

# Carpal Tunnel Syndrome: Efficacy of Non-Operative Treatment

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This is a very straightforward study of 5482 carpal tunnel patients treated non-operatively. Although there was some initial modest abatement of symptoms in approximately 17% of patients treated by NSAIDs, NSAIDs and oral steroids, steroid injection, galvanic stimulation, or cold laser therapy there was rapid recurrence in symptoms within 4 to 9 weeks. All of these modalities were failures at 5 years to the following extent:

NSAIDs: 99% failure

NSAIDs and oral steroids: 98% failure

Steroid injection: 99% failure

Galvanic stimulation: 100% failure

Cold laser therapy: 100% failure

Therefore non-operative treatment of carpal tunnel syndrome fails 98-100% of the time. These costly treatments are often invoked for fear of the painful, prolonged recovery period following an open CTR. We have reported elsewhere the safety and efficacy of the Brown Procedure endoscopic carpal tunnel release (not to be confused with other techniques) to be approximately 98% successful without any iatrogenic nerve or vascular injury and with full return to activity in 8.7 days. We have also reported that permanent nerve damage can occur with only 8 weeks duration of symptoms with electrodiagnostically "mild" CTS. We therefore recommend abandonment of these non-operative modalities for the more conservative Brown Procedure ideally performed prior to the eight week point in duration of symptoms, the goal of treatment being to eliminate the pressure on the nerve, not simply to provide palliative relief to the sufferer until permanent nerve damage ensues and unbearable pain mandates surgical release.

**KEY WORDS • carpal tunnel • endoscopic • Brown Procedure • compression neuropathy**

**E**arly definitive treatment of carpal tunnel syndrome (CTS) by surgical decompression of the median nerve was described by Brain, et al. (Brain 1947) Subsequent studies have described almost every other possible treatment modality. (Gerritsen 2002) Post-operative morbidity of open carpal tunnel release is well known. Some endoscopic techniques have been associated with iatrogenic nerve injury (Chow 1993). There has been widespread misunderstanding and confusion regarding endoscopic carpal tunnel release owing to different techniques (with different complication and efficacy) being viewed as one technique.

Medical treatment continues to be advocated by some physicians. The failure rate of splint therapy has been shown to be quite high (Gerritsen 2002). Non-steroidal anti-inflammatory drugs (NSAIDs) are prescribed by many clinicians, but recent studies have shown there are not clear benefits. (Gerritsen 2002) (Chaing 1998) Herskovits recommended limiting treatment with oral steroid to a maximum of 2 weeks. (Herskovitz 1995) The role of these non-operative treatments must be defined, as newer safer techniques of endoscopic carpal tunnel release. The Brown Procedure was pioneered at The Hand Center and it achieves

decompression of the median nerve with minimal complications and no iatrogenic nerve or artery injuries in a recent twelve year study of 14,722 patients. The Brown Procedure has led to the obsolescence of open carpal tunnel release in 99.97% of patients and has supplanted non-operative modalities which are shown in this study to fail in 98% of patients.

## Materials and Methods

Of patients seeking treatment at The Hand Center (Houston, TX) for symptoms of CTS, 5482 were selected for this study. These patients were treated with non-operative modalities or NSAIDs. Data including electrodiagnostic testing, treatment duration (from 2 weeks to over 5 years) and results of treatment were obtained from patients previously treated for CTS. In patients with no prior treatment, a confirmatory electrodiagnostic study was obtained. Patients with normal distal sensory latencies were further evaluated with midpalmar studies and comparison studies with the ulnar nerve in accordance with AAEM guidelines. Patients were placed on NSAIDs or NSAIDs and oral steroids for a period of 2-3 weeks, if their duration of symptoms was less

than 6 weeks or if they chose non-operative treatment. Treatment with NSAIDs or NSAIDs with oral steroids was continued only if there had been a significant change in patient symptoms. When symptoms failed to completely resolve, a Brown Procedure endoscopic carpal tunnel release was recommended. Average time to recurrence of symptoms was noted. Patients were excluded from the study if they had been treated non-operatively except in the case of galvanic stimulation where 86% of patients were treated for CTS without confirmatory electrodiagnostic studies (typically by chiropractors) or in the case of cold laser therapy where 92.9% of patients were treated without nerve conduction studies (typically by a family practice or occupational medicine physician). These groups were nonetheless included as we believe the data is informative and each patient tested positive for CTS at The Hand Center by nerve conduction study.

## Results

Of the 3419 patients treated with NSAIDs, 91% had no significant change in symptoms, while in 8% symptoms resolved but recurred in 3-11 weeks (Table 1). Symptoms resolved for at least 5 years in only 1% (44 patients) of the patients, two-thirds of whom had mild CTS and one-third moderate CTS. There was no treatment success in those patients with severe or profound CTS. Thus, treatment failed after 11 weeks in 99% of patients.

Table 2 shows the results from the 1182 patients treated with NSAIDs and oral steroids. While this group had a somewhat higher initial response, 82% having no significant change in symptoms. Recurrence occurred in 16% of the patients on average after 8 weeks, and at 5 years there was only a 2% success rate. These results showed that treatment failed after 10 weeks in 98% of patients.

Of the 746 patients treated with steroid injection there was an initial favorable response in 82% of patients; however, 17% suffered recurrence of symptoms after an average of 4.6 weeks and only 1% were asymptomatic after 5 years (Table 3). Some patients continued to receive steroid injections (as many as 10 injections) without favorable results. Thus, similar to the above described results, treatment failed in 99% of patients after 6 weeks.

The results from the 79 patients treated with galvanic stimulation are shown in Table 4. In this group, 68 patients did not have confirmatory nerve conduction studies prior to commencing treatment but were confirmed to have CTS when tested at The Hand Center. There was a higher proportion of patients with moderate, severe, and profound CTS in this group than in the other treatment groups, suggesting either more longstanding CTS or perhaps exacerbation of the condition due to galvanic stimulation. There was no significant change in symptoms in 84.8% of patients. Of those who reported improvement, symptoms recurred within 3.25 weeks. Still, some of the patients continued with this form of treatment even though they failed to ever note any additional improvement. Thus, this treatment was 100% ineffective, with no long term success. Among the 56 patients treated with cold laser therapy there was also a trend toward more severe CTS although not quite as pronounced as in the gal-

vanic stimulation group. There was no significant change in symptoms in 92.9% of patients and all who initially reported improvement had recurrence within 2 weeks. There was no long term success. Thus, as above, treatment was 100% ineffective.

## Discussion

The early failure of non-operative treatments was evident in most patients. Due to the risk of permanent median nerve damage, treatment with the Brown Procedure was not withheld in those with persistent symptoms. Sufficient data were generated prior to definitive treatment with the Brown Procedure. These data are extremely valuable, as they were collected from a group of 5482 patients over 12 years.

Treatment with NSAIDs and treatment with steroid injection failed in 99% of patients. Treatment with NSAIDs and oral steroids failed in 98% of patients. Failure of symptom resolution with oral steroids therapy was also reported by Chang. (Chang 1998) These modalities should therefore be abandoned except in patients with acute or subacute CTS in which the duration of symptoms is 6 weeks or less. If there is no improvement in symptoms within 2-3 weeks, such treatment should be discontinued in favor of the Brown Procedure.

Patients treated with steroid injection have been shown to have a significantly higher incidence of permanent nerve damage. We highly advise against the use of injected steroids except in rare cases, due to the marked increase in permanent nerve damage, presumably a result of inadvertent iatrogenic injury following steroid injection directly into the median nerve. Patients often reported an injection that was extremely painful and resulted in persistent neurological symptoms. Other studies have described complications of steroid injections, such as nerve injury, tendon rupture, and hypopigmentation. (Gooch CL 2005)

Based on the results of this study, we believe there is no role for galvanic stimulation or cold laser therapy in the treatment of CTS. Indeed, the data suggest that galvanic stimulation may actually worsen CTS. Moreover, a recent study showed that chiropractic care is not effective. (Gooch CL 2005) Patients opting for non-surgical modalities are less likely to seek necessary timely care in the form of surgical treatment. This delay places them at a significantly higher risk for permanent nerve damage as we have confirmed in a yet to be published study. Those results point to a higher incidence of permanent nerve damage in both patients with a longer duration of symptoms and those with more severe CTS. The data also show a 3.9% incidence of permanent nerve damage even in patients with mild CTS, therefore surgical treatment should not be denied to such patients since they simply progress to moderate and severe CTS with poorer surgical outcomes.

The pervasiveness of treating CTS with NSAIDs and steroids can be ascribed to several factors, including:

1. Lack of understanding that the goal of treatment of CTS is complete resolution of symptoms to prevent permanent nerve damage due to longstanding chronic pressure.
2. A belief that non-operative treatment is successful if the

symptoms are made tolerable, thereby sparing the patient a surgical procedure.

3. A lack of understanding that there are different techniques of endoscopic carpal tunnel release, some with unacceptable high morbidities. (Agee 1992) The Brown Procedure has been proven extremely safe and efficacious with low morbidity and early return to work.
4. A general fear of surgery based on the fear of poor results, e.g. lifelong chronic pain following some cases of open carpal tunnel release.

The authors have also conducted a 12-year study of 14,722 patients who underwent the Brown Procedure. The success rate for this procedure was 97.3%. The diagnosis of CTS was confirmed electrodiagnostically according to AAEM standards. (Jablecki 1996) (Agee 1992) Although, as also shown in the present study, the failure rate for non-operative "treatment" is extremely high it is still widely practiced and considered to be a "conservative approach". However, we believe the Brown Procedure to be the most conservative treatment, if properly timed. The 10-year recurrence rate following this procedure was 3.7%. No pain or only minimal pain was reported by 94% of patients. The Brown Procedure is performed on an outpatient basis under light general anesthesia and required minimal tourniquet time. The study showed that patients returned to normal activity in 8.7 days.

The present study clearly shows that 98% of patients fail non-operative treatment with NSAIDs, NSAIDs and oral steroids, steroids, and other modalities. These forms of treatment, if used at all, should be discontinued after 2-3 weeks in favor of surgical intervention, preferably the Brown Procedure, in order to minimize the risk of permanent nerve damage. We do not advise treatment with steroid injections, galvanic stimulation, or cold laser therapy as these modalities have failed to achieve acceptable results.

**Table 1. 3419 Patients treated for CTS with NSAIDS**

# of Patients	%	Severity of CTS (motor latency)	No Significant Change in Symptoms (pts)	Symptoms Resolved but Recurred	Average Time To Recurrence (262 pts)	Symptoms Resolved No Recurrence In 5 Years	Failure Rate
1299	38%	Mild 3.7 – 4.19(*) (sensory latency abnormality only)	90% (116)	8% (104)	11 wks	2% (26)	98%
1778	52%	Moderate 4.2 – 4.9	91% (1618)	8% (142)	8 wks	1% (18)	99%
308	9%	Severe 5.0 – 7.0	95% (293)	5% (15)	4 wks	0	100%
34	1%	Profound > 7	97% (33)	3% (1)	3 wks	0	100%
<b>AVERAGE</b>			<b>91%</b>	<b>8%</b>	<b>8.97</b>	<b>1%</b>	<b>99%</b>

**Table 2. 1182 Patients treated for CTS with NSAIDS and Oral Steroids**

# of Patients	%	Severity of CTS (motor latency)	No Significant Change in Symptoms (pts)	Symptoms Resolved but Recurred	Average Time To Recurrence (262 pts)	Symptoms Resolved No Recurrence In 5 Years	Failure Rate
414	35%	Mild 3.7 – 4.19(*) (sensory latency abnormality only)	78% (323)	20% (83)	10 wks	2% (8)	98%
1778	55%	Moderate 4.2 – 4.9	83% (540)	15% (98)	7 wks	2% (13)	98%
308	9%	Severe 5.0 – 7.0	88% (84)	11% (10)	4 wks	1% (1)	99%
34	1%	Profound > 7	92% (21)	8% (2)	2 wks	0	
<b>AVERAGE</b>			<b>82%</b>	<b>16%</b>	<b>8 wks</b>		<b>2%</b>

**Table 3. 746 Patients treated for CTS with Steroid Injection**

# of Patients	%	Severity of CTS (motor latency)	No Significant Change in Symptoms (pts)	Symptoms Resolved but Recurred	Average Time To Recurrence (262 pts)	Symptoms Resolved No Recurrence In 5 Years	Failure Rate
239	32%	Mild 3.7 – 4.19(*) (sensory latency abnormality only)	80% (191)	19% (45)	6 wks	1% (3)	99%
418	56%	Moderate 4.2 – 4.9	81% (339)	18% (75)	4 wks	1% (4)	99%
67	9%	Severe 5.0 – 7.0	89.5% (60)	9% (6)	2 wks	1.5% (1)	98.5%
22	3%	Profound > 7	95% (21)	5% (1)	1 wks	0	
<b>AVERAGE</b>			<b>82%</b>	<b>17%</b>	<b>4.6 wks</b>	<b>1%</b>	<b>99%</b>

Overall failure rate = 99%

**Table 4. 79 Patients treated for CTS with Galvanic Stimulation**

# of Patients	%	Severity of CTS (motor latency)	No Significant Change in Symptoms (pts)	Symptoms Resolved but Recurred	Average Time To Recurrence (262 pts)	Symptoms Resolved No Recurrence In 5 Years	Failure Rate
8	10.1%	Mild 3.7 – 4.19(*) (sensory latency abnormality only)	87.5% (7)	12.5% (1)	2 wks	0	100%
21	26.6%	Moderate 4.2 – 4.9	90.5% (19)	9.5% (2)	2.5 wks	0	100%
38	48.1%	Severe 5.0 – 7.0	78.9% (30)	20.1% (8)	3.25 wks	0	100%
12	15.1%	Profound > 7	91.7% (11)	8.3% (1)	1 wks	0	100%
<b>AVERAGE</b>			<b>84.8%</b>	<b>15.2%</b>	<b>4.6 wks</b>	<b>0%</b>	<b>100%</b>

\*86% (68/78 pts) treated prior to electrodiagnostic study  
Overall failure rate = 100%

**Table 5. 56 Patients treated for CTS with "Cold Laser Therapy"**

# of Patients	%	Severity of CTS (motor latency)	No Significant Change in Symptoms (pts)	Symptoms Resolved but Recurred	Average Time To Recurrence (262 pts)	Symptoms Resolved No Recurrence In 5 Years	Failure Rate
12	21.4%	Mild 3.7 – 4.19 (*) (sensory latency abnormality only)	83.3% (10)	16.7% (2)	1.5 wks	0	100%
29	51.8%	Moderate 4.2 – 4.9	93.1% (27)	6.9% (2)	2 wks	0	100%
10	17.9%	Severe 5.0 – 7.0	100% (10)			0	100%
5	8.9%	Profound > 7	100% (5)			0	100%
<b>WEIGHTED AVERAGE</b>			<b>92.9%</b>	<b>7.1%</b>		<b>0%</b>	<b>100%</b>

\*91% (51/56 pts) treated prior to electrodiagnostic study  
Overall failure rate = 100%

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