Neuropathic Pain in the Orthopedic Patient

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"Instead of looking at your patients and thinking of them as having back or neck pain... instead see them as suffering with skepticism, nervousness- and being tentative about getting another decision wrong. Set your business up to help people overcome THOSE things and the rewards will undoubtedly come your way"

— unknown
Rehabilitation Philosophy

- What does every patient want/need?
  - What’s wrong with me?
  - What can I do about it?
  - What can you do about it?
  - How long will it take?
- “Man is inert, sluggish, and averse from labour, unless compelled by necessity...”
  - Thomas Malthus

Resources

- Adriaan Louw, PT, PhD, CSMT
  - https://www.ispinstitute.com
- Jack Stagge PT, OCS
- David Butler: Neuro Orthopaedic Institute NOI
- https://www.youtube.com/playlist?list=PLo4JkIPFPNSQultT9BORFzI3-4FAydgK
  - Youtube channel for Physical Therapy Nation

Referred Sources of Pain
The Ouch Button

• When you palpate and there is pain that must be the location of problem...
  – Or is it?

The Ouch Button

“When pain from localized peripheral neural pathology becomes widespread, tenderness can be found along the course of the affected nerve.”
  • Devor, Lishman, Quitner, etc.

Tender Points

• Will be Found in Muscles Innervated by Involved Nerve The complaint of pain and demonstration of local tenderness may obscure the fact of offending pathological lesion is centrally placed
  • Keele C. A. Neile E (cds). 1971

Neurogenic Rheumatica

• The usual diagnosis of arthritis, bursitis, neuritis, muscular rheumatism, fibrositis should not be made until cervical nerve root irritation has been considered. Joint swelling may be directly caused by inflamed nerve roots.
Types of Nerve “Injuries”

- Mechanical
  - Compressive
  - Traction
- Chemical
  - Inflammatory
- Combination

Compressive

- External: Boney formations, cyst, scar tissue
  - Treatment of Externally Compressive Neuropathy
  - May include traction techniques ie manual or mechanical
- Internal: Swollen Nerve
  - Treatment may require injection, oral steroids, or direct intervention in addition to typical treatments for External compression

Inflammatory

- Localized neuritis with distalization of symptoms.
- Examples: Herpes Zoster, Neuralgias including Sciatica etc.
- Treatment Techniques DO NOT involve stretching.
  - 15% elongation in NORMAL neural tissue causes microvascular stoppage
- Active – Ongoing – Inflammatory Condition
  - Very gentle oscillation of surrounding anatomical structures.
### Comparisson

<table>
<thead>
<tr>
<th>Compressive</th>
<th>Inflammatory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loss of Reflex</td>
<td>Possible Hyper Reflexia</td>
</tr>
<tr>
<td>Hypoesthesia</td>
<td>Hyperesthesia</td>
</tr>
<tr>
<td>Loss of strength</td>
<td></td>
</tr>
<tr>
<td>Irradiation with compressive positioning</td>
<td>Irradiation with provocation positions</td>
</tr>
<tr>
<td>Hair loss</td>
<td>Distal Tenderpoint, Mechanical hyperalgesia</td>
</tr>
<tr>
<td>Possible + electrodiagnostic tests</td>
<td>Negative Electrodiagnostic tests</td>
</tr>
</tbody>
</table>

“E. M. G. will probably be negative if nerve is inflamed rather than compressed. Must lose 80% of conduction channels before tests are definitive.”

- Haldeman S., SPINE Vol. 9, No. 1, 1984
- Sunderland S., Nerve and Nerve Injury, 1977
- Yoshizawa, H. SPINE Vol. 20. No. 4, 1995

Electromyography and nerve conduction velocity studies remain the gold standard for confirmation of the diagnosis of suprascapular neuropathy; however, nerve pain may occur even in the setting of a negative electromyography.
Lesion Side

• Does it matter which side the nerve lesion is on?


RESULTS:
• Mechanical withdrawal threshold of the ipsilateral hind paw was significantly decreased for 21 days. Conversely, mechanical withdrawal threshold of the contralateral hind paw was significantly decreased from 5 to 10 g for 7 days, and was <5 g at days 14 and 21. TNF-alpha expression and GFAP-positive satellite cells in the contralateral DRG significantly increased from day 7 to day 21. In the contralateral spinal dorsal horn, GFAP-positive astrocytes significantly increased for 21 days, but Iba-1 was not significant.

Sleep effects

• Sleep deprivation 36-48 hours
  – Pain pressure threshold decreases 23%
  – Max pain pressure threshold decrease 42%
  – Visual analog scale increases 50%
  
  Disturbances in sleep, pain behaviour and psychological distress influence return to work in workers who have suffered a soft tissue injury, e.g. low back pain. In conclusion, there is a reciprocal relationship between sleep quality and pain

  • Sleep and pain. Harvey Moldofsky. Sleep Medicine Reviews Volume 5, Issue 5, October 2001, Pages 385-396
Centralization

Not the McKenzie principle...


- The aim of this study was to investigate whether bilateral widespread pressure hypersensitivity exists in patients with unilateral carpal tunnel syndrome. A total of 20 females with carpal tunnel syndrome (aged 22-60 years), and 20 healthy matched females (aged 21-60 years old) were recruited. Pressure pain thresholds were assessed bilaterally over median, ulnar, and radial nerve trunks, the C5-C6 zygapophysial joint, the carpal tunnel and the tibialis anterior muscle in a blinded design.

- The results showed that pressure pain threshold levels were significantly decreased bilaterally over the median, ulnar, and radial nerve trunks, the carpal tunnel, the C5-C6 zygapophysial joint, and the tibialis anterior muscle in patients with unilateral carpal tunnel syndrome as compared to healthy controls (all, $P < 0.001$).

- Pressure pain threshold was negatively correlated to both hand pain intensity and duration of symptoms (all, $P < 0.001$). Our findings revealed bilateral widespread pressure hypersensitivity in subjects with carpal tunnel syndrome, which suggest that widespread central sensitization is involved in patients with unilateral carpal tunnel syndrome.

Widespread mechanical pain hypersensitivity as sign of central sensitization in unilateral epicondylalgia: a blinded, controlled study. Fernández-Carnero J1, Fernández-de-las-Peñas C, de la Llave-Rincón AI, Ge HY, Arendt-Nielsen L.

- The aim of this study was to investigate whether generalized deep tissue hyperalgesia exists in patients with chronic unilateral lateral epicondylalgia (UE).

- A total of 26 UE patients (10 males and 16 females, aged 25 to 63 y) and 20 healthy comparable matched controls (aged 26 to 61 y) were recruited and pressure pain threshold (PPT) was assessed bilaterally over the median, ulnar, and radial nerve trunks, the lateral epicondyle, C5-C6 zygapophysial joint, and the tibialis anterior muscle in a blind design.

- PPT was significantly decreased bilaterally over the median, ulnar, and radial nerve trunks, the lateral epicondyle, the C5-C6 zygapophysial joint, and tibialis anterior muscle in patients with UE than healthy controls (all $P<0.001$). PPT over those measured points was negatively related to current elbow pain intensity (all $P<0.05$). A more significant decrease in PPTs were present in females (all $P<0.05$).

- This revealed a widespread mechanical hypersensitivity in patients with UE, which suggest that central sensitization mechanisms are involved in patients with unilateral UE. The generalized decrease in PPT levels was associated with elbow pain intensity, supporting a role of peripheral sensitization mechanisms in the initiation or maintenance of central sensitization mechanisms. In addition, females may be more prone to the development of generalized mechanical hypersensitivity.

Sixteen women with unilateral LE (mean ± SD age, 43 ± 7 years), 17 women with unilateral CTS (43 ± 6 years), and 17 healthy women (43 ± 6 years) were included in this study. Pressure pain thresholds (PPT) were bilaterally assessed over the median, ulnar, and radial nerve trunks, as well as over the C5-6 zygapophyseal joints, by an examiner blinded to the subjects’ condition. A mixed-model analysis of variance was used to evaluate differences in PPT among groups (LE, CTS, or controls) and between sides (affected/nonaffected or dominant/non-dominant).

RESULTS:

* The individuals in both the LE and CTS groups demonstrated lower PPT bilaterally over the median (group, P<.001; side, P=.437), radial (group, P<.001; side, P=.556), and ulnar (group, P<.001; side, P=.938) nerve trunks as compared to controls.

* Additionally, radial (P=.002) and ulnar (P=.05) nerves were more sensitive bilaterally in patients with LE than in patients with CTS. The median nerve was more sensitive bilaterally in patients with CTS than patients with LE (P=.02). Lower PPT over the cervical spine (group, P=.002; side, P=.23) were found bilaterally in both the LE and CTS groups. Further, patients with CTS exhibited lower cervical PPT than patients with LE. Lower PPT were negatively correlated with both pain intensity and duration of symptoms in both the LE and CTS groups (P<.001).

CONCLUSIONS:

* Bilateral mechanical nerve pain hypersensitivity is related to specific and particular nerve trunks in women with either unilateral LE or CTS.

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### Peripheral Nerve Reaction to Injury

<table>
<thead>
<tr>
<th>Insult</th>
<th>Physiologic Status</th>
<th>Etiology</th>
<th>Electrophysiology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimal</td>
<td>Conduction block, rapidly reversible</td>
<td>Focal ischemia, mild compression</td>
<td>Focal conduction block</td>
</tr>
<tr>
<td>Intermediate</td>
<td>Conduction block, prolonged</td>
<td>Focal demyelination</td>
<td>Focal conduction block and slowing</td>
</tr>
<tr>
<td>Severe</td>
<td>Wallerian degeneration</td>
<td>Loss of axon and myelin sheath</td>
<td>Absent response</td>
</tr>
</tbody>
</table>

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### Fibers and Functions

<table>
<thead>
<tr>
<th>Fiber Category</th>
<th>Diameter (microns)</th>
<th>Speed (meters/second)</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aa</td>
<td>1-2</td>
<td>50-100</td>
<td>Large motor axons, nociceptive afferents and somatosensory afferents</td>
</tr>
<tr>
<td>Ab</td>
<td>2-4</td>
<td>10-50</td>
<td>Touch, pressure, vibration, joint position sensory axons</td>
</tr>
<tr>
<td>Ag</td>
<td>5-10</td>
<td>1-10</td>
<td>Gamma efferent motor axons</td>
</tr>
<tr>
<td>Ad</td>
<td>10-15</td>
<td>0.5-2</td>
<td>Sharp pain, very light touch &amp; temperature sensation</td>
</tr>
<tr>
<td>Bx</td>
<td>1-3</td>
<td>1-2</td>
<td>Sympathetic preganglionic motor nerve</td>
</tr>
<tr>
<td>C</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>Dull, itching, burning pain and temperature sensation</td>
</tr>
</tbody>
</table>

Symptom involved indicates severity.

**SEVERITY**

This can be helpful for diagnosis and education of the patient.
“Orthopedic” Patient Diagnosis That May Have Neurogenic Causation or in whom symptoms are maintained by Neurogenic Input.

**Lower Extremity**
- Failed Back Syndrome
- Chronic Hamstring Strain
- Chronic Plantar Fascitis
- Compartment Syndrome
- Persisting pain Post op Knee
- Chronic Trochanteric Bursitis
- Chronic Peroneal Tendonitis
- Chronic Achilles Tendonitis

**Upper Extremity**
- Chronic Biceps tendonitis
- Arthritic “___”
- Adhesive capsulitis
- Chronic Lateral Epicondylitis
- Chronic Medial Epicondylitis
- RTC tear
- Failed RTC repair
- Non specific arm pain

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**Evaluation**


- A high index of suspicion for nerve entrapments enables the clinician to identify these conditions in a timely manner and institute an appropriate management program, thus improving patient outcomes.


Signs and symptoms suggestive of nerve entrapment include anesthesia, dysesthesias, paresthesias, or weakness in the distribution of a peripheral nerve. The physical examination may reveal an abnormal neurologic examination finding in the distribution of a peripheral nerve, positive nerve provocative testing, and positive Tinel sign over the area of entrapment. Electrodiagnostic studies, radiographs, magnetic resonance imaging studies, and sonographic evaluation may assist with the diagnosis of these disorders.
Subjective Findings

Common Complaints
- “feels like a hot poker”
- “burning intense pain”
- “feels dead”
- “feels weird” “not right”
- “Can’t really describe it”
- “Can’t pin point what aggravates”
- Intolerance to hot/cold
- Hypersensitivity to clothing/bedsheets
- Don’t like ESTIM

Pain Detect
Total Score
0-12 A neuropathic pain component is unlikely (< 15%)
13-18 Result is ambiguous, however a neuropathic pain component can be present
19-38 A neuropathic pain component is likely (> 90%)
Objective Findings

- Compensated Postures
- Atrophy
- Compensated Cervical motion with UE AROM
- Compensated Elbow ROM with UE AROM
- Compensated Knee/ankle ROM with Lumbar ROM
- Palpable tenderspots
- Potential weakness
- Diminished sensation
- Abnormal/asymmetrical ULNT or LLNT signs
- Hyper/hyporeflexive

<table>
<thead>
<tr>
<th>Movement</th>
<th>Nerve root levels</th>
<th>Nerve root levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shoulder</td>
<td>Shrugs (elevation)</td>
<td>Trapizius C2-5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Spinal accessory</td>
</tr>
<tr>
<td>Abduction</td>
<td>Deltoid/supraspinatus C5 (6)</td>
<td>Axillary/suprascap.</td>
</tr>
<tr>
<td>External rotation</td>
<td>Infraspinatus/teres C5 (6)</td>
<td>Suprascapular</td>
</tr>
<tr>
<td>Internal rotation</td>
<td>Pectoralis major C5-7</td>
<td>Lateral pectoral</td>
</tr>
<tr>
<td>Adduction</td>
<td>Latissimus/Pectoralis C6 (8)</td>
<td>Subsapular/pectoral</td>
</tr>
<tr>
<td>Flexion</td>
<td>Deltoid/corachobr. C5-6</td>
<td>Axillary/musculocut.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Radial</td>
</tr>
<tr>
<td>Elbow</td>
<td>Flexion</td>
<td>Biceps/brachialis Brachioradialis C5-6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Musculocutaneous</td>
</tr>
<tr>
<td>Extension</td>
<td>Triceps</td>
<td>C6-7 Radial</td>
</tr>
<tr>
<td>Wrist</td>
<td>Flexion</td>
<td>Flexor carpi mm. C6-7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Median/ulnar</td>
</tr>
<tr>
<td>Extension</td>
<td>Extensor carpi radialis Ext. carpi ulnaris C6-7 (C7)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Radial</td>
</tr>
<tr>
<td>Pronation</td>
<td>Pronator teres</td>
<td>C6-7 Median</td>
</tr>
<tr>
<td>Supination</td>
<td>Supinator C5-6</td>
<td>Radial</td>
</tr>
<tr>
<td>Finger</td>
<td>Flexion</td>
<td>Flexor digitorum mm. C7-8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Median (ulnar)</td>
</tr>
<tr>
<td>Extension</td>
<td>Extensor digitorum C7-8</td>
<td>Radial</td>
</tr>
<tr>
<td>Abduction &amp; adduction</td>
<td>Interosseus muscles C8-T1</td>
<td>Ulnar</td>
</tr>
<tr>
<td>Thumb abduction</td>
<td>Abductor pollicis C8-T1</td>
<td>Median</td>
</tr>
<tr>
<td>Hip</td>
<td>Flexion</td>
<td>Iliopsoas L2-3 (L4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lumbar plexus</td>
</tr>
<tr>
<td>Extension</td>
<td>Gluteus</td>
<td>L5-S2</td>
</tr>
<tr>
<td>Abduction</td>
<td>Gluteus medius</td>
<td>L5-S1</td>
</tr>
<tr>
<td>Adduction</td>
<td>Adductur mm.</td>
<td>L2-4</td>
</tr>
<tr>
<td>Knee</td>
<td>Flexion</td>
<td>Hamstring L5-S1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sciatic</td>
</tr>
<tr>
<td>Extension</td>
<td>Quadriceps</td>
<td>L2-4 Femoral</td>
</tr>
<tr>
<td>Ankle</td>
<td>Dorsiflexion</td>
<td>Tibialis anterior L4-5 (S1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Peroneal (Fibular)</td>
</tr>
<tr>
<td>Plantar flexion</td>
<td>Gastroc/soleus S1 (S2)</td>
<td>Tibial</td>
</tr>
<tr>
<td>Inversion</td>
<td>Posterior tibial</td>
<td>L5 (S1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tibial</td>
</tr>
<tr>
<td>Eversion</td>
<td>Proneal (fibular) mm. L5 (S1)</td>
<td>Peroneal (Fibular)</td>
</tr>
<tr>
<td>Great toe</td>
<td>Dorsiflexion</td>
<td>Extensor hallucis L5 (S1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Flexor hallucis S1 (S2)</td>
</tr>
<tr>
<td>Plantar flexion</td>
<td>Gastroc/soleus</td>
<td>Tibial</td>
</tr>
</tbody>
</table>
Neural Irritation Tests

Passive by Clinician
- Femoral
- Saphenous
- SLR (use IR and Add)
- ULNT 1-3
  - Median
  - Radial
  - Ulnar

Active
- Slump (use lumbar sidebending)
- Obturator
- Axillary

The test modified becomes the treatment
-Gary Gray

When you find a test that is positive consider how you can modify it to become a manual technique.

Often will see objective improvement in the test before there is a change in subjective symptoms
- EDUCATE THE PATIENT ON THIS!!!

The purpose of this study was to quantify the strain of the median nerve and the ulnar nerve throughout upper-extremity positioning sequences used by clinicians to evaluate nerve dysfunction.

Median
- nerve tension test caused a maximum summative strain in the median nerve at the carpal tunnel of 7.6%,
- with the largest increase in strain during elbow extension (3.5%).

Ulnar
- Nerve tension test caused a maximum summative strain in the ulnar nerve of 2.1%,
- with the largest increase in strain during shoulder abduction (0.9%).


Significant excursion of the ulnar nerve is required for unimpeded upper-extremity motion. The 2 most common sites of nerve entrapment, the cubital tunnel and the entrance of Guyon's canal, were studied.

SHOULDER ABD 30 degrees to 110 degrees
- An average of 4.9 mm ulnar nerve excursion was required
- 5.1 mm was needed

ELBOW FLEXION 10 degrees to 90 degrees.
- Wrist EXT was moved from 60 degrees of extension to 65 degrees of flexion, 13.6 mm excursion of the ulnar nerve was required at the wrist.

COMBINED
- 22.9 mm at the elbow
- 23.2 mm at the wrist
- Ulnar nerve strain of 15% or greater was experienced at the elbow with elbow flexion and at the wrist with wrist extension and radial deviation.

Any factor that limits excursion at these sites could result in repetitive traction of the nerve and possibly play a role in the pathophysiology of cubital tunnel syndrome or ulnar neuropathy at Guyon’s canal.
Symptoms of quadrilateral space syndrome usually include vague shoulder pain, numbness or tingling in the arm, and tenderness to pressure over the area of the quadrilateral space. A dull ache in the shoulder may worsen when the arm is moved overhead repeatedly.
Golfer’s Elbow


Following clinical screening, we examined movement of the median nerve at the wrist using high-resolution (10-22 MHz) ultrasound in 16 controls and 12 patients with non-specific arm pain (also referred to as repetitive strain injury).

Imaging was performed just proximal to the carpal tunnel with the wrist in neutral, 30 degrees of extension and 30 degrees of flexion. In control subjects the position of the median nerve was 4.8 (SE=0.4) mm more radial with the wrist flexed than with the wrist extended. In the twelve arm pain patients the average change was only 1.2 (SE=0.5) mm.

It appears that ultrasound imaging may be helpful in diagnosing non-specific arm pain, a condition for which there are no well-defined diagnostic tests at present. The reduced nerve movement seen with ultrasound imaging confirms previous work with magnetic resonance imaging.
Musculocutaneous

The Musculocutaneous Nerve

- **Nerve roots:** C5-C7.
- **Motor functions:** Innervates the muscles in the anterior compartment of the arm—such as the pronator teres, the pronator quadratus, the flexor carpi ulnaris, and the flexor digitorum profundus.
- **Sensory functions:** Given rise to the lateral cutaneous nerve of the forearm, which innervates skin on the lateral surface of the forearm.

Ulnar

Consider when your post op shoulder patient struggles to regain OH motion

Radial
Suprascapular

“FROZEN SHOULDER”
Suprascapular Nerve Impingement

The suprascapular nerve is derived from the upper trunk of the brachial plexus from the roots of C5 and C6. It supplies sensory and sympathetic fibers to two-thirds of the shoulder capsule. Usually there are no sensory fibers to the skin. The nerve then travels through the suprspinatus muscle under the bicipital groove to supply the infraspinatus muscle. In about 50% of people there is another connection through the suprspinatus muscle, creating a second fibrous transverse for the nerve to traverse.

The Shoulders of Professional Beach Volleyball Players High Prevalence of Infraspinatus Muscle Atrophy

• (PDF Download Available).
The Shoulders of Professional Beach Volleyball Players High Prevalence of Infraspinatus Muscle Atrophy

- Atrophy of the infraspinatus muscle was found in 30% of the hitting shoulders, and it was not typically recognized by the players.
- Average external rotation strength was decreased in the hitting shoulder (8.2 versus 9.5 kg, P < .0001).
- Players with atrophy had significantly more loss of external rotation strength (2.3 kg) than did players without atrophy (0.8 kg).
- Average Abduction strength was decreased in the hitting shoulder (7.8 vs 8.5 kg, P < .001). The infraspinatus muscle substantially contributes to abduction strength (up to 40%).
- Pain in the hitting shoulder was present in 63% of the players, without clear correlations to the investigated clinical and imaging parameters.
- Compression of the suprascapular nerve was not observed.

The literature well acknowledges that the reason for infraspinatus atrophy is overhead-shoulder activity, over-use, or trauma leading to a neuropathy of the suprascapular nerve.** Such neuropathy can be caused by direct compression of the suprascapular nerve at the level of the scapular notch or at the spinoglenoid notch, because of a ganglion cyst or a hypertrophied transverse scapular or spinoglenoid ligament, respectively. But in volleyball players with infraspinatus atrophy and documented neuropathy, a compression of the suprascapular nerve by a ganglion or a ligament was not observed. This is in agreement with our findings: the 84 sonographies and 29 MRIs of the hitting shoulders showed neither a ganglion cyst nor a hypertrophied ligament in the course of the suprascapular nerve. We therefore agree with Ferretti et al15,16 that the cause of infraspinatus atrophy in volleyball players is a stretching neuropathy of the suprascapular nerve caused by the repetitive hitting activity.


We retrospectively reviewed the results of non-operative treatment of suprascapular neuropathy in fifteen patients seen between November 1983 and February 1991. The clinical diagnosis was confirmed with electrodiagnostic studies. The treatment consisted of a program of physical therapy to improve the range of motion of the shoulder and to strengthen the surrounding muscles. The average duration of follow-up was three years and eleven months (range, one year to eight years and ten months). The latest evaluation included electrodiagnostic studies of the affected extremity and dynamic isokinetic testing of both upper extremities. The result was excellent for five patients and good for seven. The three remaining patients had operative treatment because of persistent symptoms; one of these patients had an excellent result, one had a good result, and one had a poor result. The results suggest that, in the absence of a well defined lesion producing mechanical compression of the suprascapular nerve, suprascapular neuropathy should be treated non-operatively.
What’s this sound like?

• Have the patient bring his arm across the anterior portion of the body to bring the scapula maximally around the thorax. (This increases the distance of the suprascapular foramen from the cervical spine origin of the nerve, thereby stretching it). With this movement there is often increased irritation to the nerve and pain in related areas.

What’s this sound like?


• METHODS:
  • A 5-year retrospective chart review of patients with EMG-confirmed SSN.
  • MAIN OUTCOME MEASURES:
  • Descriptive statistics were used to summarize demographics, risk factors, causes, EMG findings, diagnostic evaluation, treatments, and self-reported outcomes. Exact Mantel-Haenszel χ² tests and Fisher exact tests were used to assess correlation between these measures.
  • RESULTS:
  • The 3 most common causes of SSN were trauma (32 patients), an inflammatory process (i.e., brachial neuritis) (14), and the presence of a cyst (13). Remaining cases were related to a rotator cuff tear or were due to overuse. No cases were attributed to notch abnormalities. At the time of follow-up (a mean of 50 months [range, 15-84 months] after EMG), 50% of subjects returned to activity with no restrictions (excellent outcome) and 40% returned to activity with restrictions (good outcome), regardless of cause and treatment. EMG findings, specifically the presence/absence of fibrillation potentials, did not predict recovery.
Complete Fatty infiltration of intact rotator cuffs caused by suprascapular neuropathy

• Abstract
• Suprascapular neuropathy is generally considered to be a diagnosis of exclusion, although it has been described in association with several activities and conditions. To our knowledge, this is the first description of suprascapular neuropathy with complete neurogenic fatty replacement in patients with intact rotator cuff tendons in the absence of traction or compression mechanisms. We present 4 cases of patients who presented with complete fatty infiltration of the supraspinatus (1 patient), infraspinatus (2 patients), and both (1 patient) resulting from suprascapular neuropathy. Each of these patients underwent arthroscopic suprascapular nerve decompression and subsequently had immediate improvement in pain and subjective shoulder value.

A comparative analysis of fatty infiltration and muscle atrophy in patients with chronic rotator cuff tears and suprascapular neuropathy.

• We have observed that the magnetic resonance imaging (MRI) appearance of fatty infiltration (FI) and muscle atrophy (MA) differ between chronic cuff tears and suprascapular neuropathy, suggesting different pathophysiology.
The femoral neuralgia is a rather frequent and invalidating clinical disorder.

It takes on many clinical forms because of the anatomical variations of the cutaneous branches of saphenous and femoral nerves.

Bilateral femoral nerve injury can occur after various surgical and nonsurgical processes, but has rarely been reported.

We describe a case of bilateral femoral neuropathy after a suicide attempt in a 41-year-old woman. We suggest a stretch mechanism to explain this observation. We also discuss the other causes of bilateral nerve palsy, usually secondary to a compressive injury, with a review of the medical literature.

CONCLUSIONS:
Half of the reported cases are secondary to a surgical process (particularly abdominopelvic surgery). If a compressive origin is most frequent, a stretch mechanism may at times explain a bilateral femoral neuropathy.
Saphenous nerve entrapment has been reported within the literature to be associated with or mimic a number of conditions including lumbar radiculopathy, patellofemoral disorders, suprapatellar plica, tear of medial meniscus, tibial stress fracture, pes anserine tendonopathy or bursitis, osteochondritis dissecans, nonspecific synovitis and reflex sympathetic dystrophy.

Saphenous nerve entrapment has been reported on historical examination patients will typically present with complaint of medial knee and or leg pain, pain with kneeling, and there may be an associated trauma to the saphenous nerve via blunt trauma or previous surgical procedures.

The distribution of pain in saphenous nerve entrapment patients has been reported as at the knee (90%), thigh (7%) and calf (3%) and it may also be present at night. Physical examination may elicit hypoesthesia or dysesthesia in the absence of any motor weakness and a positive Tinel's test at the site of injury. Patients may also present with pain on gait and resisted adduction or flexion at the hip, as well as pain on palpation at the adductor canal or the medial femoral condyle where the saphenous nerve pierces or wraps around the sartorius muscle. Pain may also be elicited with prone hip extension (reversed Lasegue’s sign) due to an increase in neural tension along the saphenous nerve.

- Saphenous nerve, a pure sensory nerve, may compromise as a result or complication of a surgical procedure or secondary to trauma or insidiously.
- We present a male patient with low back pain concomitant with pain in medial portion of left thigh in addition to pain and numbness in medial part of leg and inferior part of patella after a strenuous activity.
- Preliminary diagnosis suggested that the patient had radiculopathy but electrophysiologic tests revealed the absence of left saphenous response both in medial leg and infrapatellar region, while normal findings were recorded from right side.
- Needle electromyography in L4 innervated muscles were normal. The patient had saphenous nerve entrapment in left thigh.
- Two months later symptoms relieved with conservative therapy.

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Sciatic

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Peroneal

Shin Splints
Peroneal tendinitis

An unusual case of leg pain and atrophy in a patient with gastrocnemius due to tibial nerve branch compression by a Baker's cyst. The clinical findings and electrodiagnostic studies were supportive of isolated medial gastrocnemius denervation. Treatment by synovectomy along with decompression of the branch of the posterior tibial nerve to the medial head of the gastrocnemius muscle resulted in clinical improvement.
Intraoperative nerve monitoring during total shoulder arthroplasty surgery. Malik AA1, Aresti N1, Plumb K1, Cowan J1, Higgs D1, Lambert S1, Falworth M1. Shoulder Elbow. 2014 Apr;6(2):90-4

- **BACKGROUND:**
  - Nerve injury is an acknowledged complication of total shoulder arthroplasty (TSA). Although the incidence of postoperative neurological deficit has been reported to be between 1% and 16%, the true number of nerve damage is considered to be higher. The present study aimed to identify the rate of intraoperative nerve injury during total shoulder arthroplasty and to determine potential risk factors.

- **METHODS:**
  - A prospective study of nerve conduction in 21 patients who underwent primary or revision TSA was carried out over a 12-month period. Nerve conduction was assessed by measuring intraoperative sensory evoked potentials (SEP). A significant neurophysiological signal change was defined as a change in sensory evoked potential amplitude to ≤50% of the preoperative level or a change in latency of ≥10% or a change in waveform morphology not caused by anesthetic or operative technique.

- **RESULTS:**
  - Seven (33%) patients had a SEP signal change. The only significant risk factor identified for signal change was male sex (odds ratio 15.00, 95% confidence interval). The median nerve was the most affected nerve in the operated arm. All but one signal change returned to normal before completion of the operation and no patient had a persisting postoperative clinical neurological deficit.

- **CONCLUSIONS:**
  - The incidence of intraoperative nerve damage may be more common than previously reported. However, the loss of SEP signal is reversible and does not correlate with persisting clinical neurological deficits. The median nerve appears to be most at risk. Monitoring SEPs in the operated limb during TSA may be a valuable tool during TSA.


- **BACKGROUND:**
  - This study compared the incidence and pattern of potential nerve injuries between reverse shoulder (RSA) and total shoulder arthroplasty (TSA) using intraoperative neuromonitoring. Our hypothesis was that RSA has a greater risk of nerve injury than TSA due to arm lengthening.

- **METHODS:**
  - We reviewed 36 consecutive patients who underwent RSA (n = 12) or TSA (n = 24) with intraoperative neuromonitoring. The number of nerve alerts was recorded for each stage of surgery. Neurologic function was assessed preoperatively and postoperatively at routine follow-up visits. Predictive factors for increased intraoperative nerve alerts and clinically detectable neurologic deficits were determined.

- **RESULTS:**
  - There were nearly 5 times as many post-reduction nerve alerts per patient in the RSA cohort compared with the TSA cohort (2.17 vs. 0.46). There were 17 unresolved nerve alerts postoperatively, with only 2 clinically detectable nerve injuries, which fully resolved by 6 months postoperatively. A preoperative decrease in active forward flexion and the diagnosis of rotator cuff arthropathy were independent predictors of intraoperative nerve alerts.

- **CONCLUSION:**
  - RSA has a higher incidence of intraoperative nerve alerts than TSA during the post-reduction stage due to arm lengthening. Decreased preoperative active forward flexion and the diagnosis of rotator cuff arthropathy are predictors of more nerve alerts. The clinical utility of routine intraoperative nerve monitoring remains in question given the high level of nerve alerts and lack of persistent postoperative neurologic deficits.
Patients with continued weakness may be perceived as lacking motivation by health care providers.

Persistent motor and sensory abnormalities after surgery may affect the rehabilitation process.

A case of a 20-year-old man who underwent surgical repair of multiple knee structures with the use of a pneumatic tourniquet. Several weeks after surgery, electromyographic evaluation was done because he was having difficulty in his rehabilitation because of persistent weakness.

An electromyography and nerve conduction study (NCS) revealed femoral and saphenous nerve palsies.

A review of the literature indicates that tourniquet-induced nerve palsies are not a rare event.

Further evaluation should be considered if patients who are having persistent weakness or sensory findings after surgery have used a tourniquet.


**METHODS:**

- Thirty-four patients with a mean age of 28.4 years were included. The Latarjet procedure was divided into 4 defined stages. Delaney/reduction and anterior axillary and posterior axillary incisions were performed. In “nerve alert” zone intraoperative neuromonitoring was performed for some patients. Postoperative monitoring was performed in 30 patients. Transcranial electrical motor evoked potentials (TcMEP) were recorded and adjusted to relieve tension. Patients with intraoperative nerve alerts underwent diagnostic electromyography at least 4 weeks postoperatively. Of the patients, 17 (56.7%) had 30 episodes of nerve dysfunction (ie, nerve alerts) during surgery.

**RESULTS:**

- Of 34 patients, 26 (76.5%) had 45 separate nerve alert episodes. The most common stages of the procedure for a nerve alert were glenoid exposure and graft insertion. The alerts occurred in 22 of 34 patients (64.7%) that clinically detected nerve deficit postoperatively, all corresponding with intraoperative nerve alert. All cases involved the axillary nerve, and all patients returned to baseline after repositioning of the arm into a neutral position. Postoperative nerve deficit.

**CONCLUSIONS:**

- Patients with continued weakness or sensory findings after surgery have used a tourniquet.


**METHODS:**

- The incidence of neurologic injury after shoulder arthroplasty has been reported to be 1% to 4%. However, the true incidence may be higher, because injury is identified only clinically and reappraisal of the post-arthroplasty shoulder is difficult.

**RESULTS:**

- Continuous intraoperative monitoring of the brachial plexus was performed in 30 consecutive patients undergoing shoulder arthroplasty. Impending intraoperative compromise of nerve function was signaled by sustained neurotonic electromyographic activity or greater than 50% amplitude attenuation or 10% latency prolongation of ipsilateral somatosensory evoked responses and transcranial motor evoked potentials. Postoperative monitoring was continued longitudinally. “Nerve alert” was defined as averaged 50% or more attenuation of transcranial electrical motor evoked potentials for each nerve alert, the surgeon altered intraoperative placement, and if there was no response to this, the position of the operative extremity was then changed.

**RESULTS:**

- Of 34 patients, 26 (76.5%) had 45 separate nerve alert episodes. The most common stages of the procedure for a nerve alert were glenoid exposure and graft insertion. The alerts occurred in 22 of 34 patients (64.7%) that clinically detected nerve deficit postoperatively, all corresponding with intraoperative nerve alert. All cases involved the axillary nerve, and all patients returned to baseline after repositioning of the arm into a neutral position. Postoperative nerve deficit.

**CONCLUSIONS:**

- The nerves, in particular the axillary and musculocutaneous nerves, are at risk during the Latarjet procedure, especially during glenoid exposure and soft tissue release.
Treatment

- Passive mobilizations, spine and peripheral soft tissue entrapments
- Initiate Active Nerve glides when objective change in neural tension noted and patient demonstrates proper technique
- Then Strengthen
- Patient's normally have developed loss of specific muscular strength and endurance. This is due to disuse atrophy, reflexive inhibition, or neural compression.

Rub my feet please...

- Ankle joint mobilization reduces axonotmesis-induced neuropathic pain and glial activation in the spinal cord and enhances nerve regeneration in rats. Martins, Daniel, Pain vol. 152. pgs 2653-2661, 2011
Nerve Sliders and Tensioners


- The aim of this cadaveric biomechanical study was to measure longitudinal excursion and strain in the median and ulnar nerve at the wrist and proximal to the elbow during different types of nerve gliding exercises.
- The results confirmed the clinical assumption that 'sliding techniques' result in a substantially larger excursion of the nerve than 'tensioning techniques' (e.g., median nerve at the wrist: 12.6 versus 6.1mm, ulnar nerve at the elbow: 8.3 versus 3.8mm), and that this larger excursion is associated with a much smaller change in strain (e.g., median nerve at the wrist: 0.8% (sliding) versus 6.8% (tensioning)).
- The findings demonstrate that different types of nerve gliding exercises have largely different mechanical effects on the peripheral nervous system. Hence different types of techniques should not be regarded as part of a homogenous group of exercises as they may influence neuropathological processes differently.
- The findings of this study and a discussion of possible beneficial effects of nerve gliding exercises on neuropathological processes may assist the clinician in selecting more appropriate nerve gliding exercises in the conservative and post-operative management of common neuropathies.
**Effects of upper extremity neural mobilization on thermal pain sensitivity: a sham-controlled study in asymptomatic participants.**


**OBJECTIVES:**
- To investigate potential mechanisms of neural mobilization (NM), using tensioning techniques in comparison to sham NM on a group of asymptomatic volunteers between the ages of 18 and 50.

**RESULTS:**
- No group differences were seen for 6-skill multidigit pain perception at either immediate or comparative times.
- Group differences were identified for immediate C-fiber mediated pain perception (P < .001), in which hypoalgesia occurred for the NM group but not the sham NM group. This hypoalgesic effect was not maintained at comparator (P = .06). Group differences were also identified for the 3-week and comparator periods for elbow extension KRM (P = .0002) and shoulder abduction KRM (P = .0005). Group differences were not identified for the KRM and KRM composite for the IG. Differences were identified for the NM group but not the sham NM group.

**CONCLUSION:**
- This study provides preliminary evidence that mechanistic effects of NM, as well as the description of a sham NM for use in future clinical trials.

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**Short-term changes in median nerve neural tension after a suboccipital muscle inhibition technique in subjects with cervical whiplash: a randomized controlled trial.**


**PARTICIPANTS:**
- Forty subjects (mean age 42 years; standard deviation [SD] 10.4; with whiplash cervical pain and a positive response to the ULNT) were randomized and distributed into two study groups: intervention group (IG; n=20) and control group (CG; n=20).

**INTERVENTIONS:**
- The IG underwent the SMI technique for 4 minutes and the CG received a sham (placebo) intervention. Measures were collected immediately after the intervention.

**RESULTS:**
- The mean baseline elbow range of motion was 116.0° (SD 10.2) for the CG and 130.1° (SD 7.8) for the IG. The within group comparison found a significant difference in elbow range of motion for the IG (mean difference = 14.1°, 95% confidence interval [CI] 10.3 to 17.9, P = .0001), but not for the CG (mean difference = 0.9°, 95% CI 0.04 to 1.71, P = .104). Group differences were also identified for the 3-week and carryover periods for elbow extension KRM (P = .0002) and shoulder abduction KRM (P = .0005). Group differences were not identified for the KRM and KRM composite for the IG. Differences were identified for the IG but not the CG.

**CONCLUSION:**
- The SMI technique has an immediate positive effect on elbow extension in the IG. No immediate effects on self-reported cervical pain or grip strength were observed.

- This study analyzed the acute effects of infrared and neural mobilization on the median nerve on the range of elbow extension of the dominant limb.
- Forty participants from university, neurologically asymptomatic, 12 males and 18 females (22.8 ± 1.9 years), were randomly divided into four groups: Group 1 (control) rested for 25 minutes in the supine position; Group 2 received the specific neural mobilization for the median nerve; Group 3 received an application of infrared for 15 minutes on the forearm; Group 4 received the same application of infrared followed by neural mobilization.
- Significant differences of extension value were observed between Group 1 and Group 3 (15.75 degrees), and between Group 1 and Group 4 (14.60 degrees), and the average higher in Group 3 (26.35 degrees).
- This research provides new experimental evidence that NM in relation to superficial heat produces an immediate effect on elbow range of motion versus NM isolated.

Central sensitization does not identify patients with carpal tunnel syndrome who are likely to achieve short-term success with physical therapy. Fernández-de-Las-Peñas C1, Cleland JA, Ortega-Santiago R, de-la-Llave-Rincon AJ, Martínez-Perez A, Pareja JA.

The aim of the current study was to identify whether hyperexcitability of the central nervous system is a prognostic factor for individuals with carpal tunnel syndrome (CTS) likely to experience rapid and clinical self-reported improvement following a physical therapy program including soft tissue mobilization and nerve slide neurodynamic interventions.

Participants underwent a standardized examination and then a physical therapy session. The physical therapy sessions included both soft tissue mobilization directed at the anatomical sites of potential median nerve entrapment and a passive nerve slide neurodynamic technique targeted to the median nerve.

Pressure pain thresholds (PPT) over the median, radial and ulnar nerves, C5-C6 zygapophysial joint, carpal tunnel and ipsilateral anterior muscle were measured bilaterally. Additionally, thermal behavior and pain thresholds were measured over the carpal tunnel and thenar entrance bilaterally to evaluate central nervous system excitability.

Subjects were classified as responders (having achieved a successful outcome) or non-responders based on self-perceived recovery.

Three variables included PPT over the C5-C6 joint affected side <137 kPa, PPT carpal tunnel affected side >90 kPa and general health >66 points were identified. If 2 out of 3 variables were present (LR+), the likelihood of success increased from 48.6 to 93.3%. We identified 3 factors that may be associated with a rapid clinical response to both soft tissue mobilization and nerve slide neurodynamic techniques targeted to the median nerve in women presenting with CTS. Our results support that widespread central sensitization may not be present in women with CTS who are likely to achieve a successful outcome with physical therapy. Future studies are now necessary to validate these findings.

Effects of neuromobilization maneuver on clinical and electrophysiological measures of patients with carpal tunnel syndrome. Oskouei AE1, Talebi GA2, Shakouri SK1, Ghbili K3.

- The aim of this study was to investigate the efficacy of neuromobilization combined with routine physiotherapy in patients with carpal tunnel syndrome through subjective, physical, and electrophysiological studies.
- Twenty patients with carpal tunnel syndrome (totally 22 hands) were assigned to two groups: treatment and control groups. In both groups, patients received the routine physiotherapy. In addition to the routine physiotherapy, patients in the treatment group received neuromobilization. The symptoms severity scale, visual analogue scale, functional status scale, Phalen’s sign, median nerve tension test, and median nerve distal sensory and motor latency were assessed.
- There were significant improvements in the symptoms severity scale, visual analogue scale, median nerve tension test, and Phalen’s sign in both groups. However, the functional status scale and median nerve distal sensory and motor latency were significantly improved only in the treatment group.
- Neuromobilization in combination with routine physiotherapy improves some clinical findings more effectively than routine physiotherapy. Therefore, this combination can be used as an alternative effective non-invasive treatment for patients with carpal tunnel syndrome.
Evaluation and Treatment of Upper Extremity Nerve Entrapment Syndromes
Eric E. Floranda, MD*, Bret C. Jacobs, DO, MBAc

• INTRODUCTION
• These syndromes present with various symptoms and signs corresponding to the site of compression and anatomic distribution supplied by the involved nerve.
• To make a diagnosis, the clinician must recognize the muscles innervated, sensory distribution, muscle stretch reflex, and compressive sites associated to a particular nerve.
• Nerves can be purely motor, purely sensory, or mixed.
• KEY POINTS
  – A firm knowledge of muscles and the cutaneous distribution of nerve innervates is essential in localizing nerve injury.
  – Patients usually present with weakness, pain, and paresthesias in a distribution particular to the nerve and the level of the lesion.
  – Tools are available to aid the clinician in the diagnosis and prognostication of nerve injury.
  – Conservative management is generally the first-line treatment before surgery is contemplated.


• The aim of this study was to investigate whether bilateral widespread pressure hypersensitivity exists in patients with unilateral carpal tunnel syndrome. A total of 20 females with carpal tunnel syndrome (aged 22-60 years), and 20 healthy matched females (aged 21-60 years old) were recruited. Pressure pain thresholds were assessed bilaterally over median, ulnar, and radial nerve trunks, the C5-C6 zygapophyseal joint, the carpal tunnel and the tibialis anterior muscle in a blinded design.
• The results showed that pressure pain threshold levels were significantly decreased bilaterally over the median, ulnar, and radial nerve trunks, the carpal tunnel, the C5-C6 zygapophyseal joint, and the tibialis anterior muscle in patients with unilateral carpal tunnel syndrome as compared to healthy controls (all, P < 0.001).
• Pressure pain threshold was negatively correlated to both hand pain intensity and duration of symptoms (all, P < 0.001). Our findings revealed bilateral widespread pressure hypersensitivity in subjects with carpal tunnel syndrome, which suggest that widespread central sensitization is involved in patients with unilateral carpal tunnel syndrome.

Impact of shoulder internal rotation on ulnar nerve excursion and strain in embalmed cadavers. A pilot study. Gugliotti M1, Futterman B1, Ahrens T1, Block D1, Brown L1, Dagrò M1, Falesto J1, Lyon A1. J Man Manip Ther. 2016 May;24(2):111-6

• OBJECTIVE: To determine if the substitution of shoulder internal rotation for external rotation during the upper limb neurodynamic test (ULNT3) evokes a comparable ulnar nerve excursion and strain in embalmed cadavers. Shoulder external rotation is a primary movement component of the ULNT3. It has been suggested that shoulder internal rotation may provide a similar load to the nervous system. There are no data to either support or negate this claim.
• METHODS: Excursion and strain were measured in the ulnar nerve of six embalmed cadavers during the traditional ULNT3 and an experimental maneuver using shoulder internal rotation.
• RESULTS: The total means ± SD of excursion for the traditional and experimental maneuvers were 2·11 ± 0·89 and 2·09 ± 0·92 mm, respectively. The total means ± SD of strain for the traditional and experimental maneuvers were 5·274 ± 2·223 and 5·241 ± 2·308%, respectively. A very strong correlation (r = 0·98) was shown to exist between maneuvers and this relationship was determined to be significant (P = 0·001).
• DISCUSSION: The results of this study provide evidence that there is no appreciable difference in excursion or strain when substituting shoulder internal rotation for external rotation during the ULNT3. Patients who exhibit limitation of shoulder external rotation mobility may benefit from this substitution when presenting with signs of ulnar nerve pathodynamics. Further research involving patients will be needed to assess the validity of the experimental maneuver for clinical application.

A total of 72 women with CTS (19 with minimal, 18 with moderate, and 35 with severe) and 19 healthy age-matched women participated. Pressure pain thresholds were bilaterally assessed over the median, ulnar, and radial nerves, the C5 to C6 zygapophyseal joint, the carpal tunnel, and the tibialis anterior muscle. In addition, warm and cold detection thresholds were bilaterally assessed over the carpal tunnel and the thenar eminence. All outcome parameters were assessed by an assessor blinded to the participant’s condition.

**RESULTS:**

No significant differences in pain parameters among patients with minimal, moderate, and severe CTS were found. The results showed that PPT were significantly decreased bilaterally over the median, ulnar, and radial nerve trunks, the carpal tunnel, C5 to C6 zygapophyseal joint, and the tibialis anterior muscle in patients with minimal, moderate, or severe CTS as compared with healthy controls (all, P<0.001). In addition, patients with CTS also showed lower heat pain threshold and reduced cold pain threshold compared with controls (P<0.001). No significant sensory differences between minimal, moderate, or severe CTS were found.

**CONCLUSIONS:**

The similar widespread pressure and thermal hypersensitivity in patients with minimal, moderate, or severe CTS and pain intensity suggests that increased pain sensitivity is not related to electrodiagnostic findings.

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- The results confirmed the clinical assumption that ‘sliding techniques’ result in a substantially larger excursion of the nerve than ‘tensioning techniques’ (e.g., median nerve at the wrist: 12.6 versus 6.1mm, ulnar nerve at the elbow: 8.3 versus 3.8mm), and that this larger excursion is associated with a much smaller change in strain (e.g., median nerve at the wrist: 0.8% (sliding) versus 6.8% (tensioning)). The findings demonstrate that different types of nerve gliding exercises have largely different mechanical effects on the peripheral nervous system.

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- “The same fascial restriction that predisposes to muscle compartment syndromes may also envelop the neurovascular structures within the leg resulting in either ischemic or neurogenic symptoms.”
- “many different pathologies may coexist in the lower limb and may be a source of confusion for the clinician or alternatively may be the reason for poor treatment outcomes.”

• “Entrapment of the suprascapular nerve may cause pain in the shoulder which may be attributed wrongly to tendinitis, a tear of the rotator cuff or cervical disc disease”

Casestudy

• 63 y/o TKA with multiple LOA's for adhesions, hx of CIPD
Case study

- 17 y/o D1 prospect golfer with R shoulder pain
  - c/o shoulder “locking up” during tournaments
  - Pain would increase as tournaments went on
  - MRI negative
  - Palpable guarding with attempts to flex beyond 110
  - Normal capsular mobility
  - No symptoms with practice

Case study

- 56 y/o female s/p Biceps Tenodesis and cyst removal
  - Excruciating pain 1st visit post op
  - Pendulums increased pain
  - Sharp point of pain laterally on arm and numbness medial aspect of the humerus
  - Steroid dose pack reduced symptoms

Case study

- 68 y/o female s/p RTC repair
  - Full PROM flexion and ER
  - PROM ABD limited to 100
  - When began Phase III (strengthening) c/o excruciating pain at the shoulder, flexion dropped to 90 deg and ER 30
  - c/o numbness and swelling along inside of the arm digits 4-5
Case Study

- 67 y/o male with L sided Radicular pain dx Lumbar stenosis
  - c/o increased symptoms sitting esp on toilet with pain at the groin that is new
  - Had hx of reoccurrent Post hip/LBP  1-2x/year
  - Walking alleviates except some tightness in calf

Questions?

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