Repetitive Trauma Disorders of the Elbow, Wrist, & Hand

Paul N. Krop, M.D.
Repetitive Trauma Disorders

• Definition - Disorders, primarily of the soft tissues, due to repeated exertions and movements of the body. These are often worsened by abnormal posturing of the worker, vibration, high repeated stresses.

• Ramazinni, in 1717 in "The Diseases of Workers" described the concept:

• Various and manifold is the harvest of diseases reaped by certain workers from the crafts and trades that they pursue. All the profit that they get is fatal injury to their health, mostly from two causes. The first and most potent is the harmful character of the materials they handle.

• The second, I ascribe to certain violent and irregular motions and unnatural postures of the body, by reason of which, the natural structure of the vital machine is so impaired that serious diseases gradually develop there from."
"Cubital Tunnel Syndrome"

- Is general term used to indicate compression or traction on Ulnar Nerve about elbow, although may be affected at one of several sites near elbow:
  - Arcade of Struther
  - Medial intramuscular septum of upper arm
  - Medial edge of triceps tendon or muscle.
  - Cubital Tunnel Itself
  - Flexor Carpi Ulnaris Muscle.
B
1 flexor carpi ulnaris
2 common flexor origin
3 medial epicondyle
4 ulnar nerve, transposed anteriorly
a incision prior to osteotomy of medial epicondyle
1. medial epicondyle and common flexor origin, retracted anteriorly and distally
2. flexor carpi ulnaris, retracted distally
   a. incision in medial elbow capsule
   b. incision in medial collateral ligament
"Cubital Tunnel Syndrome"

- **Causes** -
  - Direct blow to nerve
  - Chronic compression of nerve, as in resting arm against desk, work station, or machinery.
  - Positioning of elbow in marked flexion as in sleep, work or hobbies.

- **Symptoms** -
  - Medial elbow pain
  - Numbness in ulnar 1 ½ digits
  - Weakness/in coordination/Late Ayro -
  - Physiology of intrinsic hand muscles
"Cubital Tunnel Syndrome"

• Diagnosis -
  – Symptoms -
    • Weakness of flexor of 4th & 5th
    • Digits, clawing of 4th & 5th

• Treatment -
  – Rest
  – Pressure avoidance
  – Night resting long arm splint at 450 elbow flexion & neutral rotation of forearm.
  – Surgical decompression/transposition.
Lateral Epicondylitis / Tennis Elbow

- Also called tennis elbow
- 90% not tennis players
- Common upper extremity tendonopathy
- Usually insidious onset without "single event" History
- Age related, rare under 30 - something's (except in tennis).
- Worse in smokers.
- Pathology routinely shows fibroblasts and increased blood vessels and gross findings at surgery show fibrous tissue instead of normal healthy tendon; consistent with repetitive minor injury.
Lateral Epicondylitis / Tennis Elbow

- Normal range of motion pain on grasp with resisted wrist extension, especially with elbow extended.
- Local tenderness just distal to lateral epicondyle.
- Weakness of grasp & wrist extension
- Normal elbow X-ray
Lateral Epicondylitis / Tennis Elbow

• Diagnosis -
  – Normal range of motion pain on grasp with resisted wrist extension, especially with elbow extended.
  – Local tenderness just distal to lateral epicondyle.
  – Weakness of grasp & wrist extension
  – Normal elbow X-ray
Lateral Epicondylitis / Tennis Elbow

• Treatment -
  – Rest
  – Change in activities
  – Change in ergonomics of work environment (position, repetition amount of force, etc.).
  – Anti inflammatories (local or injectable) may be of some use.
  – P.T. Identify muscular trigger points, work on stretch & repetitive moderate muscle loading until healed.
  – “Counterforce Brace" - controversial - may increase other problems - I do not recommend - Surgery less than 5% of cases; debride affected tissues & repair.
Fig. 78-6. Resisted wrist extension test.

Fig. 78-7. Resisted extension of the middle finger produces lateral elbow pain and reproduces symptoms of lateral epicondylitis.

Fig. 78-8. Lateral deviation of the hand produces lateral elbow pain in tennis elbow.

Fig. 78-9. Extension of the elbow with the forearm pronated and the wrist palmar flexed produces lateral elbow pain in lateral epicondylitis.

Fig. 78-10. Steroid and local anesthetic injection into the proximal tendon of the extensor carpi radialis brevis for lateral epicondylitis.
Fig. 78-11. A, The modified lateral release operation of Bosworth. B, Lengthening of the distal tendon of the extensor carpi radialis brevis (ECRB) muscle. C, Surgical repair of the proximal tendon of the ECRB. D, Percutaneous tenotomy of the ECRB tendon.
Lateral Epicondylitis / Tennis Elbow

Long Recovery!

With or without surgery.
Forearm
Radial Tunnel Syndrome

• Symptoms -
  – Proximal dorsal forearm ache weakness of wrist extension pain and weakness on resisted 3rd & 4th digit extension.

• Causes -
  – Repetitive grasping/pulling direct blow dorsal proximal forearm.
1. sensory branch of radial nerve
2. radial recurrent artery
3. biceps and brachialis, retracted
4. brachioradialis
5. radial nerve
6. branch to brachioradialis
7. posterior interosseous nerve
8. arcade of Frohse
9. supinator
10. branch to extensor carpi radialis brevis
Radial Tunnel Syndrome

• Findings -
  – Tenderness over radial tunnel (in contrast to lateral tennis elbow).
  – Weakness to wrist and 3rd, 4th digital extension.
  – No numbness
  – EMG findings

• Treatment -
  – Rest/ Time
  – Splinting
  – Surgical decompression, including Arcade of Fronsce
DE Quervain's Syndrome

• Findings -
  – Tenderness, Radial side, Distal forearm at and distal to, radial styloid swelling; women more common positive Finkelstein's test.

• Causes -
  – Repetitive grasping, especially with wrist ulnar deviation; hammering.
B

1 superficial branches of the radial nerve
2 superficial vein
3 extensor pollicis brevis
4 abductor pollicis longus
a incision in the extensor retinaculum
DE Quervain's Syndrome

• Treatment -
  – Rest, splint (including, thumb), inject tendon sheath(s) with corticosteroid & anesthetic.
  – Occasionally, surgical release of first dorsal compartment - sheathe (often two compartments, release both)
  – Successful recovery near 100%.
  – Watch out for radial nerve.
Hand
Trigger Digit

• Findings -
  – Painful locking of digit in flexion
  – Begins insidiously
  – Ring most common
  – More common with age
  – Tender nodule sliding to and from through palmar area over distal metacarpal.
Trigger Digit

• Treatment -
  – Rest
  – Inject flexor sheathe with corticosteroid / analgesic
  – Differential gliding exercises of Hunter of Phila hand center (hook & straight fist).
  – Surgical release of A, pulley.
1 flexor tendon
2 neurovascular bundle
3 A₁ pulley
a diagonal incision in A₁ pulley
CAUSES OF CTS

• NATURAL DISEASE PROCESS

• METABOLIC FACTORS

• ENVIRONMENTAL STRESS
  – REPETITIVE MOTION
  – EXTREME WRIST POSITIONS
  – VIBRATORY TRAUMA
Cumulative Trauma, Carpal Tunnel Syndrome in the Workplace

• Upper discomfort is common, but becoming a patient because of it is an uncommon choice, often driven more by perceptions and anxieties than the quality of the primary illness.

• Choosing to be a "patient" in a workers' compensation program confounds the illness.
WHAT IS CARPAL TUNNEL SYNDROME?

MEDIAN NERVE DYSFUNCTION ENHANCED BY AN UNDIVIDED TRANSVERSE CARPAL LIGAMENT
Associated Conditions

- Diabetes
- Alcoholism
- Thyroid imbalance
- Rheumatoid arthritis
- Pregnancy, menopause
- Others
Other Areas
Of Nerve Entrapment

• Neck
• Shoulder
• Elbow
• Forearm
• Wrist

All may cause hand numbness and pain.
BAD DESIGN

GOOD DESIGN
BEND THE TOOL, NOT THE WRIST