

Simple carpal ligament release versus release plus epineurotomy in the treatment of carpal tunnel syndrome A comparative study

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Summary

Background: surgical treatment of established carpal tunnel syndrome (CTS) can be accomplished by various operative modalities, epineurotomy of the median nerve plus carpal ligament release has been advocated by many authors, This study try to evaluate the role of epineurotomy on the outcome of operative treatment of CTS postoperatively, compared to simple release only .

Patients and Methods: 48 hands of 42 patients, 34 female and 8 male. where classified in to two groups, one group had a release of the transverse carpal ligament alone, group (1). and the other group had a release plus epineurotomy of the median nerve, group (2). Selection of patients was according to the same clinical criteria regarding physical finding, periods of symptoms preoperatively, as well as sex and age. Positive finding of (EMG) confirming established median nerve dysfunction due to compression, the operative procedure technically unified by the operating team. Clinical assessment of the patients carried out six month post operatively.

Results: 60% of group (1) and 56% in group (2) no longer had any symptoms referable to the dysfunction of the median nerve. Physical examination revealed average two–point discrimination of 5.1 mm in group (1) and 4.7 in group (2). The electrophysiological test (EMG) showed average sensory latency of 4.1 mil sec. in both groups. Evaluation of the patients six months postoperatively revealed no detectable significant differences between the two groups with regard to symptoms, objective finding, Tinel's sign. Phalen test, or (EMG) values.

Conclusion: epineurotomy of the median nerve add no benefit to the simple carpal ligament release of the transverse carpal ligament alone.

Keywords: Carpal tunnel syndrome. epineurotomy in carpal tunnel syndrome.

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Introduction:

Carpal tunnel syndrome, (CTS) or "median neuropathy at the Wrist", is the most common, most important, best defined and the most carefully studied of all nerve entrapment syndromes⁽¹⁾.

It is the compression of the median nerve within the confines of the carpal tunnel, manifested by: pain, paresthesia and muscle weakness in the forearm and hand. CTS is more common in woman with peak incidence around age of 42(2).

The life time risk for CTS is around 10% of adult population(3). It is estimated that 400.000-500.000 cases annually in the united states with economic cost of two billion Dollar per year (4).

Surgical treatment of CTS is one of the modalities of management which has been prescribed and it is indicated in 40% of patients ⁽²⁾⁽⁴⁾. Compression upon the nerve might be due to either decrease in the volume of the tunnel or enlargement of the contents through the inflammation in the tenosynovium around the tendons⁵, and part of this inflammatory process is swelling and this will compress the nerve,

the swelling of this membrane is the final common pathway for most of cases of CTS, whether caused idiopathically or medically(6). The Compression leads to a reduction of epineural blood flow which occurs at a pressure of 20-30 mm Hg (2.6-4k Pascal). Further compression will cause intraneural microcirculation impairment, resulting in endoneural adema and fibrosis, axonal transport impairment, followed by structural and functional changes, and thickened, contracted, epineurium which may become a definite, recognizable compressive layer of tissue⁽⁷⁾. on this hypothesis Gelbermann and Enna and many other authors built their assumption that epineurotomy might be regarded as an adjuvant in decompression during ligament release. This study try to assess the effect of epineurotomy on the clinical results of the operative treatment of CTS .

Patients and Methods

Form Feb. 2006to Jan. 2008, 68hands (52 patient) that were operated upon at orthopeadic department of Surgical Specialties Hospital – Medical city. Teaching Hospital Baghdad. (48) hand (42) patients was suitable for our study, the criteria for inclusion were clinical signs and symptoms of dysfunction of the median nerve due to compression in the carpal canal that were not responsive to non operative treatment; as well as electromyogram (EMG) that

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demonstrate fibrillation suggesting an advanced degree of nerve compression. Cases that were excluded from our study are shown in the table (1).

Table (1): cases excluded from the study.

No.	Case	No. of Patients
	Age below 25 year	2
	Patients with previous CT release	1
	Incomplete follow up	2
	Insufficient data	1
	Pregnant woman	1
	Total	10

The hands were randomly chosen to receive one of two types of treatment either by operative decompression of the median nerve by longitudinal incision to divide the transverse carpal ligament alone, Group (1), or operative decompression of the median nerve plus longitudinal opening or peeling of its epineurium in the region of the carpal Tunnel, Group (2).

Thus, twenty four hands were randomly selected for epineurotomy and other twenty four treated without epineurotomy, each hand was considered separately with no regard for which procedure (if any) was done on the contralateral side in the same patient when both hands been effected.

The patients evaluated six months post-operatively by an orthopaedic surgeon who was blinded to type of surgical procedure. all patients had (EMG) performed, for future matching with the preoperative (EMG), plus full physical examination data collection, including (sleeping numbness , difficulty gripping and making a fist, dropping objects,) via Tinel's sign, Phalen's test, Durkan's test.

In Group (1) there was 20 patients (24) hands of (15) woman and (5) men. Average age 45.7 year (range 5-60). 18 hands had pain altered sensibility, paresthesia and loss of manual dexterity. and the remaining 6 hands had three of the four symptoms. the average duration of symptoms was 2.3 year (range 3 months-14 year). The minimal duration of follow-up was six months (range 6-12 months).

Group (2) included (22) patient, (24 hand), it is the epineurotomy group; with (17) woman and (5) men, with an average age of (49) year (range 25-67). 15 hand had pain, altered sensibility, paresthesia and loss of manual dexterity, 9 hands had three of the four symptoms, average duration of follow up was 8 months (range 6-12 months).

Results:

At six months follow-up evaluation, 15 hands (60%) of group 1 and 14 hands (56%) in group 2, no longer had any symptoms referable to the dysfunction of the median nerve.

On physical examination: the average two point discrimination in the distribution of median nerve was 5.1 millimeter (rang 3-11mm) in group 1, and 4.7 mm (rang 3-10 mm) in group 2. six hands (24%) in group 1 and 11 hands (44%) in group 2 had a

positive Tinel's sign, Phalen test was elicited symptoms in (2) hands (8%) in group 1, and in 4 hands (16%) in group 2. , Darken test elicited in two patients from each group .

Electrophysiological test: the average of sensory latency of 4.1 milli seconds (rang 3.4-5.0 m.s.) of the 23 hands in group 1. and 4.1 m.s. (range 3.2 – 5.3 m.s.) in group 2. One hand (4%) in group 1 had immeasurable latency. None of the hands in group 2.

Table (2): preoperative and postoperative results (TPDT= two-point discrimination test; SNCT= sensory nerve conduction test; TS= Tinel sign; PT= phalen test). DT (Durkan test)

group	Group 1		Group 2	
	Preop.	Postop.	Preop.	Postop.
TPDT	7m.m.	5.1m.m.	6.9m.m.	5.1m.m.
SNCT	5.2m.sec.	4.1 m.sec	5.2 m.sec	4.1 m.sec
TS	64%	24%	68%	44%
PT	60%	8%	60%	16%
Durkan test	72%	3%	75%	2.8%

Table 3: result of physical finding in relation to the groups of patients.

Group	Symptom free	Two-point discrimination	Tinel's sign	Phalen's Test	Durkan's test	EMG test
Group 1	60%	5.1 m.m.	24%	8%	3%	4.1m. sec.
Group 2	56%	4.7m.m.	44%	16%	2.8%	4.1m. sec.

Discussion:

The classification of peripheral nerve injuries into neurotmesis, axonotmesis, and neuropraxia (Seddon)(8), generally accepted, but neuropraxia has many different causes and conduction block produced by compression may vary considerably with the magnitude and duration of the deforming force, category I, as classified by Sunderland⁽⁹⁾. Intracarpal pressure measurement in a wrist with CTS in neutral position may be up to 30 mm Hg compared to 4-12 mm Hg of a normal wrist and might be up to 90 mm Hg during forcible wrist flexion compared to 16-20 mm Hg of normal wrist,⁽¹⁰⁾ this might lead to temporary conduction block with immediate recovery after removal of the pressure, it is almost equivalent to Seddon's neuropraxia, along existing conduction block which recovers after decompression of nerve fibres fits Sunderland categories II and III (10)(4).

On the other hand there is the concept of axonostenosis which has been proposed by Curtis and Katz, Losina,⁽¹¹⁾ based on electrical studies; they assumed that the dysfunction of the neural axon was limited to the actual site of compression of axons in continuity. Similar evidence was obtained from our electrodiagnostic studies on median nerve palsy. In

which there was a delay of conduction velocity only at the zone of compression caused by fibrosis around the nerve trunk.

The surgical techniques reported by Eversmann, Enna, Jacobson, Spinner and Spencer,⁽¹²⁾ are more extensive involving exploration and dissection of each fascicle in the fibrotic region of the nerve trunk i.e perineurotomy rather than simple perineurotomy, precise comparison of the results from different investigators in this field is not feasible, but it appears that we have a higher rate of recovery than that reported by Eversmann and Jacobson.⁽¹²⁾

Several authors have addressed the issue of nerve manipulation especially in the form of epineurotomy in relation to the outcome of decompression of the median nerve in the carpal canal. Duncan et al⁽¹³⁾, palled members of the American society for surgery of the hand during his work on 467 hands with CTS that 369 (79%) who completed the survey performed a linear epineurotomy through the constricted area of the median nerve during carpal tunnel release⁽¹²⁾.

Foulkes et al, performed a prospective clinical study of 36 wrist (33 patients) that had been randomized to operative treatment of (CTS) with and without epineurotomy. Patients evaluated preoperatively and at 6 to 12 month postoperatively with 15 hand from each group evaluated revealed an overall sensory testing improvement postoperatively from 6.2 mm to 4.2 mm of (TPDT) and 5.1m\sec to 3.9m\sec of (SNCT) versus of 7mm to 5.1mm and 5.2m\sec to 4.1m\sec respectively in both groups of our study, this difference might be related to the shorter pre, operative duration of symptoms in their cases and longer followup period.

The use of adjuvant manipulation of the median nerve has been questioned by Robert and Szabo⁽¹⁴⁾ who found that internal neurolysis resulted in return of sensation and improvement in the thenar function in only 7 hands (3%) of their 267 patients who had constant sensory loss and atrophy or palsy of thenar muscles. Whoever, Gellbermann et al⁽⁷⁾ found no significant difference in the outcome between patients who had an epineurotomy and those who had not, a results corroborate with ours.

Conclusions:

There is no post-operative significant difference in the clinical results of adjuvant epineurotomy compared to simple ligament release only in the treatment of established (CTS).

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