

CARPAL TUNNEL SYNDROME

Background

1. Definition: Entrapment neuropathy of median nerve as it courses through carpal tunnel
 - Stage I:
 - Predominantly nocturnal symptoms of numbness and /or tingling in fingers or hand coinciding with distribution of median nerve
 - Stage II:
 - Nocturnal and daytime symptoms
 - Symptoms associated with repetitive wrist movements or having wrist in one position for extended period of time
 - Complaints of hand weakness and/or dropping objects
 - Stage III:
 - Less sensory complaints, loss of fine motor skills and complaints of weakness more predominant
 - Thenar muscle atrophy
2. General Information:
 - Most common entrapment neuropathy

Pathophysiology

1. Pathology of Disease:
 - Local compressive entrapment causes demyelination leading to nerve block (neuropraxia)
 - If compression persists, local nerve blood flow is impeded. This leads to cascade of events eventually culminating in axon damage
 - Experienced pain thought to result from inflammatory mediators (TNF α) causing abnormal Na⁺ ion influx into damaged nociceptive fibers.
2. Incidence, Prevalence:
 - 1988 US survey estimated 1.88% of general public to have self-reported carpal tunnel syndrome (CTS)¹
 - White females among highest prevalence¹
 - Occupations with higher prevalence than general public:
 - Female supermarket checkers (prevalence 62.5%)
 - Mail service workers
 - Health care workers
 - Construction
 - Assembly and fabrication^{2,3}
3. Risk Factors:³
 - Repetitive hands/wrists bending and/or twisting
 - Race - more common in whites than non-whites
 - Gender - more common in females than males
 - Use of vibrating hand tools
 - Age - increasing risk per year
 - Wrist ratio: anterior to posterior distance >70% of medial to lateral distance significantly associated with idiopathic CTS⁴
 - Obesity

- Intense keyboard use (>4-6 hrs/day) as risk factor for CTS **still unknown**⁵
- 4. Morbidity / Mortality:
 - Most cases of unilateral CTS developed bilateral symptoms over time⁶
 - CTS common during pregnancy

Diagnostics

1. History
 - Symptom onset
 - Night versus day
 - Provocative factors
 - Hand positions, repetitive movements
 - Occupation
 - Pain localization
 - Median nerve distribution vs. whole hand symptoms
 - Alleviating maneuvers
 - Shaking out hands, hand position changes
 - Predisposing conditions
 - Diabetes, obesity, acromegaly, pregnancy, polyarthritis
 - Recreational activities
 - Baseball, body building
2. Physical Examination
 - Tinel's Test:
 - Tapping median nerve directly over or just proximal to carpal tunnel
 - Sensitivity = 67%, Specificity = 68%⁷
 - Very little diagnostic value in CTS
 - Phalen's Test:
 - Static wrist flexion for 60 seconds or until symptoms reproduced
 - Sensitivity = 85%, Specificity = 89%⁷
3. Diagnostic Testing
 - Nerve conduction studies:
 - Evaluates median nerve sensory and motor pathways
 - Needle Electromyography (EMG):
 - Evaluates axonal degeneration of the median nerve
4. Diagnostic Imaging
 - Ultrasound
 - Useful to visualize median nerve cross-sectional area as it enters carpal tunnel
 - Nerve conduction studies more useful for grading severity
 - MRI Resonance Imaging
 - Median nerve signal intensity, transverse carpal ligament bowing, and other measurements of carpal tunnel have very high sensitivity.⁸
 - Useful if space-occupying lesion suspected

Differential Diagnosis

1. Key Differential Diagnoses
 - Cervical radiculopathy

- Diabetic Neuropathy
- Rheumatoid Arthritis
- 2. Extensive Differential Diagnoses
 - Thoracic Outlet Syndrome

Therapeutics

1. Acute treatment
 - Wrist splints
 - Neutral wrist splint more effective than cock-up (extension) splint⁹
 - Recommend patients wear splint only at night
 - Night-time use significantly more effective than doing nothing¹⁰
 - NSAIDS
 - No better than placebo¹¹
 - Oral corticosteroids
 - Prednisolone (PEPID – please link to PEPID drug database) 20mg daily for 2 weeks, followed by prednisolone 10mg daily for 2 weeks¹¹
 - Less effective than injected steroids (into carpal tunnel)
 - Magnet therapy, acupuncture, exercise, and chiropractic care did not reduce symptoms compared to placebo or control¹²
2. Further Management (24 hrs)
 - Corticosteroid injections
 - More effective than placebo saline injection¹³
 - 40mg Triamcinolone (PEPID – please link to PEPID drug database) (Kenalog®) injected without lidocaine
 - May provide symptom relief for 3-6 months
 - Can be repeated when symptoms return
3. Treatment during pregnancy
 - Wrist splinting less effective in this population¹⁴
 - Reduction of symptoms with delivery, but not resolution of problem^{15,16}
 - Corticosteroid injections provide significant relief
 - 4mg dexamethasone used in the 3rd trimester¹⁷
4. Long-Term Care
 - Surgery
 - Indicated for patients who fail conservative methods, have sensory deficits, or muscle atrophy
 - Very good long-term results with very low recurrence rates¹⁸

Follow-Up

1. Return to Office
 - After completion of prescribed therapy or when symptoms return
 - Earlier if inadequate symptom relief
2. Refer to Specialist
 - Orthopedic surgery referral
 - Failure of conservative methods
 - Severe sensory deficit
 - Muscle atrophy

3. Admit to Hospital
 - Not indicated

Prognosis

1. No treatment: study of 132 patients who received no treatment found 47% recovered, 28% remained stable, and 23% worsened¹⁹
2. Conservative medical therapy: most patients experience symptom reduction
3. Surgical treatment: very good long-term results with low recurrence rates¹⁸

Prevention

1. Avoid repetitive wrist movements
2. Weight management
3. Ergonomic keyboards controversial¹²

Patient Education

1. Handout from American Academy of Family Physicians
<http://www.aafp.org/afp/2003/0715/p279.html>

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