

Carpal tunnel release by using two mini incisions

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ABSTRACT

Background:

Carpal Tunnel Syndrome (CTS) is an entrapment idiopathic median neuropathy, causing paresthesia, pain, and other symptoms in the distribution of the median nerve due to its compression at the wrist in the carpal tunnel. The pathophysiology is not completely understood but can be considered compression of the median nerve traveling through the carpal tunnel.

Patients and methods:

In this study 60 cases presented with symptoms suggestive of C.T.S Patients were evaluated for any predisposing factors or etiological causes. Symptoms had to be suggestive of carpal tunnel syndrome and included; nocturnal pain or parasthesia in the median nerve distribution, weakness of thenar muscles or poor hand grip. the mean patient age at the time of operation was 38 years ranged between 20-59 years. Females were more affected than males. The dominant hand was affected in 50% of patients, with 20% of patients complaining of bilateral manifestation, usually affected one hand more than another. All cases were idiopathic with no specific cause found, with 6.67% of patients gave a history suggestive of a job requiring repeated hand movements.

Results:

In our study, all patients (100%) were operated by double-mini incision release. There are marked improvement in pain , marked improvement in weakness of hand . Complications were only seen in 13.3% of patients, 8.3% of patients complained of poor hand grip although they had marked improvement of numbness, 5% of patients had tender scar.

Conclusion:

Double mini- skin incision for treatment of cts is a reliable, safe method of treatment.

Keyword:

Double mini skin incision,transverse carpal ligament,good healing,no excessive scar formation.

Introduction:

Carpal Tunnel Syndrome (CTS) is an entrapment idiopathic median neuropathy, causing paresthesia, pain, and other symptoms in the distribution of the median nerve due to its compression at the wrist in the carpal tunnel. The pathophysiology is not completely understood but can be considered compression of the median nerve traveling through the carpal tunnel.⁽¹⁾

In 1913 Piere Marie and Charles Foix reported to the French neurological society describing the role of the transverse carpal ligament in causing paralysis and atrophy of the thenar muscles.⁽²⁾ In 1933 Abbott and Saunders published a large series of patient with chronic median neuropathy following fractures of the distal radius. Later that year James Learmonth reported on the first surgical release of the transverse carpal ligament for post-traumatic median nerve compression.⁽³⁾

The National Center for Biotechnology Information and highly cited older literature say

the most common cause of CTS is typing.⁽⁴⁾

More recent research by Lozano-Calderón has cited genetics as a larger factor than use.⁽⁵⁾

The main symptom of CTS is intermittent numbness of the thumb, index, long and radial half of the ring finger.⁽⁶⁾

The numbness usually occurs at night, as humans tend to sleep with flexed wrists. It can be relieved by wearing a wrist splint that prevents flexion.⁽⁷⁾

Long-standing CTS leads to permanent nerve damage with constant numbness, atrophy of some of the muscles of the thenar eminence, and weakness of palmar abduction.⁽⁸⁾

Patients and methods:

In this study 60 cases presented with symptoms suggestive of C.T.S. This study was performed in Menoufia University hospital and Al Sahel Teaching Hospital. These cases were subjected to:-

❖ Clinical examination to define the main

symptoms, signs and features of C.T.S and its differential diagnosis.

- ❖ Plain x-ray of the wrist to exclude bony abnormalities.
- ❖ Electrophysiological studies .

Inclusion criteria:

1. History and clinical examination to confirm the diagnosis of carpal tunnel syndrome and exclude other possible causes. Patients had to have substantial symptoms that were not relieved by conservative management.
2. Thenar wasting or progressive hand dysfunction due to carpal tunnel syndrome was an indication for surgery.
3. Nerve conduction studies confirming carpal tunnel syndrome. If a patient had clear symptoms and signs of carpal tunnel syndrome with normal neurophysiological studies he was considered a candidate for surgery if his symptoms were not relieved medically.

Exclusion criteria:

Presence of rheumatoid arthritis, presence of neuromuscular disorders, thyroid disorder, pregnancy, failed previous surgery, cervical spondylosis.

A two-portal incision technique was performed during local anesthesia assisted by intravenously administered analgesia and under tourniquet control. Proximal portal was a 1cm incision

outlined longitudinally from the wrist flexion crease and proceed proximally adjacent to the ulnar border of the palmaris longus tendon (or in the midline of the wrist if the palmaris longus is not present)(Fig.1,A).

Blunt dissection exposes the palmar carpal fascia. This was punctured with a blade. The proximal skin was elevated and with the blunt-tipped scissors the palmar carpal fascia was split longitudinally subcutaneously (Fig. 1, B).

Distally, the fascia was incised to the thickened proximal border of the transverse carpal ligament. A retractor was placed beneath the distal skin and pulled upward. This causes the transverse carpal ligament to slightly elevate from the flexor sheath to allow direct visualization for insertion of a blunt elevator. The blunt elevator was inserted beneath the transverse carpal ligament. The flexor sheath and nerve was freed from the ligament by sweeping the instrument back and forth beneath the "corrugated" internal surface of the transverse carpal ligament (Fig. 1, C).

It is important to directly visualize the entrance of the elevator beneath the transverse carpal ligament. It is possible to mistake the edge of the palmar fascia for the transverse carpal ligament if it is not directly visualized, and this could cause the elevator to enter Guyon's canal. The distal end of the transverse carpal ligament can be palpated by the opposite hand as the elevator exits beneath its edge in the ulnar palm.⁽⁹⁾

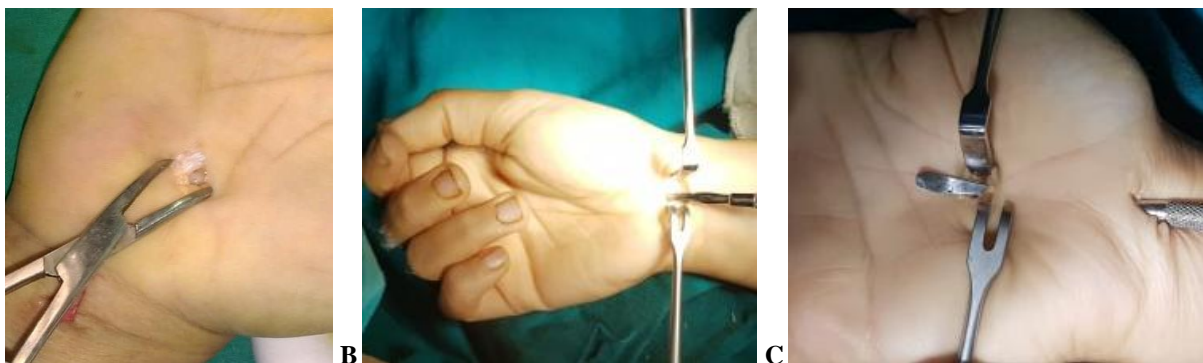


Figure (1,A) Incision outlined distal incision at radial axis of ring finger and base of thumb web. **(B)** palmar carpal fascia incised proximally. **(C)** blunt elevator sweeps through carpal canal.

The distal portal was a 1-cm incision made by drawing an imaginary line running from distal wrist crease to the crossing point of two perpendicular lines extending from the inferior edge of the extended thumb and to the line between 3rd and 4th digits, these imaginary line divided into three equal parts, distal 3rd skin part was opened .

An important modification at this point was

dissection and inspection of the distal incision. The fatty tissues were spread and small retractors were inserted in the distal incision. The palmar fascia was split longitudinally and distally 1 cm under direct vision. The soft deep tissues were gently spread with the small blunt-tipped scissors. This frees the superficial arch and flexor sheath-median nerve from any adherence to the adjacent soft tissues . Attention was then returned to the

proximal portal and the blunt elevator was passed beneath the transverse carpal ligament under direct vision. With the wrist slightly extended, the curved elevator was passed distally through the distal portal. The elevator should pass easily as the distal palmar fascia was split and the soft tissues have been released from the distal edge of the transverse carpal ligament (Fig. 2).

The transverse carpal ligament was cut off through the distal and proximal incisions under direct vision, between the ulnar neurovascular bundle and the lateral aspect of the median nerve. Extension of the wrist can help in the identification of the transverse carpal ligament and the median nerve segment under the non-incised skin segment. The ligament was cut off as far as the inferior edge of the proximal incision. The proximal part of the ligament is sectioned through the proximal skin incision. The sectioning of the ligament was checked along the carpal tunnel, and the median nerve is inspected.⁽⁹⁾



Figure (2) Elevator confirm location of exit incision.

Skin Closure:

At this point, the tourniquet was released, hemostasis was attained and the wounds were closed with 4-0 prollyn.

Post-operative:

Patients were discharged on the same day of the operation. The sutures were removed after 2 weeks. Patients were encouraged to move their fingers on the same operative day, yet hand use would be advised to be minimal especially in the first weeks.

Patients were advised to modify hand use to avoid recurrence or appearance of symptoms in the other hand.

Follow Up:

The most widely used is a questionnaire published by the Boston group (Levine 1993) called Boston Carpal Tunnel Questionnaire (BCTQ), also referred to as the Levine scale is a patient-based outcome measure that has been developed specifically for patients with CTS. It has two distinct scales, the Symptom Severity Scale (SSS) which has 11 questions and uses a five-point rating scale and the Functional Status Scale (FSS) containing 8 items which have to be rated for degree of difficulty on a five-point scale. Each scale generates a final score (sum of individual scores divided by number of items) which ranges from 1 (no symptoms) to 5 (the worst symptoms), with a higher score indicating greater disability.⁽¹⁰⁾

Results:

In this study 60 cases presented with symptoms suggestive of C.T.S. This study was performed in Menoufia University hospital and Al Sahel Teaching Hospital.

Age: The mean patient age at the time of operation was 38 years ranged between 20-59 years. 12 patients (20%) were between 21-30 years, 30 patients (50%) were between 31-40 years, 3 patients (5%) were between 41-50 years and 15 patient (25%) was above 50 years.

Gender: The cases included 60 (100%) females and 0 (0 %) male with female sex predominance.

Occupation: Four female patient (6.7%) worked as secretary while other remaining 56 female patients (93.3%) worked as house wife.

Predisposing and Etiological Factors:

None of the patients had any general medical condition as a cause of the CTS. None had any of the other etiological factors of CTS. None of the female patients were pregnant at the time of presentation. 4 patients (6.7%) had jobs required repeated daily strenuous hand use as work related predisposing factors (secretary). 56 Patients (93.3%) had no work related predisposing factors.

Site and Bilateral Affection:

30 patients (50%) complained of their right hand while 18 patient (30%) complained of left hand. In the other hand 12 patients (20%) complained of both hands, 9 (15%) of whom had symptoms more in right hand and the other 3 (5%) had symptoms more in left hand. All patients (100%) were right handed.

Symptoms:

All patients (100%) complained of pain along the median nerve distribution distal to the wrist mainly in the palmar aspect of the thumb, index and middle fingers, and radial half of the ring finger. Pain was perceived in different forms. 44 patients (73.3%) complained of numbness, 12 patients (20%) complained of burning pain and other 4 patient (6.7%) complained of electric like pain. The pain was exacerbated at night and in long standing cases the pain was present night and day and exacerbated after effort and relieved by hand elevation, shaking or hand rubbing.

Only 20 patients (33.3%) had pain radiated to the elbow while other patient (66.7%) had pain only in their hands.

Also 48 patients (80%) complained of weakness in their hand in the form of weak hand grip in 36 patients (60%) and in the form of weak opposition in 12 patients (20%).

The duration of symptoms also varied between patients. 12 patients (20%) had symptoms of CTS for less than 1 year, 40 patients (67%) had symptoms for duration between one to five years, and 8 patients (13%) had symptoms for duration between five to ten years.

Signs:

Weakness was seen in 48 patients (80%) in the form of weak hand grip in 36 patients (60%) and in the form of weak opposition in 12 patients (20%). Thenar atrophy was seen in only 4 patient (6.7%) who had long standing disease and electrophysiological studies showed severe nerve compression.

Tinel’s sign and Phalen’s test were **positive** in all patients.

Diagnostic Studies:

All patients performed plain X-ray of the wrist both AP and lateral views. No fractures were noticed, no abnormal bony swelling or those of soft tissue shadow swelling.

EMG and NCSs:

NCSs were performed for all patients. 48 patients (80%) had abnormal NCSs in the form of sensory- motor affection while 12 patients (20%) had sensory affection only.

16 of them (26.7%) had severe CTS, 32 patients (53.3%) had moderate CTS while 12 patients (20%) had mild CTS.

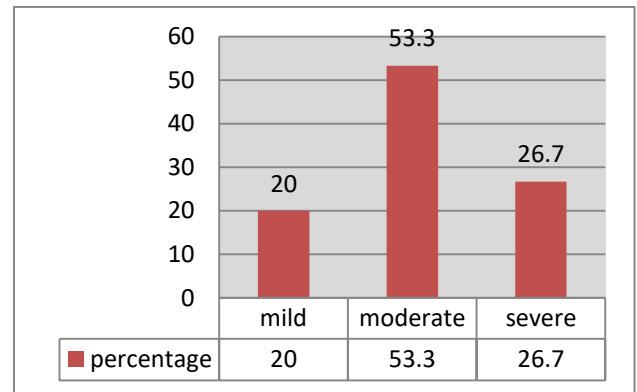


Chart 1: Graph showing severity of affection

Surgical management:

30 patients (50%) operated on the right side and 18 patients (30%) operated on the left side. The 12 patients complained bilateral symptoms were initially operated upon on the most symptomatizing hand after which they were followed up, seven of them (11.7%) were satisfied with their current condition and felt they do not need another operation and could carry on with their lives and daily activities. The other 5(8.3%) patients operated for other hand upon 6 weeks after the initial operation.

Table 1: Follow up and scoring

Score	Preoperative	Postoperative	P value [#]
Mean ± SD	4.09 ± 0.471	1.51 ± 0.213	<0.001*
Range	3 – 5	1 – 2	

[#] compared by paired T test * significant as P value <0.05

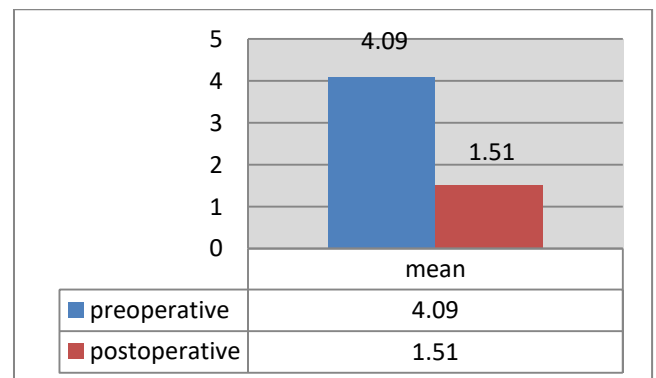


Chart 2: graph showing score range

Discussion:

Carpal tunnel syndrome is the most frequently encountered entrapment neuropathy. It occurs most frequently during middle or advanced age .⁽¹¹⁾ There is a difference in the reported incidence between men and women with some reports showing women to be twice as much affected than men , while others showed women to be three to five times as much affected as men .⁽¹²⁾ In our study we found that incidence of carpal

tunnel syndrome is very high in females . This could be due to the small sample size in the study and thus may not reflect the actual incidence of carpal tunnel syndrome in the general population or the ratio between female to male affection.

The dominant hand is most often involved but the non-dominant hand may be affected and the condition is bilateral in at least 10% of patients.⁽¹³⁾

In our study the dominant hand was affected in 50% of cases, bilateral in 20% of cases and in non-dominant hand in 30% of cases.

Numerous conditions are associated with the presence of carpal tunnel syndrome. Any disease that reduces the cross sectional area of the carpal tunnel or increases the volume of its contents may produce median nerve compression and entrapment. However, idiopathic causes are probably the commonest .⁽¹⁴⁾ In this study we found no secondary cause and all patients had idiopathic carpal tunnel syndrome.

It is believed that in carpal tunnel syndrome, the median nerve is compressed by thickening of the flexor tendon sheaths, yet the exact cause of thickening is unknown.⁽¹⁵⁾

Physical load factors such as repetitive and forceful gripping is probably a major risk factor in at least 50% cases with carpal tunnel syndrome. This has led to the concept that carpal tunnel syndrome is a job related disorder. The physical factors implicated and extensively studied in relation to occupational CTS include repetition, force, posture, external pressure, and vibration. Repetition is the most widely recognized risk factor for occupational CTS. In epidemiological studies high repetition is defined either by the frequency of the task or the percentage of time spent on repetitive work .⁽¹⁶⁾ In our study only 4 patients gave a history suggestive of a job requiring repeated hand movements, yet the rest of the females were *housewives*, who performed repeated daily housework, such as washing, cooking and cleaning, all of which require intense hand activity and may be a cause of carpal tunnel syndrome.

Pain is the most common reported symptom, mostly in the form of numbness and tingling in 80% of patients. Patients describe numbness in all or part of the hand which often worsens at night. Other forms of pain presentation in patients include dull ache (20%), stiffness (6%), burning sensation (5%) or electric like sensation (5%) .⁽¹⁷⁾

In our study, numbness and tingling affected 44 patients (73.3%), burning sensation in 12 patients (20%), and electric like sensation in 4 patient

(6.7%). 60% of patients complained of weakness of hand grip and 20% weakness of opposition. This shows that sensory manifestations are the most common presentations with nocturnal exacerbation as a prominent feature.

Conclusion:

Although conservative treatment, in the form of the analgesics, diuretics, steroids, local injection of steroids and use of splints provide temporary relieve of symptoms. Surgical release still remain the definite mode of treatments, with 80% of patients showed marked improvement and 20% of patients showed mild improvement of sensory manifestation.

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