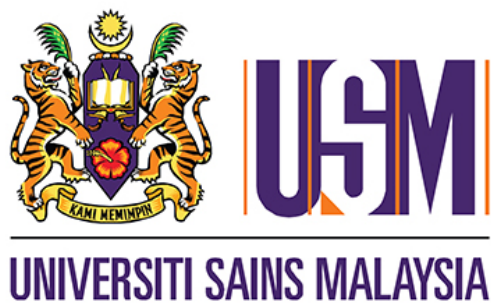


**THE FUNCTIONAL OUTCOME OF MINI CARPAL
TUNNEL RELEASE IN HOSPITAL QUEEN
ELIZABETH II**

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**DISSERTATION SUBMITTED IN PARTIAL
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LIST OF ABBREVIATIONS

ASHT	American Society of Hand Therapy
CTR	Carpal Tunnel Release
CTS	Carpal Tunnel Syndrome
DASH	Disabilities of the Arm, Shoulder and Hand
FSS	Functional Status Scale/ Score
MPCTR	Mid-Palmar Carpal Tunnel Release
NCS	Nerve Conduction Study
NSAID	Non-Steroidal Anti-Inflammatory Drugs
SSS	Symptom Severity Scale/ Score
TCL	Transverse Carpal Ligament

Abstrak

Pengenalan

Sindrom Terowong Karpal (CTS) adalah istilah yang merujuk kepada apa-apa keadaan yang membawa kepada tekanan saraf median semasa ia melalui terowong karpal. Aduan utama adalah paraesthesia dan kesakitan pada waktu malam. Penilaian klinikal dan dengan “Nerve Conduction Study (NCS)” adalah diagnostik terhadap CTS. Pilihan perawatan CTS boleh dikelaskan kepada kaedah bukan pembedahan dan pembedahan tetapi pesakit yang dirawat melalui pembedahan mempunyai hasil yang lebih baik selepas tempoh satu tahun daripada berbanding mereka yang dirawat tanpa pembedahan. Hasil pembedahan terowong karpal (CTR) boleh dinilai sama ada secara objektif atau subjektif. Kajian ini menilai hasil fungsi pembedahan mini CTR pada bahagian kedutan distal pergelangan tangan.

Objektif

Objektif utama kajian ini adalah untuk menentukan sama ada kaedah pembedahan mini CTR adalah selamat, mudah diulang dan penilaian kualitatif daripada pesakit yang menjalani pembedahan tersebut. Alat yang digunakan untuk menilai hasil fungsi pembedahan mini CTR ini ialah melalui penilaian borang soal selidik “SYMPTOM SEVERITY SCALE (SSS)” dan “FUNCTIONAL STATUS SCALE (FSS)” yang diisi sebelum pembedahan dan 3 bulan selepas pembedahan dijalankan.

Secara objektif , kekuatan genggam tangan diukur dengan menggunakan “Jamar Hand Grip Dynamometer” sebelum dan selepas pembedahan pada bulan ke-3 untuk mengukur hasil perkembangan prosedur tersebut.

Kaedah

Seramai 36 pesakit (40 tangan) yang berumur antara 22-71 tahun yang telah dipastikan mempunyai CTS daripada kajian NCS dipilih dari Hospital Queen Elizabeth II. Pesakit telah disaring mengikut kriteria inklusif dan eksklusif yang telah ditentukan berdasarkan nota kes dan temuduga di klinik. Pada hari pembedahan , persetujuan bertulis diambil dan soal selidik berdasarkan SSS, FSS dan kekuatan genggam tangan telah dinilai. Selepas itu, pembedahan mini CTR dengan insisi di kedutan distal pergelangan tangan telah dilakukan oleh seorang pakar bedah tunggal untuk mengelakkan bias. Seterusnya, pesakit telah didisaj dengan rancangan yang sesuai selepas pembedahan itu. 3 bulan selepas pembedahan, pesakit dikehendaki menghadiri klinik untuk penilaian semula SSS, FSS dan kekuatan genggam tangan selepas pembedahan. Pesakit-pesakit juga disoal selidik mengenai tarikh pengembalian kerja, penampilan parut, komplikasi sekiranya ada dan pendapat keseluruhan serta pengalaman mengenai prosedur tersebut. Semua data telah dikumpul secara terperinci dan dianalisis menggunakan perisian IBM® Social Science and Statistical Packaged (SPSS) versi 19.0.

Keputusan dan rumusan

Min skor SSS telah berkurang daripada 33.60 kepada 15.25 yang menandakan bahawa CTR berjaya dalam mengurangkan simptom pesakit berbanding sebelum pembedahan. Begitu juga dengan skor min untuk FSS, di mana ia berkurang daripada 26.65 kepada 11.25 selepas pembedahan CTR yang menandakan bahawa pembedahan itu berjaya. Kekuatan cengkaman tangan meningkat sebanyak 28 hingga 31 % secara purata 3 bulan selepas CTR . Semua 36 pesakit yang menjalani pembebasan terowong carpal di bahagian kedutan distal pergelangan tangan dengan insisi mini yang menegak berpuas hati dengan penampilan parut selepas pembedahan yang hampir tidak kelihatan. Semua pesakit kecuali seorang wanita telah mengalami komplikasi Sudeck Dystrophy yang kemudian diselesaikan melalui rehabilitasi yang komprehensif. Manakala, 3 tangan yang dibedah mempunyai kesakitan pada parut pembedahan sehingga 3 minggu yang pertama yang kemudiannya hilang pada 3 bulan. Semua pesakit kecuali wanita yang mempunyai Sudeck Dystrophy dapat kembali bekerja dalam masa 4 minggu dari tarikh pembedahan. Secara keseluruhannya, semua 36 pesakit dapat kembali kepada status fungsi yang baik 3 bulan selepas pembedahn CTR.

Abstract

Introduction

Carpal tunnel syndrome (CTS) is a term which refers to any condition leading to compression of median nerve as it is transmitted in the carpal tunnel. The main complaints were paraesthesia and night pain. Clinical evaluations along with nerve conduction study are almost diagnostic of CTS. The treatment options for CTS can be classified into non operative and operative methods but patients treated surgically have better outcomes at one year than those treated nonoperatively. The outcome of carpal tunnel release (CTR) can be assessed either subjectively or objectively with each has its own advantages and disadvantages. This study assessed the functional outcome of vertical mini CTR at distal wrist crease.

Objective

The main objective of this study was to determine whether this particular method of mini CTR was safe, easily reproducible and qualitative assessment of the patients. The tools used to assess the functional outcome were the SYMPTOM SEVERITY SCALE (SSS) and FUNCTIONAL STATUS SCALE (FSS) questionnaire pre and post operatively at 3 months. Objectively, the hand grip strength was measured by using Jamar Hand Grip Dynamometer pre and post operatively at 3 months to gauge the outcome of carpal tunnel release.

Methods

36 patients (40 hands) aged between 22 to 71 years of age who had been diagnosed to have CTS from nerve conduction studies were selected from Hospital Queen Elizabeth II and screened according to the pre-determined inclusion and exclusion criteria. On the day of surgery, written consents were taken and the patients pre operative SSS, FSS and hand grip strength were evaluated. Subsequently, the vertical mini incision CTR at distal wrist crease was performed by a single surgeon to avoid bias. 3 months after their surgery, patients were reassessed of the post operative SSS, FSS and hand grip strength. The patients were also asked pertaining return to work date, scar appearance and tenderness, complications and overall opinion and experience regarding the procedure.

Results and conclusion

The mean score for SSS reduced from 33.60 to 15.25 which signify that CTR was successful in reducing the patients' symptoms. Likewise the mean score for FSS reduced from 26.65 to 11.25 post operatively which signify that the surgery was a success. The handgrip strength improved by 28 to 31 % on average 3 months after CTR. All the 36 patients who underwent the vertical mini carpal tunnel release at distal wrist crease were satisfied with the post operative scar which was barely visible. All but one lady developed Sudeck's Dystrophy which later resolved. 3 hands had scar tenderness up to 3 weeks which resolved at 3 months. All patients except the lady who had Sudeck's Dystrophy were able to

return to work within 4 weeks from the date of surgery. Overall, all the 36 patients were able to return to good functional status after CTR at 3 months post operative.

Chapter 1: Introduction

Carpal tunnel syndrome (CTS) is a term which refers to any condition leading to compression of median nerve as it is transmitted in the carpal tunnel. Aetiologies that predispose to reduction in the size of carpal tunnel include acute trauma to the wrist and carpal bones, hypothyroidism, tenosynovitis, rheumatoid arthritis and inflammation. However, the majority of cases are idiopathic.

Majority patients present with paraesthesia and anaesthesia of radial three and half digits of the hand associated with night pain. Besides weakness in abduction and opposition of the thumb which are the motor losses lead to diminution of hand grip strength. Various clinical methods have been described to clinically confirm CTS. Symptoms may be reproduced Tinel's test (tapping over carpal tunnel), Phalen's test (holding wrist joint in flexion) and Durkin's compression test which is the most sensitive and specific. It is performed by direct compression of median nerve at the carpal tunnel to reproduce the symptoms. Nerve conduction study (NCS) is proven to be diagnostic and confirm clinical suspicion of CTS (De Krom *et al* 1992).

Treatment of CTS can be classified into non operative and operative methods. Non operative methods include modification of activity, splinting and steroid injections. Surgery is indicated when conservative treatment fails, atrophy of thenar muscle, sensory loss or axonal loss on NCS. Patients treated surgically have better outcomes at one year than those treated nonoperatively (Jarvik JG *et al* 2009).

The rationale behind this study is to propose that the vertical mini open carpal tunnel release at distal wrist crease is a safe, easily reproducible means of decompressing the median nerve at the level of carpal tunnel and can be done practically with limited facilities. The proposed benefits of this method are reduced complications at the level of wrist, reduced risk of recurrent branch damage and quicker return of function given the length of incision (Celloco P *et al* 2005).

Chapter 2: Literature Review

2.1: Epidemiology

Carpal tunnel syndrome (CTS) was described as early as 1854 by Sir James Paget. CTS is the most common peripheral mononeuropathy; nevertheless its prevalence is still rather under reported throughout the world (Atroshi.I *et al* 1999). Women are three times more likely than men to develop CTS, perhaps because the carpal tunnel itself may be smaller in women than in men. The dominant hand is usually affected first and produces the most severe pain.

In a survey by De Krom M.C. *et al* (1992) in the Netherlands reported in a group of 751 patients aged 24 to 74 years the prevalence of confirmed CTS electrophysiologically was 5.8% in women and 0.6% in male. The mainstay question in this study was “Do you wake up at night because of tingling sensation in your fingers?” which turns out to be a simple screening tool. Numerous literatures claim this question proves to have high diagnostic value of CTS and can be used to detect existing CTS among adult women earlier.

More recently, the annual incidence of individuals suffering from CTS has been reported 1.5% to 3.5% of the population and of that approximately 20 out 1000 individuals undergoes carpal tunnel release (Bradley *et al* 2003).

Surgical treatment for carpal tunnel syndrome is the most frequent surgery of the hand and wrist, with 463,637 carpal tunnel releases annually accounting for 1 billion US Dollars in direct cost (Concannon M.J *et al* 2000).

2.2: Diagnosis of Carpal Tunnel Syndrome (CTS)

Early diagnosis and treatment are important to avoid permanent damage to median nerve. 73% of CTS patients reports sleep disturbance, another 12% miss their daily work and another 18% change their work activities. Whereas 17% of them need to change their jobs (Nordstrom D.L. *et al* 1998). Tingling sensation or discomfort which wakes the patient from sleep at night is the chief complaint in 95% of patients of CTS confirmed by neurophysiological study (De Krom *et al* 1990).

Numerous provocative tests have been advocated to diagnose CTS. Paraesthesia of the fingers innervated by the median nerve which wakes the patient up from sleep is the most prominent symptoms. There are 12 provocative test documented by De Krom *et al* (1990) described by various surgeons. The following tests are:

- 1. Flick sign.** The patient was asked if flicking movements with wrist and fingers eliminated the symptoms in the hand.
- 2. Thenar wasting.** Inspection of the hand for thenar muscle atrophy.

3. **Paresis abductor pollicis brevis.** Assessment of the strength of the muscle.
4. **Paresis opponens pollicis.** Assessment of the strength of the muscle.
5. **Wrist extension test.** The patient required to keep both wrists in dorsal extension for a minute. The test is positive if numbness or tingling reproduced in median nerve distribution within a minute
6. **Phalen's test.** Patient was asked to keep both hands in complete palmar flexion for 60 seconds and presence of tingling and numbness suggestive of CTS.
7. **Tourniquet test.** Symptoms will be reproduced when a pneumatic blood pressure cuff placed above elbow and inflated above the patient's systolic pressure.
8. **Tinel's sign** elicited by percussion of median nerve at the flexor retinaculum and regarded as positive by presence of tingling along the median nerve distribution.
9. **Pressure (Durkin's compression) test** is application of direct pressure over the median nerve where it leaves the carpal tunnel which causes pain.
10. **Lüthy's sign.** This test is positive if the skinfold between thumb and index finger did not close tightly around a cup or bottle due to thumb abduction paresis.
11. **Hypoalgesia.** Diminished pain sensation in the median nerve area upon testing with a sharp pin is scored positive.
12. **Hyperpathia.** Diminished sensation in the median nerve area is scored positive.

Nevertheless, Rempel. D *et al* (1998) reported that there is no single test or tool to diagnose carpal tunnel syndrome. At the same time, the same group claims in spite of false positives and negatives documentation, nerve conduction study findings are considered the most accurate single test. In conclusion, combination of electrodiagnostic study findings and symptom characteristics provides the most accurate carpal tunnel syndrome diagnosis.

2.3: Treatment for Carpal Tunnel Syndrome (CTS)

Treatment for carpal tunnel syndrome should begin as early as possible as untreated or ill treated CTS may deteriorate and lead to permanent loss of sensation and paralysis of the thenar muscles in some cases.

Various non operative and surgical techniques have been employed in the treatment of CTS. Surgical decompression indicated in almost all failed non operative situations. Three common types of surgical techniques are standard open incision, mini open incision and endoscopic release.

2.3:1 Non operative Treatment

Non surgical treatment is an option during the initial period in patients diagnosed CTS. The recommended non surgical treatments are (Keith M.W *et al* 2009):

1. **Drugs.** Non steroidal anti – inflammatory (NSAIDs) are used mainly to ease the symptoms. Besides diuretics had been proposed as well to reduce swelling in the hope of increasing the volume of carpal tunnel. Corticosteroids injection with combination of lignocaine administered directly into the tunnel to relieve pressure and reduce inflammation to provide short term relieve.
2. **Exercise.** Referral to the physiotherapist and occupational therapies are recommended at initial stage for stretching and strengthening exercise along with night splint.
3. **Alternative therapies.** Acupuncture and chiropractic care have reported to benefit some patients but their effectiveness remains debatable.

2.3:2 Operative Treatment

Carpal tunnel release (CTR) is one the most common surgical procedures in upper limb surgeries. CTR recommended in failed conservative treatment and if symptoms persist longer than 6 months. The aim of surgery is to decompress the carpal tunnel by releasing the

flexor retinaculum. Three types of surgical techniques had been described (Aslani H.R *et al* 2012):

1. **Standard open incision.** The standard open incision is the most commonly used technique in many centers till today. Long palmar skin incision (Figure 2.1) is made to divide the flexor retinaculum under direct vision of the median nerve.



Figure 2.1: Standard open surgical large incision procedure (Aslani H.R et al 2012).

2. **Mini open incision.** 2 different types of mini incision have been described. Tzaan W.C *et al* 2005 proposed a mid palmar carpal tunnel release (MPCTR). The other method was proposed by Celloc P *et al* 2005. In this method the TCL was released through a mini transverse incision at the distal crease of the wrist. Both methods involve transaction of the flexor retinaculum blindly.

- a. **Mid palmar carpal tunnel release (MPCTR).** The mid palmar incision transects the flexor retinaculum distal to proximal. In this method, an incision made about 0.5cm to 1.0 cm proximal to the junction of the transverse line

drawn from proximal edge of the first web space and the axis of the middle finger/ ring finger as shown in Figure 2.2.

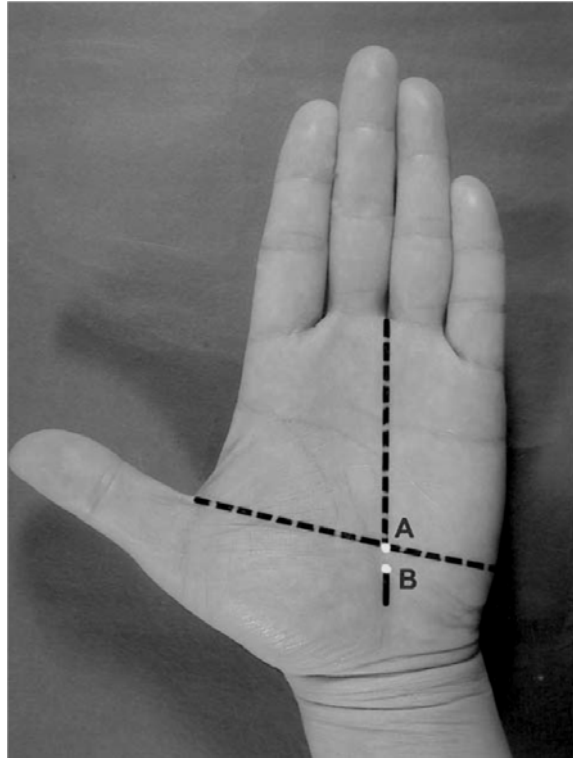


Figure 2.2: Image shows accurate location of mini open mid palmar incision. White dot A is the junction of the transverse line from the proximal edge of the first web space (Kaplan's line) and the middle/ring finger axis. White dot B is the distal end of the incision. The distance between point A and B is 0.5 to 1.0cm (Tzaan W.C et al 2005).

Upon incision, dissection performed with blunt end scissors at the distal segment of the median nerve (Figure 2.3). Fatty tissue exposure at the distal part of transverse carpal ligament (TCL) indicates adequate distal release of the tunnel (Figure 2.4). Following