Carpal Tunnel Syndrome (CTS): the carpal tunnel is a tight canal at the base of the palm, through which tendons and nerves pass from the forearm to the hand.

The most common cause of CTS is inflammation of the tendons in the tunnel, which is usually due to repetitive movements of the hand and/or wrist, particularly with the use of a computer keyboard.

Other causes include fluid retention from medication. Systemic conditions often associated with CTS include diabetes, thyroid disorders, rheumatoid arthritis (and pregnancy!)

About one in five people who report pain, numbness and tingling in the hands may have CTS.

About 14% of a large study in Sweden experienced these symptoms and 3.8% were diagnosed with CTS.

Electrodiagnostic studies (nerve conduction) showed that 4.9% had abnormalities of the median nerve at the wrist.

This equates to a 2.7% prevalence of CTS in the general population.

Workers who had to use excessive force with the hand for more than one hour a day were more likely to have confirmed CTS than those with less frequent use. (5.4% as compared with 1.8%)

In older people, women are 4 times more likely to have confirmed CTS than men.

In 1998, a study found that 40% of patients with diagnosed CTS had an underlying medical condition, but that less than 12% of these patients was aware of this condition.

The authors of the study attributed this high level of missed diagnosis to an "incomplete approach to the diagnosis of arm pain" which stemmed from an assumption that repetitive motion at work was the source of the problem.

They suggested that "a thorough systematic search for concurrent medical diseases should be performed," since

"the diagnosis and treatment of these underlying illnesses typically lead(s) to improvement."([1])

Note also that CTS-type problems may in fact be due to pathology in the cervical spine(C6-7 and possibly T1).

Arthritis at the wrist is another possible diagnosis.

Symptoms of CTS:

- Tingling or numbness in hand or fingers.
- Shooting pains in wrist or forearm, possibly extending up to the shoulder, neck or chest.
- Difficulty in clenching the fist to grasp small objects (loss of dexterity).
- Symptoms flare up at night and may disturb sleep.

Tests:

1. Tinel's test: tapping the area of the hand above the median nerve: tingling/numbness or pain suggests CTS

2. Phalen's test: placing the hands back to back (without any pressure): pain/tingling/numbness within 60 seconds suggests CTS
3. Dynameter: a device to test the strength of your grip; measures the pressure you can exert when squeezing a trigger mechanism
4. Electrodiagnostic test; nerve conduction test using electrical impulses

Treatment:

1. treating underlying condition
2. anti-inflammatory medication e.g. ibuprofen if appropriate
3. massage
4. ergonomics: chair height relative to desk, keyboard and/or mouse; sitting posture; wrist rest
5. splints/braces
6. physical therapy: ultrasound, interferential current therapy (ICT): can reduce inflammation and swelling
7. chiropractic: especially if there is a ?double crush': i.e. nerve compression at 2 sites: neck and wrist; C7 pathology may mimic CTS
8. acupuncture with/without electro-acupuncture: the US NIH* concluded after review in 1997 that acupuncture may be a useful adjunctive treatment.
9. Vitamin B6: several studies have shown that 100mg 3 times a day may be beneficial.
10. Homoeopathy: a variety of different remedies may be effective; it is best to seek expert help from a registered homoeopath.

Note: Corticosteroid injection therapy is not effective except in the short-term (only around 2 weeks): one study() found that 48% of the patients who took part and had steroid injections later went on to require surgical release.

Surgery may be required if the condition fails to respond to the above measures.

*National Institutes of Health

Cubital Tunnel Syndrome: entrapment of the ulnar nerve as it passes behind the elbow, causing

symptoms similar to those you experience when you bang your ?funny bone'.

Of course, when persistent, these are far from amusing symptoms.

Sleeping with the elbow bent will worsen the problem.

Often this condition coincides with thoracic outlet syndrome (see below): in up to a third of patients; or with CTS in up to 40% of patients.

X-rays of the elbow may be needed to detect joint disease.

The differential diagnosis should include: synringomyelia, C8 and T1 pathology.

Treatment consists mainly of wearing a splint at night to hold the arm at 70 degrees of flexion. Vitamin B6 50mg 3 times a day may also be useful.

Avoidance of repetitive elbow flexion and pronation and use of vibrating tools is necessary.

Non-steroidal anti-inflammatory drugs (NSAIDs) may help to reduce inflammation.

About 50% of patients should not require surgery, which is reserved for those with disability and weakness.

Thoracic Outlet Syndrome: (TOS)

The thoracic outlet is the space between the clavicle (collarbone) and the first rib.

This is a narrow space crammed with a variety of blood vessels, muscles and nerves.

If the muscles in the chest are weakened, the clavicle may slip down and forward and exert pressure on the nerves and blood vessels.

Other causes include: muscle enlargement, injuries, an extra rib (cervical rib) and rarely tumour at the top of the lung.

The structures most often affected are the subclavian artery and the lower trunk of the brachial plexus, which is a large bundle of nerves which supplies the arm; the lower trunk carries nerves from C8 and T1. Most symptoms arise from compression of these nerves, which usually occurs at the junction of the lower trunk and the first rib.

Symptoms:

- Neck, shoulder and arm pain, can extend to hand and fingers
- Numbness
- Weakness
- Fatiguing rapidly
- Impaired circulation to arm
- Often symptoms are reproduced when the arm is positioned above the shoulder or extended.
- Overhead activities particularly difficult
- Symptoms range from mild to severe, and may be intermittent or constant
- One of the manifestations of nerve compression is sympathetic hyperactivity,(15 to 25% of nerve fibers are of sympathetic origin): this results in constriction of blood vessels in the fingers
- Chest pain: persistent chest pain with normal cardiac tests and no evidence of upper gastrointestinal tract abnormalities might be caused by TOS.

Diagnosis:

Neurological examination

Upper extremity oedema may be found

Radial (wrist) pulse may be absent or obliterated with reproduction of symptoms: tested by placing the arm of the affected side on the sitting patient's thigh with the forearm supinated (palm facing upwards). The head is turned to the affected side, the neck extended (head back) and breath held; a positive test shows the radial pulse is obliterated.

The radial pulse may also be obliterated in the ?at attention' test: when the patient thrusts the shoulders down and back as if standing to attention or carrying a backpack.

In 1997, Carlos Selmonosky presented a paper in which he proposed a Diagnostic Triad:

"supraclavicular tenderness, paresthesias and/or pains, and/or paleness of the hands on elevation of the arms and hands, weakness of the abductors and adductors of the fourth and fifth fingers".([2])

(i.e. tenderness above the collarbone, tingling and/or pain, and/or pale hands..weakness of the muscles which move the ring and little fingers towards and away from each other.)

Tests: chest X-ray

Evaluation for cervical rib

Doppler ultrasound may be performed to exclude vascular abnormalities MRI of neck: cervical spondylosis (pinching of the nerves at spinal level) must be excluded.

Nerve conduction test

Digital pneumatic plethysmography: detects sympathetic hyperactivity The normal wave forms become blunted or flattened according to the degree of sympathetic hyperactivity.

Treatment: is usually conservative (non-surgical).

One website on the Internet notes that the diagnosis itself may be a form of therapy because so often patients have been to numerous doctors and failed to get a diagnosis of any sort; they may even have been accused of malingering.

This, of course, is nothing new to arachnoiditis patients!

- Physiotherapy: strengthen muscles around the shoulder;
- Posture: note that depression may worsen a slouching posture; good posture is vital to lessen pressure on nerves and blood vessels
- Stop repetitive or strenuous activity
- Non-surgical treatment takes a while to be effective
- Weight loss may be helpful if overweight
- Avoid carrying heavy bags over the shoulder as this depresses the collarbone and increases pressure on the thoracic outlet.

Simple exercises:

1. Corner stretch: stand in a corner (about 1 foot away from it) with your hands at shoulder height, one on each wall. Lean into the corner until you feel a gentle stretch across your chest. Hold for 5 seconds.
2. Neck stretch: put your left hand on your head, and your right hand behind your back. Pull your head toward your left shoulder until you feel a gentle stretch on the right side of your neck. Hold for 5 seconds. Switch hand positions and repeat for the other side.
3. Shoulder rolls: shrug your shoulders up, back, and then down in a circular motion.
4. Neck retraction: pull your head straight back, keeping your jaw level. Hold for 5 seconds.

(Taken from the AAOS Online Service Fact Sheet [3])

Note: only do these exercises if they are not painful!

- Surgery: reserved for the most severe and persistent cases.

Other compression syndromes include:

Meralgia paresthetica: the lateral femoral cutaneous nerve may be compressed: commonly during pregnancy, but also in obesity, diabetes; it causes numbness and/or pain in the outer aspect of the thigh.

Tarsal tunnel syndrome: the posterior tibial nerve in the ankle; associated with phlebitis, fracture and rheumatoid arthritis; it causes burning/tingling of the ankle and sole, worse when walking, with some loss of sensation in the sole. (see below under foot pain section).

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[1] Atcheson et al *Arch Intern Med* 1998; 158:1469, 1506-1512

[2] Selmonosky CA 1997 Annual Clinical Meeting of the American Academy of Pain Management: An Algorithm for the Diagnosis of Thoracic Outlet Syndrome

[3] American Academy of Orthopaedic Surgeons http://orthoinfo.aaos.org/fact/thr_report.cfm?Thread_ID=206&topcategory=Shoulder