



THE UNIVERSITY OF TOLEDO MEDICAL CENTER

ORTHOPAEDIC MONTHLY

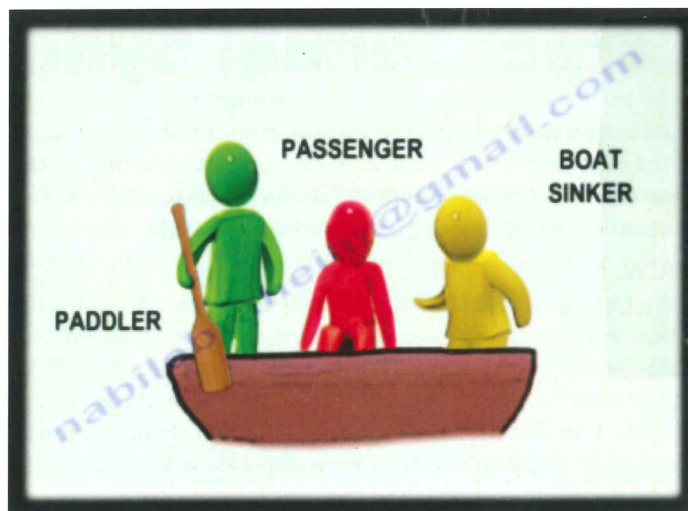
VOLUME 5, ISSUE 9 SEPTEMBER 2015

Creating Sustainable Balance Amongst Your Team

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Imagine your organization resembles a sailing boat. You will see a lot of good days, but some bad. On the good days, there is calm weather, sunshine, smooth sailing and peaceful enjoyment of nature. On the bad days, there will be cloudy weather, rough water and sometimes you will face a hurricane.

On the boat there are three types of people: 1. Engaged (PADDLER-30% of people): They keep the boat moving forward and work above and beyond with a sense of purpose. They are the BEST assets to your organization! They are creative and motivated to help the organization succeed, and are proud of the contribution their organization makes to the community. 2. Disengaged (PASSENGER-50% of people): Neutral and think situations do not affect them. They are not involved at all. They are either doing their job or doing the bare minimum. 3. Actively Disengaged (BOAT SINKER-20% of people): They are the biggest threat to the organization, they often use negativity and pointing fingers to aid in tearing an organization apart. Leaders must confront the boat sinkers, either they must paddle or get off the boat.



Which type are you? Are you a paddler, a passenger or are you trying to sink the boat?

Spondylolysis, Spondylolisthesis, Spondylitis & Spondylosis

What is the difference between spondylolysis, spondylolisthesis, spondylitis and spondylosis? These four conditions all affect the lumbar spine and may cause confusion.

SPONDYLOLYSIS (pars interarticularis defect): Anatomic defect or break in the pars interarticularis of the vertebral arch. Spondylolysis occurs in the lower lumbar spine (usually appears as a radiolucent gap on lateral x-ray) and in about 5% of the population. It is not present at birth, but develops over time and may run in families. Spondylolysis is usually asymptomatic: caused by repetitive trauma, especially hyperextension (may cause stress fractures). The patient may have activity related low back pain or hamstring tightness. AP and lateral x-rays may show defect in about 80% of cases. Oblique views may add another 15% to the diagnosis.

The "scotty dog" sign refers to the normal appearance of the lumbar spine when seen on oblique radiographic projection. If present, the pars interarticularis will have a defect (collar around dog's neck). A CT scan is the best study when checking for healing. A SPECT scan is best when x-rays are negative but strongly suspect the condition.

SPONDYLOLISTHESIS (vertebral slippage): Vertebrae start to shift out of place, if the stress fracture weakens the bone and is unable to maintain proper positioning. This forward slipping of vertebrae may affect nerves. It is the slipping of the vertebral body, not the disc. 15% of patients with pars defects progress to forward slippage. L5-S1 slippage occurs in 90% of pediatric cases.

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Spondylolysis, Spondylolisthesis, Spondylitis & Spondylosis continued

L4-L5 slippage is usually degenerative and occurs in female adults. A large slip will continue to slip and a dysplastic slip will continue to progress.

TYPES OF SPONDYLOLISTHESIS: •Congenital. •Isthmic - Most common: usually due to pars defect. •Degenerative - Occurs as a result of facet arthritis; - Affects females older than 50, African Americans and the L4-L5 level; - Typically the slip is not bad and rarely exceeds 30%; - Associated with instability and lumbar stenosis and may require flexion extension x-ray to check for instability. Other rare types are traumatic, pathologic and post-surgical.

GRADES OF SPONDYLOLISTHESIS: Type I (less than 25%). Type II (25-50%). Type III (50-75%). Type IV (75-100%). Type V (spondyloptosis). A lateral view x-ray will measure grade and slip angle. Pelvic incidence = pelvic tilt + sacral slope.

Surgical Consideration in Treatment: L1-L4 - Repair the defect if conservative treatment fails. L5-S1 - In situ fusion from L4-S1. Reduction of the slip may cause an L5 nerve root injury.

SPONDYLITIS (vertebral inflammation): Can affect either the lower spine or cervical spine.

EXAMINATION: •Pott's Disease - TB of the spine. •Ankylosing Spondylitis - An autoimmune disease involving the spine and sacroiliac joints (a form of spondylarthritis). The spine goes from a stage of inflammation to a stage of fusion. "Bamboo spine" is a radiographic feature that occurs as a result of vertebral body fusion by marginal syndesmophyte. HLB-27 is positive in the majority of cases. Fractures in Ankylosing Spondylitis: - Fracture may be occult. - Get a CT scan or an MRI for the diagnosis. - Be careful about a neurological injury.

SPONDYLOSIS (vertebral arthritis): Degenerative osteoarthritis of the joints between vertebrae and/or neural foramina. The space between the adjacent vertebrae narrows, which leads to compression of the nerve roots. Radiculopathy (compression of nerve roots) will lead to pain and sensory and motor changes. In the cervical spine, compression of the spinal cord from arthritis can lead to myelopathy.

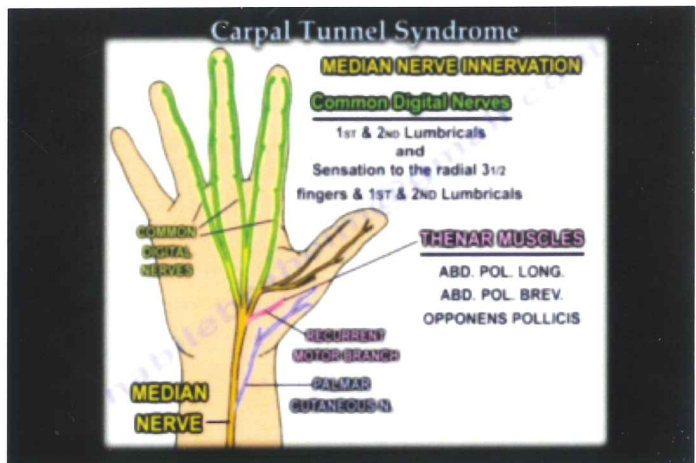
Carpal Tunnel Syndrome (CTS)

Carpal tunnel syndrome is the compression of the median nerve at the wrist (most common form of nerve entrapment). What is the carpal tunnel? The carpal tunnel is a narrow passageway on the palmar side of the wrist made up of bones and ligaments.

CARPAL TUNNEL SIMULATION - The nerve is like a truck passing through a tunnel, it should be able to pass with ease and without friction. If the tunnel is narrow, then the truck (nerve) cannot pass. If you want the nerve to pass, widen the tunnel. The carpal tunnel is defined by: •Scaphoid tubercle and trapezium (radially). •Hook of hamate and pisiform (ulnarly). •Proximal carpal row (dorsally: carpal bones). •Transverse carpal ligament (palmarly).

The carpal tunnel consists of 9 flexor tendons (flexor pollicis longus, flexor digitorum profundus and flexor digitorum superficialis) and one nerve. The palmar cutaneous branch arises from the radiopalmar part of the nerve, 5 cm proximal to volar wrist crease. This branch of the median nerve runs between the palmaris longus and flexor carpi radialis interval. It passes superficial to the transverse carpal ligament (TCL) to supply sensation to the thenar eminence. After passing through the carpal tunnel, the median nerve gives a branch on the radial side called the recurrent motor branch. The recurrent branch innervates the abductor pollicis brevis, flexor pollicis brevis (superficial) and opponens pollicis muscles. This branch has multiple variations of the nerve. Variations of the Recurrent Branch: •50-Extraligamentous. •30%-Subligamentous. •20%-Transligamentous: All with recurrent innervation.

When carpal tunnel release is needed, it is important to cut the transverse carpal ligament far ulnarly to avoid cutting the recurrent motor branch of the median nerve (which can uncommonly originate from the ulnar border of the median nerve). How does CTS occur? Pressure is placed on the median nerve and other structures by the transverse carpal ligament. When using a splint, the CT pressure is lowest when the wrist is in neutral position and increases when the wrist is in extension.



PRESENTATION: Symptoms: numbness and tingling in the radial 3½ digits (less at the thenar area of palm), clumsiness and weakness, pain and paresthesia at night (relieved by shaking the hand away), self-administered hand diagram and thenar atrophy may be present.

EXAMINATION: •Durkan's Test (Carpal tunnel compression test) - Pressing thumbs over the carpal tunnel and holding pressure for 30 seconds. The onset of pain or paresthesia at the median nerve distribution within 30 seconds is a positive result. •Phalen Test - Wrist volar flexion for approximately 60 seconds will produce symptoms. •Tinel's Sign - Performed by tapping on the median nerve over the volar carpal tunnel. •Semmes-Weinstein Test - Sensory test for detecting early CTS. •Innervation Density Test - Static and moving two-point discrimination and nerve regeneration.

Diagnosis of CTS is a clinical diagnosis. Do an EMG and nerve studies if surgery is considered. Electromyogram & Nerve Conduction Studies: The only objective evidence of a compressive neuropathy (may be negative in about 20% of patients).

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Carpal Tunnel Syndrome continued

- Carpal Tunnel, EMG, NCS:
- Use NCS for sensory and motor study.
 - Use distal latency for sensory and anything >3.5 msec is diagnostic.
 - Use distal latency for motor and anything >4.5 msec is diagnostic.
 - NSC velocity less than 52 m/sec is abnormal.

CTS is classified into:

- Mild - Only sensory conduction affected: night numbness/tingling, no weakness, diagnosis is usually by medical history and physical findings are not present.
- Moderate - Both sensory and motor conduction affected. Patients will have symptoms during the day and provocative tests are positive.
- Severe - Both sensory and motor conduction affected, needle finding in EMG, weakness and atrophy. Radiographs are not routinely used in diagnosis of some conditions associated with CTS. If you have four abnormalities (hand diagram, sensory test, Semmes-Weinstein in the wrist at neutral testing, positive compression test and night pain), the probability of correctly diagnosing CTS is about 90%.

Night pain is the most sensitive predictor (96%). - Positive compression test (Durkin's Test-89%). - Semmes-Weinstein Test (83%). - Hand Diagram (76%). - Tinel's Sign (71%). An EMG does not increase diagnostic value of these four tests; proceed with surgery even if the EMG is normal. If the patient has weakness and atrophy of the thumb and sensory tests for CTS are negative, get an MRI to rule out pressure on the motor branch of the median nerve.

ETIOLOGY:

- Repetitive motion and vibration - Causes thickening of transverse carpal ligament.
- Pregnancy.
- Systemic diseases - Diabetes, dialysis, rheumatoid arthritis, obesity, hypothyroidism, amyloidosis and mucopolysaccharidosis.

Idiopathic CTS pathology: Edema and fibrosis of tenosynovium. - Not inflammatory. CTS has a high coincidence with thumb CMC osteoarthritis. Risk factors include: female, smoking, advanced age, alcoholism, obesity and repetitive motion. Certain athletic activities such as throwing, tennis or cycling may cause carpal tunnel syndrome.

Space Occupying Lesion - Patients with atypical presentation (male, young or unilateral); suspect a space occupying lesion (ganglion, gout, lipoma, synovial sarcoma, anomaly of the muscle or dislocating fracture).

Double Crush Syndrome - Patients with carpal tunnel syndrome may feel pain in the forearm, elbow, upper arm, shoulder, chest or upper back. Compression at one site decreases the threshold at another. C6 radiculopathy and CTS coexist. An upper extremity exam will begin at the neck. BEWARE! The most common level for radiculopathy C6 is similar to CTS. Common "Double Crush" Associations: Cervical root compression and CTS (medial nerve).

Always consider spine pathology in patients with CTS. Good

prognostic indicators include: 1. Night symptoms. 2. Complete release. 3. Symptom relief with injection. 4. Small incision. TREATMENT: -NSAIDs. - Night splint in neutral position (if EMG/NCS is negative). - Activity modification: These are all first line treatment options. - Steroid injection (failure to improve after injection is a poor prognostic factor). Injection site is 1 cm proximal and 1 cm ulnar to the intersection of the palmaris longus tendon and distal palmar crease. Comparing surgery with splints: The improvement success rate is 80% with surgery and 54% with splinting at 3 months. At 18 months, the success rate is 90% with surgery and 75% with a splint. There is support and value for using local steroid injections and splinting for nonoperative care of CTS. The use of a neutral wrist splint improves night symptoms and should not be worn during the day. Wrist splint is functional at 30° of extension; however, this degree of extension narrows the carpal tunnel.

SURGERY INDICATION:

- Failure of nonoperative management.
- Thenar weakness/atrophy.
- EMG abnormalities.
- Known extrinsic compression from a mass lesion.

Surgery can be open or endoscopic. Open release results: - Pillar pain for up to 3-4 months; - Dynamic symptoms resolve rapidly (with wrist movement); - Release of the carpal tunnel and Dupuytren's contracture at the same time may make the condition worse; - Static numbness/weakness may take a year for improvement to plateau. Endoscopic advantages: small incision, decreased pillar pain and early return to work. Endoscopic disadvantages: incomplete release and may cause injury to the nerve, artery or tendon.

Acute CTS following ORIF of a distal radius fracture. Postoperative dense numbness in distribution of the median nerve after surgery, especially after superclavicular regional anesthesia wears off. - Do an immediate open CT release. OUTCOMES: Pinch strength returns in 6 weeks and grip strength is expected to return to 100% of preoperative levels by 12 weeks postoperative.

Repeat carpal tunnel release for recurrent CTS is not as successful as primary release (a larger incision may be needed). 25% of patients will have complete relief, 50% some relief and 25% with no relief.

NO EFFECT on release results:

- Internal neurolysis.
- Transverse carpal ligament reconstruction.
- Tenosynovectomy.
- Guyon's tunnel release.

Always examine the neck and have a differential diagnosis!

•Cervical radiculopathy. •Brachial plexopathy. •Thoracic outlet syndrome. •Pronator syndrome. •Peripheral neuropathy.

CAUSES OF RELEASE FAILURE:

- Incomplete TCL release.
- Incorrect diagnosis.
- Double/triple crush.
- Peripheral neuropathy.
- Space occupying lesion.
- Iatrogenic median nerve injury.

Anatomy of the Tibialis Posterior Muscle

The tibialis posterior is a relatively small muscle located within the posterior compartment of the leg (back of the calf). Some believe that this muscle may have its own compartment. ORIGIN: The upper 2/3 of the back of the tibia (lateral to the vertical line and below

the soleal line) and upper 2/3 medial surface of the fibula, deep transverse fascia, adjacent intramuscular septa and the posterior surface of the interosseous membrane.

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Anatomy of the Tibialis Posterior Muscle continued

INSERTION: The muscle followed by the tendon of the tibialis posterior, travel distally running posterior to the medial malleolus, within the groove. It then splits into a medial and lateral part. The medial part (important) of the tendon is inserted into the tuberosity of the navicular and medial cuneiform bones. The lateral is inserted into the intermediate and lateral cuneiforms and the base of the 2nd, 3rd and 4th metatarsal bones.

INNERVATION: Muscles of the posterior compartment, including the tibialis posterior, are supplied by the posterior tibial nerve (L4-L5).

FUNCTION OF TIBIALIS POSTERIOR: •Invert the foot. •Assist in plantar flexion. •Maintain the medial longitudinal arch. The major antagonist of the tibialis posterior is the peroneus brevis muscle (EVERSION). The tendon of the tibialis posterior may become entrapped during lateral subtalar dislocation.

POSTERIOR COLLICULAR FRACTURE: The tibialis posterior and flexor digitorum longus tendons support the medial malleolar fragment (reason the fragment does not displace significantly). A fracture of the posterior colliculus is supported by the posterior tibialis tendon.

TIBIALIS POSTERIOR TENDON RUPTURE: When the tendon ruptures and condition is advanced, it has the classic finding of "Too Many Toes" due to a collapse in the medial longitudinal arch, hind foot valgus, forefoot abduction and varus. Where does the tendon rupture occur? Degeneration occurs in the watershed area of the tendon, distal to the medial malleolus.

POSTEROLATERAL APPROACH TO THE TIBIA: Can be used for open plate fixation of the tibia on its posterior surface (may be necessary when the anterior soft tissues are compromised). This approach is often utilized for treatment of nonunions, especially infected nonunions with posterolateral bone grafting. It allows access to both the tibia and fibula and creates synostosis between the two bones.

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