

Carpal Tunnel Syndrome and Other Musculoskeletal Problems in the Workplace: What's the Solution?

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Repetitive Strain Injury (RSI)

- RSIs refer to a class of musculoskeletal disorders in which chronic discomfort, pain and function impairment may develop as a result of highly repetitive movements.
- Most commonly encounter in workers involved in tasks requiring excessively forceful and repetitive motions of the neck, shoulders, elbows, wrists, hands and fingers.

Repetitive Strain Injuries (RSIs) - Some examples

- Carpal Tunnel Syndrome
- Cubital Tunnel Syndrome
- deQuervain's Syndrome
- Lateral Epicondylitis (tennis elbow)
- Neck Extension Syndrome
- Tendinitis
- Thoracic Outlet Syndrome

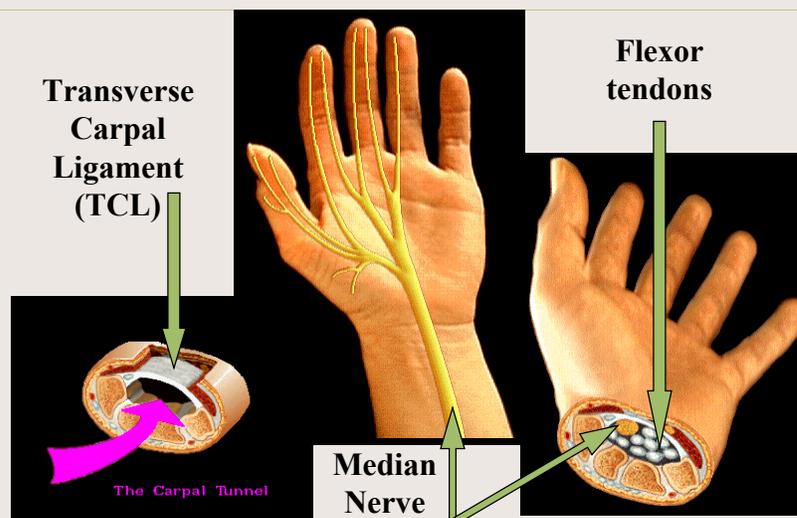
Cost & Outlook

- RSIs cost the nation \$27 billion a year in medical treatment and lost income.
- In 1991, workers compensation costs were \$60 billion
 - Direct costs: \$3,500 to \$35,000 per case
 - Indirect costs: in excess of \$200,000
- As computers continue to become more pervasive in society, RSI prevalence and costs are expected to continue to rise.

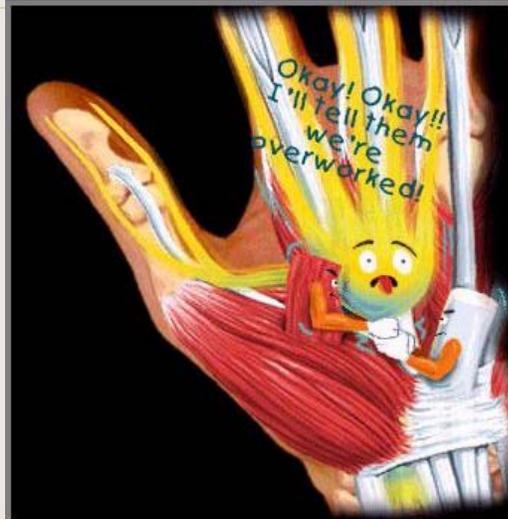
Carpal Tunnel Syndrome (CTS)

- Most frequently reported non-traumatic, work-related injury.
 - Induced by compression of median nerve in the carpal tunnel (near the anterior aspect of the wrist)
 - Aggravated by forceful and repetitive flexion and extension of the wrist
 - Compounded by pinching grips
 - Closely related to tension in finger flexor tendons and to the degree of wrist deviation from the neutral position

Anatomy of the Carpal Tunnel



Median Nerve Compression



Signs and Symptoms

- CTS is characterized by pain, numbness and tingling sensations in the proximity of the median nerve's entrance into the wrist.
 - Onset is gradual
 - Localized pain and numbness of thumb and first 2 1/2 digits
 - As disorder progresses, pain worsens at night and grip strength is diminished

Carpal Tunnel Release Surgery

- Carpal Tunnel bounded by carpal bones on bottom and transverse carpal ligament on top
- Surgeon transects ligament to increase size of carpal tunnel
- Relieves pressure on median nerve
- Is not always successful

CTR Surgery Types

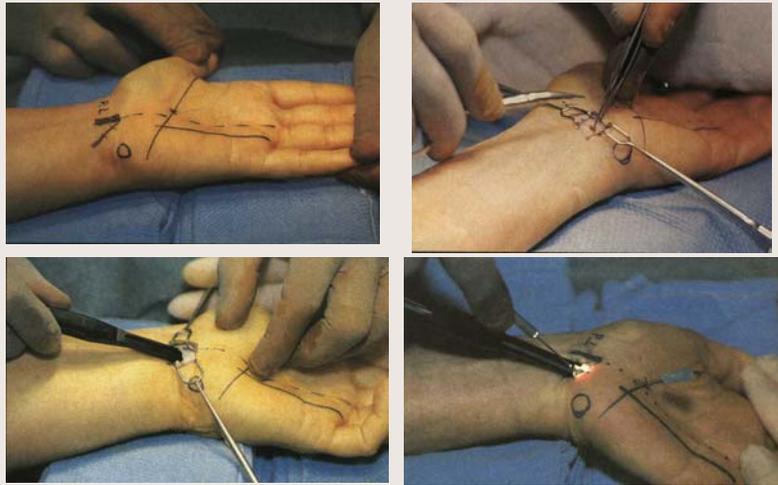
Open



Endoscopic



Carpal Tunnel Release Surgery



Current Research at ASU



Finding Effective Non-Surgical Treatments for CTS

Co-PI's: Richard N. Hinrichs, Ph.D.
and Benjamin M. Sucher, D.O.

Testing Done on Cadaver Limbs

- Twenty (20) fresh-frozen cadaver limbs (10 M, 10 F).
- Mean age 65 ± 9 years. (M: 63 ± 11 , F: 67 ± 8).
- No known wrist/ hand problems.
- Kept in -70°C deep freezer until testing.



Carefully Insert Bone Pins to Isolate TCL



Pin Placement Verified Via Fluoroscope



X-Rays Showing Proper Pin Placement



Caliper Measurements



Osteopathic Manipulation Tests



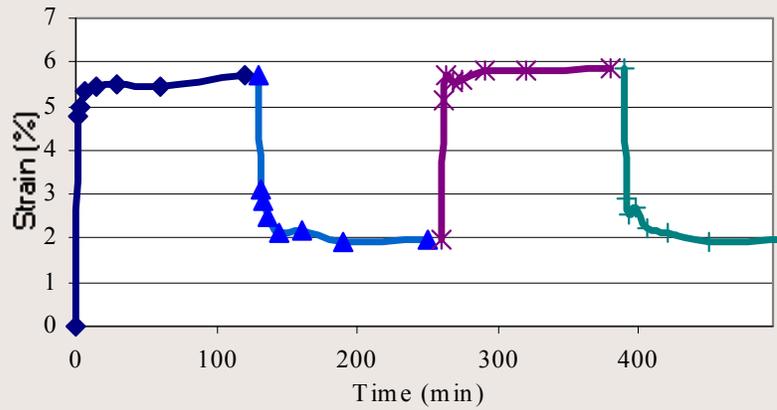
Osteopathic Manipulation Tests (con'd)



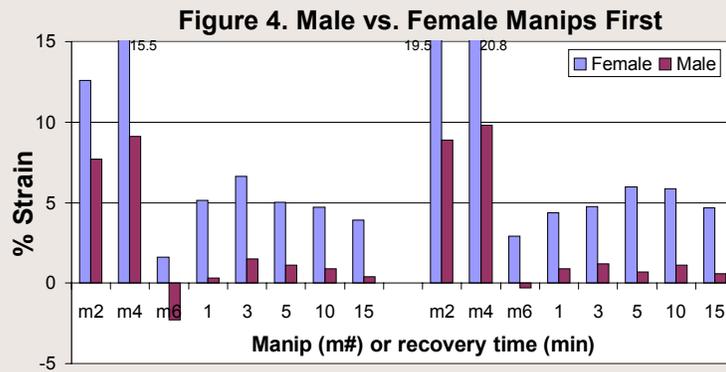
Static Loading Tests

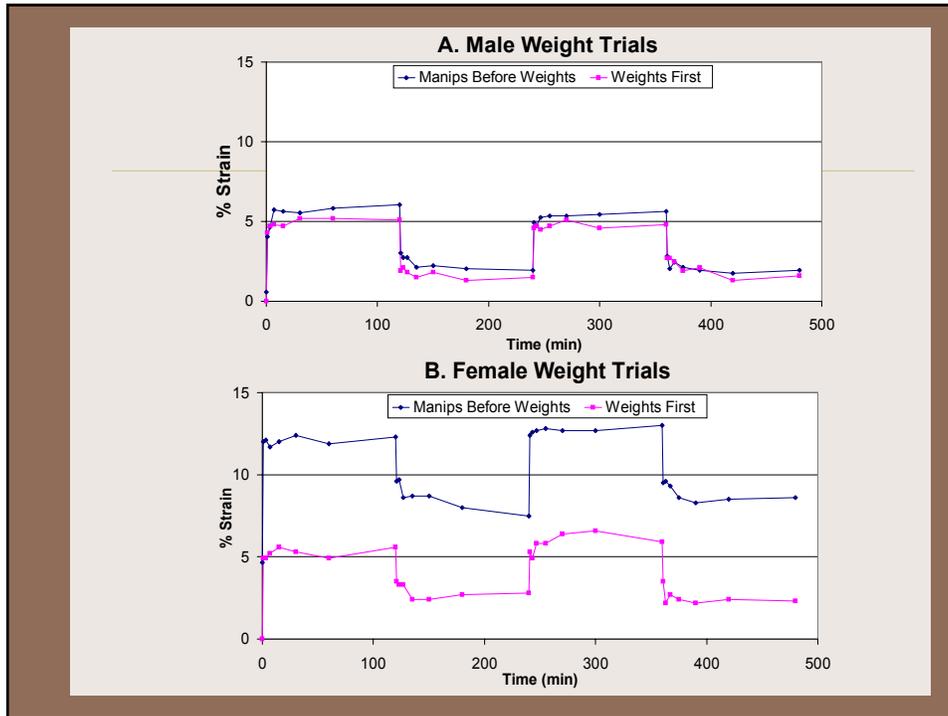


Results (Static Loads)



Results (Manipulations)





Discussion

- Our findings suggest that the TCL does respond to both dynamic and static stretching, especially in women. Our next step is to see whether or not elongating this ligament in these ways actually relieves pressure on the median nerve and a reduction in CTS symptoms in living subjects.
- Proposed treatment protocol: Alternate dynamic stretches provided by a therapist or doctor specializing in physical medicine and rehabilitation with static stretches from wearing a “CTS Bracelet” (e.g., at night) or self stretching exercises during the day.

Conclusions

- This research shows promise in developing an effective alternative to CTR surgery.
- As many as 400,000 people could be helped in the U.S. alone each year. This is the number of people currently receiving CTR surgery.
- The reduction in health care costs could be enormous.

How to Avoid or Minimize RSIs from Computer Work

- **Avoid awkward wrist positions!**
- **Relax your muscles while you work!**
- Fit your workstation to your size
- Use proper posture
- Take frequent breaks
- Stretch and strengthen muscles
- In extreme cases avoid keyboarding altogether

Basic Workstation Ergonomics: Monitor

- Place monitor directly in front of you (i.e., directly behind your keyboard (not to one side to free up desk space)).
- Top of screen should be at eye level.
- Turning head to one side or looking up or down at the monitor places unnecessary strain on your neck.

Basic Workstation Ergonomics: Keyboard and Mouse

- Best to use slide-out keyboard tray at elbow height with room for mouse directly beside (and at same height as) keyboard.
- **Place keyboard flat on the typing surface. Do not raise the back of keyboard!** This tends to promote wrist hyperextension while typing which raises the pressure inside the carpal tunnel and is a risk factor for CTS and other RSIs.

Basic Workstation Ergonomics: Keyboard and Mouse (con'd)

- **Do not rest wrists on desk while typing!** Either place keyboard at front edge of keyboard tray or place padded wrist rest between keyboard and edge of keyboard tray.
- A properly used wrist rest will reduce wrist hyperextension while typing.

Basic Workstation Ergonomics: Chair

- Buy a padded, adjustable, ergonomic computer chair.
- Best if chair has adjustable:
 - Height
 - Lumbar support
 - Forearm rests
- **Try out the chair before you buy it!**

Possible Solutions to Workstation Problem



Resources

- Good Book on Stretching:
 - “Conquering Carpal Tunnel Syndrome” by Sharon Butler (1996)
- Good Doctor: Benjamin Sucher, D.O.
 - Director, Center for Carpal Tunnel Studies, Paradise Valley, AZ
 - Leading scholar on using Osteopathic Manipulation to treat CTS with objective evidence of its effectiveness
 - Inventor of the “CTS Bracelet”
- For more information, contact us:
 - Dr. Hinrichs (www.public.asu.edu/~hinrichs/)
 - Dr. Sucher (www.centerforcarpaltunnel.com)