 (2-12)	<.001

Abbreviations: BMI, body mass index is measured in kilogram/meter²; DM, diabetes mellitus; IQR, interquartile range.

Results

Out of 229 patients who underwent open CTR, 31 developed trigger digits (13.5%). Of the 315 CTRs (86 patients had bilateral surgeries), there were 45 post-operative trigger digits (14.2%). When both sides were released, the minimum interval between sides was 2 weeks. Follow-up ranged from 1 to 53 months, with a median follow-up of 6 months (Table 1).

Our series contained TFs that developed after open CTR in all 5 digits. Trigger thumb was the most prevalent at 42.22% (19 cases), followed by the ring finger 24.44% (11 cases), middle finger 22.22% (10 cases), 8.89 little finger (4 cases), and index finger 2.22% (1 case).

Risk factors for TF development after open CTR were examined. We evaluated gender, age, handedness, BMI, workers' compensation status, and medical history of diabetes or hypothyroid. None of the evaluated categories were found to be a risk factor for developing a trigger digit after CTR. The sample size was underpowered to detect background disease such as diabetes as a causative factor for the association between CTR and TF. Furthermore, although it is our practice to examine all hands for TF and tenderness over the A1 pulleys, since this was a retrospective review, some of the patients with initial TFs may not have been documented. Looking at the occurrence of TFs in the non-operated hand could potentially distinguish between an etiology that is related to the surgical release and etiology that causes triggering that is not related to the surgery. In our population, we had 1 patient who had surgery on the right and developed a trigger thumb on the left. This was a 49-year-old female with diabetes, De Quervains stenosing tenosynovitis, and a follow-up of 18 months. No conclusions could be obtained from this observation (Table 1).

Of those patients who developed a trigger digit after CTR, trigger thumb occurred statistically sooner than any other digits. Trigger thumb occurred at a median of 3.5 months post-operatively, while other trigger digits combined occurred at a median of 7.5 months post-operatively, and this difference was statistically significant (19 thumbs, 26 fingers, $U = 148$, 2-tailed $P = .022$). Although the little finger triggering also

occurred earlier (median 4.5 months post-operatively), this was not statistically significant.

Discussion

We found an incidence of new TF after CTR in the operated hand that was comparable to the study by Zhang et al.⁸ The timing and finger involved in triggering in this study is in tandem with the meta-analysis by Lin et al.^{5,6} They found that the thumb and ring finger were most commonly affected and that most TFs developed within 6 months of surgery. Trigger thumb in our study occurred early with an average of 3.5 months after an open CTR, while the other fingers triggered 7.5 months after CTR. We found that the little finger also tended to trigger earlier though this was not significant. In general, triggering of the little finger was less common than the thumb and ring triggering based on our data.

In a large study of 1185 CTRs, King and coauthors also found the thumb to be the most common digit to trigger after CTR.⁹ They further concluded that the remaining digits did not trigger any more frequently after CTR. While the thumb triggered more often in the operated hand, the little finger triggered with the same frequency in operated and non-operated hands with CTS, and the remaining digits triggered more often in non-operated hands. It is unclear from our study and from the literature whether the epidemiology of post-operative TFs differs from primary TFs. It cannot therefore be inferred at this stage that the mechanism for triggering differs between the 2 groups but rather it is likely that postoperative (CTR) TFs occur in patients with an innate tendency toward TF but that the carpal tunnel surgery possibly increases the likelihood of triggering.

The pathology behind the link between these 2 conditions is unclear. We believe that the reason TFs tend to develop following surgery for CTS is due to an underlying tendency that is exacerbated by post-operative edema. It is possible that when a CTR is done, the radial and ulnar bursae within the carpal tunnel become edematous after their concurrent decompression with the median nerve. This edema may extend distally and

cause friction at the thumb and small finger A1 pulleys, thus leading to an increase in thumb and small finger triggering following surgery.

Hombal and Owen described the relationship in 1970 and suggested the alteration in anatomy as the pathophysiology.⁷ Some authors have suggested that by releasing the carpal tunnel, a “bow-stringing” effect occurs on the flexor tendon sheaths, and their entry angle into the A1 pulley changes, causing inflammation and thus TF.¹⁰ This hypothesis has not been supported by the suggestion that the magnitude of bowstringing is less with endoscopic CTR and yet endoscopic technique is a risk factor for subsequent development of trigger digits.^{4,11}

Our study is limited by its retrospective nature. Chart reviews rely on accurate documentation. Coupled with this, carpal tunnel patients are also likely to have shorter follow-up times and we suspect the true incidence of post-operative trigger digits to be higher. Since our practice has a high percentage of workers’ compensation patients, we may have longer follow-up of these patients who are regularly scheduled for longer follow-up durations until they achieve a permanency rating. Workers’ compensation status, however, was not found to be a statistical risk factor for subsequent triggering. We may also have a bias regarding length of follow-up in this retrospective review since it is possible that patients with continued complaints after surgery (some of which are the occurrence of TF) will have longer follow-up periods as they continue to be treated by the surgeon.

Although it is possible that we are missing TFs that occur in the operated hand in longer follow-up after the surgery, it is unclear whether these occurrences are directly related to the release since it is logical that post-operative changes such as inflammation and edema do not significantly persist many months following the surgery. Perhaps a separate study looking at long-term occurrence of TFs after CTR can help clarify the etiology of the related occurrence of these 2 conditions.

If the short-term association between CTR and TF occurrence is a result of post-operative inflammation and edema, evaluation for tenderness over the A1 pulleys prior to surgery and injection of steroid into those A1 pulleys that are tight or very slightly tender at the time of surgery may help prevent the manifestation of TFs.

Based on our results, we encourage ongoing research into the possible inciting role that an open CTR has on the development of trigger thumbs and trigger digits. An understanding of this mechanism may enable specific treatment such as local anti-inflammatory medication following carpal tunnel surgery or injections as described. Furthermore, we suggest disclosing to prospective carpal tunnel surgery patients the potential risk and timing of trigger thumb and trigger digits as well as

warning signs as symptoms may develop outside of a routine follow-up interval.

Declaration of Conflicting Interests

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