Topics in Neurology: Management of Neuropathy and Evaluation of Concussion

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Goals

• What is neuropathy
• Evaluation and treatment strategy for neuropathy (focus on painful peripheral neuropathy)

• What is concussion
• Concussion guidelines/recommendations (focus on 2013 updated AAN guidelines)

• Questions/Discussion
Peripheral Neuropathy

• Affects approximately 2-8% adults, incidence increases with age

• Various methods of classification
  • Axonal, demyelinating, neuronal
  • Small fiber, large fiber
  • Sensory, motor, autonomic
  • Acute, subacute, chronic, recurrent
  • Acquired, hereditary, autoimmune antibody mediated
  • Focus today on distal symmetric painful polyneuropathy

• There is no FDA approved treatment for small fiber neuropathy
Neuropathic Pain

- Pain that arises from a lesion or disease affecting the somatosensory system
- Peripheral
- Central

Symptoms
- Burning
- Cold/Hot
- Shooting/electric
- Pins/stabbing
- Tingling/crawling
- Numbness
Strategic Approach

• Prevention in patients at risk (i.e. diabetes, prediabetes, gastric bypass, HIV)
• Determine underlying cause (may have multifactorial etiology)
• Medications alone or in combination (oral, topical, different mechanisms of action)
Some Main Causes of Neuropathy

- Diabetes, prediabetes (Likely related to metabolic syndrome and inflammatory nerve damage)
- Alcohol
- Thyroid disease
- Vitamin B12 deficiency, Vitamin B6 toxicity (100 mg daily may cause toxicity)
- Drug induced (chemotherapy)
- Monoclonal gammopathy
- Paraneoplastic neuropathy
- Vasculitis
- HIV
- Hereditary
- Berreliosis
- Amyloidosis
• Approximately 75% of neuropathies have an identifiable cause

• Initial screening can include:
  - CBC, CMP, ESR, TSH, Vitamin B12, Folate, SPEP, Immunofixation, HgbA1C, RPR

• Patient’s with cryptogenic neuropathy should have further evaluation including EMG/NCS testing (skin biopsy, autonomic testing for small fiber neuropathy)
Pharmacotherapy for neuropathic pain in adults: a systematic review and meta-analysis

Nanna B Finnerup*, Nadine Attal*, Simon Haroutounian, Ewan McNicol, Ralf Baron, Robert H Dworkin, Ian Gilron, Maija Haampää, Per Hansson, Troels S Jensen, Peter R Kamerer, Karen Lund, Andrew Moore, Srinivasa N Raja, Andrew S C Rice, Michael Rowbotham, Emily Sema, Philip Siddall, Blair H Smith, Mark Wallace

Lancet Neurol 2015; 14:2-73

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Mechanisms

• Sodium Channel (i.e. NaV 1.7) upregulation and sensitization from peripheral nerve damage
• Results in hyperactivity (ectopic) activity in nociceptive neurons

Therapy: Na-Channel Blockers
• Carbamazepine and Oxcarbazepine – Effective for trigeminal neuralgia, not approved for peripheral neuropathic pain (PNP)
• Topical Lidocaine 5% – Effective for post herpetic neuralgia (PHN), mixed efficacy for PNP. (Less side effects)
Mechanisms

• TRPV1 (capsaicin) receptor upregulation results after peripheral nerve injury
• Even tiny sensory input can activate intense burning type pain

Treatment:
• Capsaicin 8% topical patch – approved for peripheral neuropathic pain (PNP)
• Causes 30 minutes to 1 hour of massive activation pain fibers followed by degeneration of these fibers
Mechanisms: Ca-channel upregulation and central sensitization
Mechanisms

- Ca-channel upregulation occurs at the central presynaptic terminals of the primary afferent fibers in response to nerve injury.
- Central sensitization can occur on second order neurons leading to activation of pathological pain sensation by ANY sensory input.

Treatment: Ca-Channel Modulators

- Few side effects with no significant drug interactions.
Mechanisms

• Normally pain sense to the brain is followed by a descending inhibitory signal via noradrenaline and serotonin receptors.

• In chronic pain there is decreased descending inhibition.

Treatment:

• TCA - Amitriptyline: Effective for PHN, PNP, CP. Side effects common.

• SNRI - Venlafaxine, Duloxetine: Effective for PNP. Less side effects.
Other Treatments

• Opiods, Tramadol also have efficacy for neuropathic pain
• NSAIDS not effective
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Lancet Neurol 2015; 14:6-23

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**Total daily dose and dose regimen**

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Summary

• Oral
  • Antidepressants (TCA, SNRI)
  • Anticonvulsants (Ca)
  • Anticonvulsants (Na)
  • Tramadol
  • Opioids

  \[\text{Consider combinations}\]

• Topical
  • Lidocaine
  • Capsaicin
Concussion

- Complex process affecting the brain induced by traumatic forces
- Approximately 3.8 million recreation and sport-related annually
- Approximately 9% of all high school injuries
  - Highest incidence in football, boy’s hockey and boy’s lacrosse
  - Females have a higher concussion rate
- History of concussion increases risk 3-6% of another conc
- Recurrent concussion most likely to occur within 10 day

Lincoln, AM J Spots Med 2011
Giza, Neurology 2013
Diagnosis of Concussion

• Clinical diagnosis
• Careful history
• Physical and neurologic exam
• Ancillary testing such as: SCAT3, Sport Concussion Assessment Tool

Management of Diagnosed Concussion

• Cognitive Restructuring
  • Educate
  • Reassurance
  • Reattributio of symptoms

• Diminish likelihood of developing chronic postconcussion syndrome
Retirement From Play After Multiple Concussions

• May obtain formal neurological and neurophysiological assessments
• Counseling regarding risks for developing chronic impairments
• Changes on imaging
• Permanent neurologic changes
**Return to Play**

- Athletes should not return to play the same day of injury
- Graduated return

**Graduated Return-to-Play Protocol**

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<th>Rehabilitation Stage</th>
<th>Objective of Stage</th>
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<tr>
<td>1</td>
<td>No activity</td>
<td>Recovery</td>
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<tr>
<td>2</td>
<td>Light aerobic exercise</td>
<td>Increased heart rate</td>
</tr>
<tr>
<td>3</td>
<td>Sport-specific exercise</td>
<td>Add movement</td>
</tr>
<tr>
<td>4</td>
<td>Non-contact training drills</td>
<td>Exercise, coordination, cognitive load</td>
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<tr>
<td>5</td>
<td>Full-contact practice</td>
<td>Restore athletes confidence, coaching staff assess functional skills</td>
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<td>6</td>
<td>Return to play</td>
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Consensus Statement: 4th International Conference on Concussion in Sport
• Concussion risk greatest in certain sports (football, boxing, hockey, lacrosse, soccer), in females (comparable sports), after prior concussion.

• Currently no evidence that soccer headgear, position played or specific helmet use alter risk.

RECOMMENDATION:

• Sports health providers should be educated to provide accurate information

• Athletes should be counseled regarding risks
Concussion is a clinical diagnosis. Evaluation should include careful history, neurologic exam and may include ancillary validated concussion assessment tools (GCS, BESS, SAC, SCAT, CCT)

RECOMMENDATION:

• Athletic trainers should be educated to properly administer sideline tests
• Sports health providers may use these tests to assist in diagnosis/management
• CT scanning is of limited/minimal benefit after concussion

RECOMMENDATION:
- Routine CT scanning is NOT recommended for diagnosis of concussion
- Only used if intracranial/structural injury is suspected
Risk factors for prolonged recovery include prior concussion, headache/migraine, “fogginess”, prior headache, learning disability.

There is evidence of physiological and clinical vulnerability after concussion that supports removing injured player from contact risk.

RECOMMENDATION:

- Players with suspected concussion should be removed from play to minimize risk of repeat event or worse symptoms.
- Graded return to play should not be started until acute symptoms have resolved, off of medications.
• Cognitive restructuring (reassurance, education, guidance) can reduce risk of chronic post-concussive symptoms.

RECOMMENDATION:

• Cognitive restructuring early after concussion
Younger athletes take longer to recover from symptoms and cognitive impairment than adults.

RECOMMENDATION:

- Symptoms management and graded return to play should be managed more conservatively in high school and younger athletes.
Questions?

- haha@ucdavis.edu
- (916) 734-3588