CARPAL TUNNEL SYNDROME

By: Donald Barthel
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Carpal Tunnel...

Is it really aoe/coe?
Examples of False Assumptions

• Carpal tunnel syndrome is usually occupationally related.
• Degenerative disk disease is due to cumulative trauma.
• Common medical diseases (e.g. hypertension, heart disease, “GERD”, …) are related to an injury.
• Why in athletic pursuits do we encourage activity and then in workers’ compensation arena blame activity?

ASSH Position Statement on Cumulative Trauma Disorder and Repetitive Strain Injury

• The American Society for Surgery of the Hand is concerned that patients with upper extremity pain are being assigned specific diagnoses on the basis of subjective complaints without objective physical findings. There is also a tendency to assign a causal relationship to work for this pain when there is a lack of epidemiological evidence. As part of our normal process of providing the best care for our patients, it is important that the diagnosis be accurate and the assignment of causation be correct.
• The American Society for Surgery of the Hand feels that the diagnoses of "cumulative trauma disorder" (CTD) and "repetitive strain injury" (RSI) are not appropriate and may actually lead the patient to believe that he or she has a condition that is something more than the ordinary aches and pains of life.

http://www.assh.org/Public/HandConditions/Pages/CumulativeTraumaDisorder.aspx
FACT

CTS is 2nd only to backs as most common injury in lost-time cases

FACT

CTS claimants tend to be...

OLDER
PAID MORE

Meaning CTS is even more expensive!
FACT

CTS surgery drives up average costs from

$1,500
to

$12,000

FACT

"[Doctors are] not getting histories and exams to get a proper diagnosis and they're not getting tests performed properly."

Dr. Teryl Nuckols, Health Services Researcher (RAND) (11/1/11, "Rand Study Author Hopes to Improve Treatment of Carpal Tunnel", Workcompcentral)
CARPAL TUNNEL SYNDROME (CTS)

- **Definition**: “A complex of symptoms resulting from compression of the Median Nerve in the carpal tunnel, with pain and burning or tingling paresthesias in the fingers and hand, sometimes extending to the elbow.” – *Dorland's Medical Dictionary, 27th Edition*
- Most common upper extremity nerve entrapment syndrome.
What’s a “carpal tunnel”?

It really does look like a tunnel!

The Carpal Tunnel

- Transverse carpal ligament
- Carpal tunnel
- Median nerve
- Flexor tendons
- Carpal bones
The “tunnel” includes

- U-shaped cluster of 8 bones at the base of the palm
- A ligament (“transverse carpal ligament”) arching across the bones -creates the tunnel’s “roof”
The median nerve goes through the “tunnel”, controlling sensations in the:

- Palm side of the thumb
- Index finger
- Middle finger
- Half of the ring finger
So what causes this condition?

• Pressure on the median nerve!
• Caused by *anything* reducing space in carpal tunnel.

Anything?
Yes…
• ANYTHING…from bone spurs to swelling of the tendons (tough tissue connecting muscles in the carpal tunnel)

Conditions that may cause:

• repetitive, forceful grasping with the hands
  – Industrial? (Maybe, Maybe not)
• repetitive bending of the wrist
  – Industrial? (Maybe, Maybe not)
Conditions that may cause:

• hormonal changes
  – Industrial? (Better not be!)

Conditions that may cause:

• arthritis
  – Industrial? (Unlikely!)
  – Forty-six million Americans currently living with arthritis
  – Nation’s leading cause of disability
  – Increases caused by aging of the population (predominantly baby boomers)*
    *Centers for Disease Control
Conditions that may cause:

• diabetes
  – Industrial? (Unlikely!)

• thyroid imbalance
  – Industrial? (Unlikely!)

• broken or dislocated bones in the wrist that cause swelling
  – Industrial? (Maybe, Maybe not)

Conditions that may cause:

• Tunnel Size
  – Industrial? (No way!)

Though the size of your wrist appears irrelevant, having a smaller carpal tunnel makes you more prone to CTS!
Conditions that may cause:

• Heredity
  – Industrial? (No way!)

Genes account for about half of cases!

Studies show a much higher risk in women who have an identical twin with the disorder compared with those with a nonidentical twin.*

*www.health.harvard.edu

Conditions that may cause:

• Metabolic Diseases
  – Industrial? (Unlikely!)

Examples:
diabetes
thyroid disease
Conditions that may cause:

• Autoimmune Diseases
  – Industrial? (Unlikely!)

  Examples:
  Rheumatoid arthritis
  Lupus
  Connective Tissue Disorders

Conditions that may cause:

• pregnancy
  – Industrial? (If so, AOE/COE issues are the LEAST of somebody’s problems)
  20% to 60% of pregnant women develop CTS
  Symptoms usually disappear after birth (though can linger for a year!)
Conditions that may cause:

• Hormonal changes (other than pregnancy)
  – Industrial? (Unlikely!)

Example:
  ovary removal (surgical menopause)
  increases CTS risk

Conditions that may cause:

• Body Weight
  – Industrial? (Unlikely!)

Being overweight/obese may double the risk of CTS
It's as American as...

Apple Pie (and McDonalds!)

Between 1976–1980 and 2003–2004, the prevalence of obesity increased from 15.0% to...

32.9%!!!

Source: CDC, http://www.cdc.gov/nccdphp/dnpa/obesity

Cause of Carpal Tunnel Syndrome

Primary Factors (supported by current science)

• Genetics
• Age
• Obesity
• Gender
• Smoking

“…medical literature suggests most cases previously labeled as occupationally related were neither caused nor aggravated by work.” (Guides Newsletter, May – June 2009)
“Contrary to popularly held belief, no strong scientific evidence links computer use to carpal tunnel syndrome.”*

Who says that?
The defense bar?
No!
The insurance industry?
No!

What radical, employee-hating outfits make such preposterous claims?

*THE MAYO CLINIC!!!!

*HARVARD PRESS!!!!

ALSO…
Up to two-thirds of people with presumed “occupational” CTS were found to have other medical conditions capable of causing CTS!!!

And another thing…

A study of 5,600 workers found workplace computer use does not pose a risk of CTS.*

*Journal of the American Medical Association (2003)
One more thought…

A recent study found that “heavy computer users” (up to seven hours/day) did **NOT** face an increased risk of CTS!!!*

*See Neurology (2001) **

That’s the Official Journal of the American Academy of Neurology (AAN)

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A cure…?

CT cases decreased (nationally) by:

21% in 2006¹

¹Bureau of Labor Statistics

www.bradfordbarthel.com
Prof. & Bus. Service Employees:

2005 to 2006, CTS cases

Decreased by…

HALF!!!!¹

¹ Bureau of Labor Statistics

www.bradfordbarthel.com

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CTS “Risk Factors”

<table>
<thead>
<tr>
<th>Age</th>
<th>Tobacco</th>
<th>+/Weight lift</th>
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</thead>
<tbody>
<tr>
<td>Female</td>
<td>Caffeine</td>
<td>Amyloid</td>
</tr>
<tr>
<td>Obese</td>
<td>Alcohol</td>
<td>Prior CTS</td>
</tr>
<tr>
<td>Diabetes</td>
<td>Renal failure</td>
<td>Corticosteroid use</td>
</tr>
<tr>
<td>Hypothyroid (?hyper)</td>
<td>Hepatitis C</td>
<td>Raynaud’s</td>
</tr>
<tr>
<td>Wrist arthritis (OA)</td>
<td>Acromegaly</td>
<td>Systemic Sclerosis</td>
</tr>
<tr>
<td>Rheumatoid arthritis</td>
<td>Knitting/crochet</td>
<td>Breast size</td>
</tr>
<tr>
<td>Gout</td>
<td>Toxic oil syndrome</td>
<td>Polymyaglia rheumatica</td>
</tr>
<tr>
<td>Systemic lupus</td>
<td>Fractures</td>
<td>Transthyretin mutation</td>
</tr>
<tr>
<td>High demand</td>
<td>Trauma</td>
<td>Liver transplant</td>
</tr>
<tr>
<td>Short stature</td>
<td>Cushing’s synd.</td>
<td>Family history</td>
</tr>
<tr>
<td>Hypertension</td>
<td>Cushing’s dz</td>
<td>Lyme disease</td>
</tr>
<tr>
<td>BCPs</td>
<td>AV Fistulae</td>
<td>Fibromyalgia</td>
</tr>
<tr>
<td>Pregnancy</td>
<td>Estrogen/HRT</td>
<td>↓ vitamin C</td>
</tr>
<tr>
<td>Genetics</td>
<td>Wheelchair use</td>
<td>↓ vitamin B₆</td>
</tr>
</tbody>
</table>

Trigger digit
Lateral. epi
Mult. myeloma
Polyneuropathy
Dieting
Varicose Veins
Perimenopausal
Hysterectomy
Thumb CMC OA
Kidney transpl
Leprosy
‘Tendinitis’
Ganglia
Ulnar neurop.
Anatomic abn

www.bradfordbarthel.com
“Computer use deleted as carpal tunnel syndrome cause.”¹

“Clearly, if keyboarding activities were a significant risk for carpal tunnel, we should have seen, over the last 10 to 15 years, an explosion of cases. If keyboarding were a risk, it cannot be a strong factor.”

Dr. Kurt Hegmann, Director
Rocky Mountain Center for Occ. & Environ. Health
Quoted 3/9/08, in AP article: “Feared Workplace ailment drops sharply – but why?”

¹ Harvard University press release (2005)
STRONG AOE/COE CONNECTIONS

- heavy and repetitive assembly line work
- work involving prolonged, heavy gripping
- use of vibrating tools*

*(www.mayoclinic.org/.../index.html, 2/2/07)
APPROPRIATE TESTING FOR CTS?

• Physical exam
• Routine lab tests (x-rays, blood tests)

*diabetes?
*arthritis?
*fractures?

APPROPRIATE TESTING FOR CTS?

• Tinel Test:
  * doctor taps/presses median nerve
  * positive if causes tingling or “shocklike” sensation in fingers
APPROPRIATE TESTING FOR CTS?

• Phalen (aka “wrist flexion”) Test:
  * involves holding the elbows straight and flexing the hand & wrists
  * positive if fingers tingle/feel numb after one minute
APPROPRIATE TESTING FOR CTS?

• Nerve Conduction Velocity (NCV) Test:
  * administers weak electric shocks via small electrodes on hands/wrists
  * electrodes measure how quickly nerves transmit impulses

• Electromyography (EMG):
  * clinician inserts needle into muscle to measure electrical activity
  * this reveals severity of median nerve damage
CTS Treatment

- Non-surgical
  - Splinting
  - Medical management of systemic disease
    - If Vitamin B6 deficient, pyridoxine
    - Corticosteroid injection into carpal tunnel
- Surgical
  - Endoscopic
  - Open
- Treatment should decrease or resolve impairment and disability.

CTS Treatment Options?

- BRACING:
  - Need to rest affected hand at least two weeks
  - Helpful in early CTS stages (esp. when primary complaint is numbness/pain at night)
CTS Treatment Options?

• MEDICATIONS:
  – No evidence that most meds will help, including:
    * NSAIDS (aspirin, ibuprofen, naproxen)
    * COX-2 medications (ex. Celebrex)

  Corticosteriod pills should not be used more than 1-2 weeks

CTS Treatment Options?

• CORTICOSTERIODE INJECTIONS:
  – Effective for symptom relief (esp. in younger patients with short history of complaints)
  – Long-term benefits?
• Mixed
• Studies show, for most, pain returns within 2 to 4 months
• May ease symptoms more effectively than surgery in first three months, but both are “equally effective” after one year
CTS Treatment Options? (cont’d)

• SURGERY:
  – Goal: create more space in the tunnel
  – Method: releasing the traverse carpal ligament
  – Options: “open” vs “endoscopic”
Open Procedure

2 in. incision in hand/wrist to enlarge carpal tunnel

Pros: Allows surgeon to see wrist anatomy clearly
Decreases risk of injury to other nerves

Cons: Scar more tender
Recovery longer than endoscopic
Endoscopic Surgery

One or two smaller (1/2 in) incisions in wrist & palm
Camera attached to tube (endoscope) is inserted to view cutting of carpal ligament

Pros: Smaller incision = less scarring + speeds recovery

Cons: Higher risk of complications
    Ex. Damaging median/ulnar nerve
SUCCESS RATES*

Very high for both types of surgery

How high?

“80% to 90% of people report relief of daytime and nighttime symptoms after six weeks.”*

*www.health.harvard.edu

This means—of course—that you'll see success in the

VAST MAJORITY

of your workers' compensation CTS claims!
The AMA Guides & RATING CTS
CTS Case Assessment Standards

• Determine if diagnosis is accurate
  – Was the diagnosis supported by appropriate electrodiagnostic studies?

• Assess whether at maximal medical improvement.
  – Whether adequate time for resolution of impairment?

• Adequate medical documentation
  – Are there medical records and adequate history in regards to past medical history and other risk factors (medical disease, obesity, tobacco usage)?

CTS Case Assessment Standards

• Assess reliability of functional status.
  – Are the subjective complaints of interference in activities of daily living accurate?

• Assess reliability of physical examination findings
  – Was the physical examination consistent with standards defined in the Guides?

• Determine etiology of carpal tunnel syndrome (apportionment).

• Apply Guides process and criteria, as specified in appropriate edition of the AMA Guides.
Impairment Assessment

1762 carpal tunnel cases analyzed

Error rate 69% with Fifth Edition and 62% with Sixth Edition

16.5d Entrapment/Compression Neuropathy (5th ed, 491-495)

- “Objectively verifiable diagnosis”
- “Not only on believable symptoms but, more important, on the presence of positive clinical findings and loss of function”
- “Diagnosis should be documented by electromyographic studies as well as sensory and motor conduction studies”
Carpal Tunnel Syndrome

- Normal sensibility, opposition strength, nerve conduction studies = 0
- Normal sensibility/strength
  “abnormal sensory and/or motor latencies or…EMG testing
  = no greater than 5% UE (3% WPI)
- Positive clinical finding of median nerve dysfunction and electrical conduction delay(s).

CTS Impairment Options

- 0%
- “not to exceed 5%” = 0-5% UE
- Valuation based on sensory and/or motor deficits
Carpal Tunnel Syndrome (5th ed, 495)

If after an optimal recovery time following surgery, continues to be symptomatic:

1. Positive clinical findings of median nerve dysfunction and electrical conduction delay: the impairment due to residual CTS is rated according to the sensory and/or motor deficits

Table 16-15 (5th ed, 492)

Maximum Upper Extremity Impairments
Tip: Identify specific portion of median nerve involved, do not automatically rate for loss of entire median nerve. If all digits involved, the differential diagnosis is symptom magnification, peripheral neuropathy, or multiple entrapments.

Tip: Most post carpal tunnel release are Grade 5 or 4, less commonly 3. Be careful of Grade 2, 1 and 0 – more likely than not to be erroneous – based on subjective reports.
Sensory Assessment

- Examinee self-reports often unreliable.
- Based on objective sensory findings, as explicitly defined in *Guides* including two point discrimination and sensibility testing.

Motor Grading Table 16-11 (5th ed, 484)

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description of Muscle Function</th>
<th>% Motor Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Complete active range of motion against gravity with full resistance</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>Complete active range of motion against gravity with some resistance</td>
<td>1-25</td>
</tr>
<tr>
<td>3</td>
<td>Complete active range of motion against gravity only, without resistance</td>
<td>26-50</td>
</tr>
<tr>
<td>2</td>
<td>No evidence of contractility</td>
<td>100</td>
</tr>
</tbody>
</table>

Tip: Unless the nerve is severed, extremely rare to have more than a Grade 4 deficit, i.e. for median nerve involvement more than 25% x 10% UEI = 2.5% UEI.
“[G]rade 4 covers a wide range of weakness from minimal detectable weakness to severe weakness in which the muscles are functional through a full range with only very slight resistance.”

p. 484, AMA Guides

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Median nerve destroyed (ooops!)

- Sensory = Grade 0 = 100% deficit (Table 16-10a, p. 482)
- Motor = Grade 0 = 100% deficit (Table 16-11a, p. 484)

Max. value? (Table 16-15, p. 492)

  Sensory = 39%
  Motor = 10%

  100% x 39% = 39% UE (sensory)
  100% x 10% = 10% UE (motor)
Combine and convert

39% C 10% = 45% UE
45% UE = 27% WPI

CTS Impairment Options

• 0%
• 0-5% UE = 3% WPI
• Up to 45% UE = 27% WPI
CTS Errors with Fifth Edition Ratings

1. Diagnosis of carpal tunnel syndrome not confirmed by reliable electrodiagnostic testing performed by a skilled physician.
2. Unreliable functional reports.
3. Unreliable sensory or motor evaluation resulting in incorrect assessment of nerve involvement and grading.
4. Reliance on software to perform the rating. (GIGO)
5. Including factors not permitted in *Guides* resulting in “double dipping”
   - Range of motion (“the motion impairment values…are not applied to this section”)
   - Grip strength (“In compression neuropathies, additional impairment values are not given for decreased grip strength. . . the *Guides* does not assign a large role to such measurements.”)
6. Faulty assessment of causation and apportionment.

RED FLAGS

• Watch out for additional values based on
  – Decreased pinch strength
  – Decreased grip strength
  – Motor deficits of specific nerve structure(s)
  – Sensory deficits due to digital nerve lesions

“In compression neuropathies, additional impairments…not given for decreased grip strength.” p. 494
“The maximum value for each grade is not applied in automatically”

page 482, AMA Guides

Applies in California, too!
Facts

- L UE injury
- Status post-carpal tunnel release – 14 months
- MMI
- Diminished light touch
- Fair to good 2-pt discrimination (8 mm)
- Pain is “forgotten during activity”
- Complete active ROM with “some resistance”
- Sensory = Grade 4
- Motor = Grade 4

Table 16-15, p. 492

<table>
<thead>
<tr>
<th>Nerve</th>
<th>Sensory Deficit or Pain</th>
<th>Motor Deficit</th>
<th>Combined Motor and Sensory Deficits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pectoral (medial and lateral)</td>
<td>0</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Axillary</td>
<td>5</td>
<td>35</td>
<td>28</td>
</tr>
<tr>
<td>Dorsal scapular</td>
<td>0</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Long thoracic</td>
<td>0</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Medial antebrachial cutaneous</td>
<td>5</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Medial brachial cutaneous</td>
<td>5</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Median (below elbow)</td>
<td>39</td>
<td>0</td>
<td>66</td>
</tr>
<tr>
<td>Median (anterior interosseous branch)</td>
<td>0</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Median (below elbow)</td>
<td>3</td>
<td>10</td>
<td>13</td>
</tr>
<tr>
<td>Median (below elbow)</td>
<td>1</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>Ulnar palmar digital of thumb</td>
<td>5</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>Ulnar palmar digital of index finger</td>
<td>5</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>Ulnar palmar digital of middle finger</td>
<td>5</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>Ulnar palmar digital of ring finger</td>
<td>5</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>Musculocutaneous</td>
<td>5</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>Radial (upper arm with loss of pronation)</td>
<td>5</td>
<td>42</td>
<td>47</td>
</tr>
<tr>
<td>Radial (elbow with sparing of pronation)</td>
<td>5</td>
<td>39</td>
<td>44</td>
</tr>
<tr>
<td>Subscapular (upper and lower)</td>
<td>0</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Suprascapular</td>
<td>5</td>
<td>16</td>
<td>21</td>
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<tr>
<td>Thoracodorsal</td>
<td>0</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Ulnar (below elbow)</td>
<td>7</td>
<td>46</td>
<td>53</td>
</tr>
<tr>
<td>Ulnar (below elbow)</td>
<td>7</td>
<td>46</td>
<td>53</td>
</tr>
<tr>
<td>Ulnar palmar digital of ring finger</td>
<td>2</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>Ulnar palmar digital of little finger</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Ulnar palmar digital of little finger</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
</tbody>
</table>
Impairment?

Sensory?
Grade 4 = 1-25% = 10%
(see Table 16-10a, p. 482)
10% (deficit) x ? (max. sensory value)
10% (deficit) x 39% UE (max. sensory value) = 3.9% = 4% UE

Impairment (cont’d)

Motor?
Grade 4 = 1-25% = 20%
(see Table 16-11a, p. 484)
20% (deficit) x ? (max. motor value)
20% (deficit) x 10% UE (max. motor value)
= 2% UE
Combine and Convert

Sensory Impairment = 4% UE  
Motor Impairment = 2% UE  

4% C 2% = 6% UE  

6% UE = 4% WPI

Thought for the day…

• “...medical literature suggests most cases previously labeled as occupationally related were neither caused nor aggravated by work.” (Guides Newsletter, May – June 2009)
• Average observed Fifth Edition rating is 8.8% WPI, however average corrected is 3.4% WPI.
• Apportionment must always be evaluated (by facts in the case and scientific evidence).
Operating on a hand Will Not Cure a “Bad Job” or a Wounded Spirit

…or G-R-E-E-D