

Is day or night time splinting more effective than usual care in improving pain, function and reducing sensory disturbance in adults with Carpal Tunnel symptoms?

Clinical Bottom Line

Splinting can be beneficial in improving pain, function and reducing sensory disturbance in adults with mild to moderate CTS symptoms.

Criteria for Critically appraised Topic

Population

Male and female adults 18 years plus

Intervention

Night or day-time hand/wrist splinting

Comparison

Usual care which may include:

- NSAID's
- Steroid injection
- Physiotherapy – ultrasound, acupuncture, mobilisation
- Surgery – carpal tunnel release
- Ergonomic advice

Outcomes

Primary

- Improvement in function
- Improvement in sensation
- Reduction in pain
- Improved quality of lifestyle

Secondary

- Improvement in ROM,
- Improvement in grip strength
- Perceived improvement in coping

Inclusions

Patients with a medical diagnosis of carpal tunnel syndrome

Exclusions

Individuals who have had previous surgery for CTS e.g. carpal tunnel releases

Individuals who are pregnant

Individuals who have inflammatory arthritis

Search Terms used

- **Databases searched:**
Medline, AMED, Embase, Cochrane, NHS library for health, Medline, CINAHL, Bandolier, Pedro, NELH, Professional websites, e.g. COT, CSP, clinical guidelines, NICE, OT seeker, rehab data

- **Types of study used:**
Systematic reviews, RCT's, qualitative studies, patient satisfaction studies
- **Key words searched:**
Carpal tunnel syndrome, median nerve compression, splinting, hand splint, wrist brace, hand/wrist orthosis, day splint, night splint, orthosis, coping[M1][M2], function, range of movement, grip, strength, passive movement, active movement, occupational therapy, physiotherapy, physical therapy, randomised control trial, systematic review, patient satisfaction, sensory disturbance, parathesia, tingling, numbness, sensation, nerve conduction studies, ergonomics, ultra sound, acupuncture, surgery, carpal tunnel release, intra-articular steroid injection, injection, corticosteroid, ergonomics, non steroidal medication
- **Search for the past 10 years i.e. 1996 – 2006**

Available Evidence

Database Searched (specific to CAT)	Number of Extracts	Number of Relevant Abstracts
Cochrane	0	
AMED	2	0
Pedro	0	
Medline	4	1
Cinhal	22	3
Embase	19	2
Clinical Evidence	0	
Pysch Info	0	
OT Seeker	0	
Bandolier	0	
Total	47	6

Results

The initial search identified 47 abstracts appropriate to the question. On review of these, six papers (including systematic reviews) were highlighted that could potentially answer the CAT. These were then reviewed by the group and assessed for quality and appropriateness to the CAT using the CASP (Critical Appraisal Skills Programme) checklist.

Articles Reviewed/Assessed

1. Long Term Effectiveness of Steroid Injection and Splinting in mild and moderate Carpal Tunnel Syndrome (CTS), S Sevim et al, 2004, Neurological Sciences

A prospective RCT to investigate non surgical treatment for mild to moderate CTS, diagnosed by EMG and clinical signs.

120 patients were randomised in to three groups:

- Splint (standard lightweight splint with metal strip across the wrist extending to mid palm)
- Distal injection into CT
- Proximal injection into CT

Results showed that splinting gave symptomatic relief and improved EMG results when worn every night at 12 month follow-up. Injections were ineffective in terms of altering clinical signs or EMG studies.

2. Comparison of three conservative treatment protocols in carpal tunnel syndrome (CTS) O Baysal et al, July 2006, International Journal Clinical Practice

A RCT involving 36 female patients (72 wrists) with clinical and electrophysiological evidence of bilateral CTS.

Involved three groups:

- splinting and exercise therapy (12 patients)
- splinting and ultrasound (12 patients)
- splinting, exercise and ultrasound (12 patients)

Twenty eight patients completed the study (56 wrists). All completed a 3 week treatment protocol and 8 week follow-up period and a custom made neutral volar splint was provided for 24 hour use for the 3 week treatment period.

Results:

Study was limited by the small number of patients but results showed significant improvement in tinels and phalens signs and pain at end of treatment and at 8 week follow-up, improvement in grip and pinch strength at 8 week follow-up. Patient satisfaction results were better for group 3. Results suggest that a combination of splinting, exercise and ultrasound is a preferable and efficacious type of treatment in CTS.

3. Surgical versus Non-surgical Treatment for Carpal Tunnel Syndrome (Systematic Review) R Verdugo et al, The Cochrane Library, 2003

Systematic Review including 2 RCT's involving a total of 198 participants Garland 1964 and Gerritsen 2002). All participants had a diagnosis of CTS and primary outcome measure was relevant clinical improvement after 3 months of follow-up (significant pain and paraesthesiae relief by 50% plus of baseline level or improvement in hypoaesthesia or muscle weakness leading to improvement on QOL and functional status

Conclusions: in those with positive EMG 's, surgery is more effective than splinting but further research is required to ascertain whether the same applies to those with mild symptoms.

4. Non- surgical Treatment (other than steroid injection) for Carpal Tunnel Syndrome (Systematic Review)

D O'Connor et al, The Cochrane Library 2003

Systematic Review including 21 trials involving 884 participants. All participants had a diagnosis of CTS and primary outcome measure was improvement in clinical symptoms e.g. pain and paraesthesiae at least three months after treatments. Treatment included: splinting, ultrasound, oral medication and vitamins, nerve gliding exercises, yoga, and ergonomic modification. Three trials included splinting: Burke et al 1994 (compared neutral versus 20 degree extension wrist splints), Manente et al, 2001 (efficacy of nocturnal hand brace compared to no treatment for 4 weeks), Walker et al compared full-time v night only wearing of wrist splint for 6 weeks. Garfinkel et al, 1998 looked at the efficacy of yoga twice weekly for 8 weeks with wrist splints.

Conclusions: Significant short-term benefit (4 weeks) from splinting for those with mild – moderate symptoms. Also short term benefits from oral steroids, ultrasound, yoga and carpal bone mobilisation. Other non-surgical treatments do not provide significant benefit. Further trials are required to compare treatment and ascertain duration of benefit.

5. Randomised Control Trial of Nocturnal Splinting for Active Workers with Symptoms of Carpal Tunnel Syndrome (CTS)

R Werner et al 2005, Archives of Physical Medicine & Rehabilitation

A prospective RCT to investigate nocturnal hand splinting for workers identified with CTS, diagnosed by clinical symptoms of CTS (hand based diagram) and EMG.

Included 112 participants randomised into 2 groups – 65 in treatment group, 49 in control group.

- o Both groups viewed 20 minute video on ergonomic risk factors
- o Treatment group fitted with custom wrist hand orthosis – wrist in neutral position, splint instructed to be worn at night.

Results: Splinting gave symptomatic relief at 6 weeks and benefits still evident at 12 month follow-up.

6. Effectiveness of Hand Therapy Interventions in Primary Management of Carpal Tunnel Syndrome (CTS): A systematic review

M Muller et al 2004

A qualitative systematic review of 24 studies involving a total of 440 participants. All participants had a diagnosis of CTS. Studies evaluated splinting, ultrasound, nerve gliding exercises; nerve and tendon gliding exercises combined with splinting, magnetic therapy, low-level laser, yoga, manual therapy, acupuncture, and combined therapies.

Nine studies evaluated splinting as an intervention for CTS and the primary outcome measure was relevant clinical improvement, including pain, numbness, and paraesthesia. (Two case series studies excluded from this review: Ekman-Ordeberg et al (1987) and Court (1995) (investigated the effectiveness of splinting during pregnancy).

Three RCTs: Manente et al (2001) (compared night brace with no treatment for 4 weeks). Walker et al (2000) (compared full-time splinting with night splinting for 6 weeks). Gerritsen et al (2002) (compared night-time splinting with optional day wear with surgical intervention). Four cohort studies: Li et al (1999) and Dolhanty (1986) (compared night splinting plus splinting during aggravating daytime activities with no treatment). Burke et al (1994) (compared splinting of the wrist in a neutral position with splinting of the wrist at 20° of wrist extension).

Daniel et al (2000) (compared volar cock-up splints with ulnar gutter splints).
All studies evaluated in the short-term to a maximum of 18 months post randomisation.

Conclusion: Splinting was supported by 5 studies. Different types of splints and various angles of immobilization were found effective. This could, however, reflect the importance of wrist immobilization rather than splint design or splinting angle, and further research is required. Surgery was found to be generally more effective than splinting but further research is required. The best evidence to-date shows statistically significant benefits from splinting for people with CTS, but more research is required.

Implications for Practice

From the papers reviewed there is evidence to support the use of splinting in the management of CTS in those with mild to moderate symptoms but current evidence cites that surgery is beneficial over splinting in severe cases of CTS. There still appears to be dispute over the ideal position of wrist braces and length of time that they should be worn for.

Further Research Questions

Areas for consideration include:

- What is the optimum position of a splint for relief of CTS symptoms?
- When should splints be worn to provide relief of CTS symptoms – daytime /nighttime/ 24 hour wear?
- What is the optimum period of immobilisation required to provide relief of CTS symptoms?

References

Baysal O et al, Comparison of three treatment protocols in Carpal Tunnel Syndrome, International journal of Clinical Practice, July 2006, vol 60, no7, pg 820 - 8.

Muller M et al, Effectiveness of hand therapy in primary management of Carpal Tunnel Syndrome – a systematic review, Journal of Hand Therapy, 2004 ,Apr – Jun, vol 17, no2, pg 210 - 28.

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Sevim S et al, Long term effectiveness of steroid injections and splinting in mild and moderate Carpal Tunnel Syndrome, Neurological sciences, 2004, 25/2 (48 - 52).

Verdugo R et al, Surgical versus non-surgical treatment for Carpal Tunnel Syndrome, Cochrane Library, 2003, no 1.

Werner R et al, Randomised Controlled Trial of nocturnal splinting for active workers with symptoms of Carpal Tunnel Syndrome, Archives of Physical Medicine and Rehabilitation, 2005, vol 86, no1, pg 1- 7.