Treating post traumatic headache: The Gladiators, the warriors and then There’s the rest of Us.

President and CEO, The Carolina Headache Foundation, Chapel Hill, NC
Director, Carolina Headache Institute, Chapel Hill, NC
Professor, University of North Carolina
Contractor for Defense and Veteran Brain Injury Center

Disclosures

With Regards to this talk, the speaker has no disclosures to make.

The speaker will discuss the off label use of medications. No drugs are approved for use in persistent concussive symptoms including headache.
5.1 Persistent headache attributed to traumatic injury to the head

- A. Any headache fulfilling criteria C and D
- B. Traumatic injury to the head has occurred
- C. Headache is reported to have developed within 7 days after one of the following:
  1. the injury to the head
  2. regaining of consciousness following the injury
  3. discontinuation of medication(s) that impair ability to sense or report headache following the injury
- D. Headache persists for >3 months after injury to the head
- E. Not better accounted for by another ICHD-3 diagnosis

ICHD-3 beta. Cephalalgia 2013; 33: 629 - 808

Clinical Trials (.gov) N = 31

- Recruiting
  - Sumatriptan
  - Metoclopramide (2)
  - Nutrition *
  - CBT
  - Prazosin (2)
  - Cervicogenic
  - Specific Neck Rehab
  - Manipulation + Dry Needling
  - Thoracic Spine Thrust

- Completed
  - Amitriptyline
  - Nasal Morphine (acute)
  - Cervicogenic Headache
  - OBA
  - ONB
  - TP
  - Massage
  - Chiropractic
  - Myofascial Release
  - Manual Therapy and Exercise
  - Reasson Rotation

Clinical Trials (.gov) Not yet recruiting/Unknown

- ONB
- Galantamine
- Cervicogenic
- ICMR
- Pillow

Clinical Trials (.gov) Active not recruiting

- MBSR with biomarkers

Clinical Trials (.gov) Terminated/withdrawn

- Treximet, nortriptan, rizatriptan
- OBA
- Propranolol/Amitriptyline/Topiramate/Placebo
- Yoga

www.clinicaltrials.gov accessed 9/8/2017
Results

- N = 95 soldiers (male: 93.7%); age: 31.3 ± 7.4 [median: 30.0 (20 – 49)]
  - Some or finished college: 70.3%
  - Rank: Junior enlisted/NCO: 74.7%
- Prior history of headache: 13.7%
- Prior history of concussion: 39.6%
- Family history of headache: 28.2%
- Injury Characteristics
  - Blast: 53.7%
  - Parachute jump: 23.2%
  - MVA: 10.5%
- Time from injury (months): 27.6 ± 26.6 [median: 20 (1 – 132)]
Table A. Patient Headache Characteristics (n = 95)

<table>
<thead>
<tr>
<th>Headaches</th>
<th>166</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Headache Types</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>61 (43.2)</td>
</tr>
<tr>
<td>Migraine Type</td>
<td>68 (41.0)</td>
</tr>
<tr>
<td>Continuous Headache</td>
<td>71 (47.7)</td>
</tr>
<tr>
<td>Headache Days</td>
<td>Mean ± (SD), range, Median: 26.7 (6.8), 2 – 30, 30</td>
</tr>
<tr>
<td>Headache - Severe Days</td>
<td>Mean ± (SD), range, Median: 16.9 (9.7), 0 – 30, 15</td>
</tr>
<tr>
<td>Onset &lt; 7 Days, N (%)</td>
<td>73 (76.8%)</td>
</tr>
<tr>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Statistics are counts (percentages in parentheses) except where indicated. SD=Standard Deviation; IQR=Interquartile Range.

Table B. ICHD II diagnoses of all headaches within major categories

<table>
<thead>
<tr>
<th>ICHD-II HEADACHE TYPE</th>
<th>ICHD-II Code</th>
<th>Total ( % )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous Headache with migraine features</td>
<td>2.3/1.1</td>
<td>1 (0.6)</td>
</tr>
<tr>
<td>Migraine</td>
<td>1.1</td>
<td>31 (18.7)</td>
</tr>
<tr>
<td>Tension-type headache</td>
<td>2.1</td>
<td>1 (0.6)</td>
</tr>
<tr>
<td>Cluster headache and other trigeminal autonomic cephalalgias</td>
<td>3.1.2</td>
<td>6 (3.6)</td>
</tr>
<tr>
<td>Other primary headaches</td>
<td>4.1</td>
<td>3 (1.8)</td>
</tr>
<tr>
<td>Headache attributed to non-vascular intracranial disorder</td>
<td>7.2</td>
<td>1 (0.6)</td>
</tr>
<tr>
<td>Headache or facial pain attributed to disorder of cranium, neck, eyes, ears, nose, sinuses, teeth, mouth or other cranial or facial structures</td>
<td>11.2</td>
<td>1 (0.6)</td>
</tr>
<tr>
<td>Cranial neuralgias and central causes of facial pain</td>
<td>13.1</td>
<td>1 (0.6)</td>
</tr>
<tr>
<td>NOS</td>
<td>14.1</td>
<td>5 (3.0)</td>
</tr>
</tbody>
</table>

*This table summarizes all headaches observed (n=166); some individuals were diagnosed with multiple headaches –see text. Percentages do not sum to 100 due to rounding; values are counts (percentages in parentheses).

Impactful vs. Important

Table C. Final categories by major classification for most clinically important headache identified

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>TOTALS (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Migraine</td>
<td>58 (61.1)</td>
</tr>
<tr>
<td>Tension Type</td>
<td>4 (4.2)</td>
</tr>
<tr>
<td>TAC (HC n = 12)</td>
<td>2 (24.2)</td>
</tr>
<tr>
<td>Other primary</td>
<td>5 (5.3)</td>
</tr>
<tr>
<td>Secondary including NEC</td>
<td>5 (5.3)</td>
</tr>
</tbody>
</table>

1. CHCM is included as migraine. Hemicrania continua was included in the TAC category after ICHD-III.
2. NEC = Not elsewhere classified; ICHD-II 14.1.
Observations

• Injuries were more than 2 years ago
• Patients can describe multiple headaches
• Headache onset can start > 7 days
• Continuous Headaches can have migraine features
• Non-continuous Headaches can be diagnosed using primary classification


Hypothesis

Do headache characteristics or diagnosis type of persistent post traumatic headache (PTH) predict occupational outcomes in soldiers with mild TBI?
Which matters most: Diagnosis or Characteristics?

<table>
<thead>
<tr>
<th>ICHD II Diagnosis (Dx)</th>
<th># per Dx (% of all headaches)</th>
<th>ICHD II Diagnosis (Dx)</th>
<th># per Dx (% of all headaches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>54 (33)</td>
<td>2.3/1.5.1</td>
<td>24 (14.5)</td>
</tr>
<tr>
<td>1.3.1</td>
<td>14 (8.4)</td>
<td>2.3/1.5.1</td>
<td>29 (17.5)</td>
</tr>
<tr>
<td>1.8</td>
<td>10 (6.0)</td>
<td>2.3/1.5.1</td>
<td>24 (14.5)</td>
</tr>
<tr>
<td>1.9</td>
<td>7 (4.2)</td>
<td>2.3/1.5.1</td>
<td>1 (0.6)</td>
</tr>
<tr>
<td>2.2.1</td>
<td>7 (4.2)</td>
<td>2.3/1.5.1, 2.3/1.5.1.2</td>
<td>1 (0.6)</td>
</tr>
<tr>
<td>2.3.4</td>
<td>7 (4.2)</td>
<td>2.3/1.5.1, 2.3/1.5.1.2</td>
<td>1 (0.6)</td>
</tr>
<tr>
<td>2.3.8</td>
<td>7 (4.2)</td>
<td>2.3/1.5.1, 2.3/1.5.1.2</td>
<td>1 (0.6)</td>
</tr>
<tr>
<td>3.1.2</td>
<td>7 (4.2)</td>
<td>2.3/1.5.1, 2.3/1.5.1.2</td>
<td>1 (0.6)</td>
</tr>
<tr>
<td>3.2.2, 3.3, 3.8</td>
<td>7 (4.2)</td>
<td>2.3/1.5.1, 2.3/1.5.1.2</td>
<td>1 (0.6)</td>
</tr>
<tr>
<td>3.4, 4.1, 4.7</td>
<td>7 (4.2)</td>
<td>2.3/1.5.1, 2.3/1.5.1.2</td>
<td>1 (0.6)</td>
</tr>
<tr>
<td>3.5, 3.7</td>
<td>7 (4.2)</td>
<td>2.3/1.5.1, 2.3/1.5.1.2</td>
<td>1 (0.6)</td>
</tr>
<tr>
<td>Total Non-continuous</td>
<td>95 (57.2)</td>
<td>Total Continuous</td>
<td>71 (42.8)</td>
</tr>
</tbody>
</table>

Supplemental Table 3: Headache Diagnoses by Characteristic: All Occurrences (n=166)


Table 4. Outcomes by headache character and types (n, %).

<table>
<thead>
<tr>
<th>Headache Characteristics $</th>
<th>Headache Diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
</tr>
<tr>
<td>Continue AD</td>
<td></td>
</tr>
<tr>
<td>Discharge/Retire</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
</tr>
</tbody>
</table>

§Statistically significant, $p$<0.001; Totals may not add to 100% based upon rounding.


Hypothesis

Which headache characteristics of persistent post traumatic headache (PTH) predict occupational outcomes in soldiers with mild TBI?
Extent of Cranial Involvement Matters in Predicted Probabilities of Discharge/Retirement: Possible Interaction between Migraine History, Continuous HA, and HA Density

Activities Performed in Response to HA Matters in Predicted Probabilities of Discharge/Retirement: Possible Interaction between Migraine History, Continuous HA, and HA Activities

Conclusions

• The presence of a continuous headache predicted ~ 4 times as likely to be discharged/retired.
• A prior history of regular headache also appeared to predict the probability of discharge.
• Although ethnicity did significantly predict the probability of retirement/discharge after mild traumatic brain injury, this result may have been due to low n in some subgroups.
• In patients with a prior history of headache, severance is more likely if they:
  • Have a continuous holocephalic headache
  • If they tended to medicate and stay active with most clinically important headache regardless of continuous/non-continuous
TREATING PTH
Based upon Diagnosis (sic)

Where we were:
**Amitriptyline?**

**Table 4: Medications Prescribed at First Visit (n = 56)**

<table>
<thead>
<tr>
<th>Medication</th>
<th>Abortive n (%)</th>
<th>Preventive n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetaminophen</td>
<td>2 (9.3)</td>
<td>Gallopapin 6 (22.2)</td>
</tr>
<tr>
<td>Ibuprofen</td>
<td>2 (9.3)</td>
<td>Levetiracetam 1 (3.7)</td>
</tr>
<tr>
<td>Tramadol</td>
<td>1 (4.1)</td>
<td>SSRI 1 (3.7)</td>
</tr>
<tr>
<td>Topiramate</td>
<td>17 (60.7)</td>
<td>Tricyclics 4 (14.3)</td>
</tr>
<tr>
<td>VPA</td>
<td>2 (9.3)</td>
<td>Valproic acid 4 (14.3)</td>
</tr>
</tbody>
</table>


---

**A Valiant Attempt**

**Table 4: Change in Headache Frequency After Vasing Specific Prophylactic Medications**

<table>
<thead>
<tr>
<th>Medication</th>
<th>Baseline (Day/Month)</th>
<th>Follow-up (Day/Month)</th>
<th>Change (%)</th>
<th>P-value</th>
<th>Responder</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amitriptyline</td>
<td>17.1 (5.2)</td>
<td>14.4 (5.2)</td>
<td>-2.7 (±5.5)</td>
<td>P = .03</td>
<td>50 (29)</td>
</tr>
<tr>
<td>TCA (n = 41)</td>
<td>14.7 (6.4)</td>
<td>12.3 (5.7)</td>
<td>-2.4 (±6.5)</td>
<td>P = .23</td>
<td>44 (29)</td>
</tr>
<tr>
<td>TCA (n = 29)</td>
<td>15.0 (5.3)</td>
<td>12.8 (5.7)</td>
<td>-2.2 (±6.1)</td>
<td>P = .03</td>
<td>41 (49)</td>
</tr>
<tr>
<td>NaV (n = 10)</td>
<td>15.1 (5.6)</td>
<td>11.2 (5.1)</td>
<td>-3.9 (±4.9)</td>
<td>P = .23</td>
<td>60 (60)</td>
</tr>
<tr>
<td>Topiramate (n = 1)</td>
<td>15.7 (4.0)</td>
<td>20.9 (5.1)</td>
<td>-5.2 (±4.7)</td>
<td>P = .03</td>
<td>15 (20)</td>
</tr>
</tbody>
</table>


---

**A Losing Battle?**

**Table 3: Treatment variables associated with outcomes**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Overall cohort</th>
<th>Did not RCT p = .004</th>
<th>RCT (n = 33)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Injections/analgesics</td>
<td>08 (10)</td>
<td>03 (10)</td>
<td>25 (7.8)</td>
<td>0.27</td>
</tr>
<tr>
<td>NSAIDs</td>
<td>755 (73.8)</td>
<td>517 (79.5)</td>
<td>238 (71.9)</td>
<td>0.91</td>
</tr>
<tr>
<td>Opoids</td>
<td>129 (13.6)</td>
<td>289 (71.3)</td>
<td>82 (24.8)</td>
<td>0.09</td>
</tr>
<tr>
<td>Anticonvulsants</td>
<td>38 (10.3)</td>
<td>385 (31)</td>
<td>79 (23.9)</td>
<td>0.81</td>
</tr>
<tr>
<td>Antidepressants</td>
<td>37 (11.8)</td>
<td>20 (19.3)</td>
<td>19 (11.7)</td>
<td>0.32</td>
</tr>
<tr>
<td>Sex</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0.57</td>
</tr>
<tr>
<td>Other</td>
<td>72 (19.8)</td>
<td>56 (89.4)</td>
<td>18 (59.4)</td>
<td>0.06</td>
</tr>
<tr>
<td>Radiation treatment</td>
<td>107 (30.9)</td>
<td>88 (19.3)</td>
<td>21 (6.9)</td>
<td>0.004</td>
</tr>
<tr>
<td>Calcium channel blockers</td>
<td>31 (8.7)</td>
<td>16 (4.6)</td>
<td>5 (1.5)</td>
<td>0.03</td>
</tr>
<tr>
<td>Trigeminal</td>
<td>264 (28.5)</td>
<td>185 (20.3)</td>
<td>79 (23.5)</td>
<td>0.14</td>
</tr>
<tr>
<td>Diphenylbutazone</td>
<td>68 (17.4)</td>
<td>51 (12.3)</td>
<td>18 (5.4)</td>
<td>0.17</td>
</tr>
<tr>
<td>Multiple treatment</td>
<td>36 (10.4)</td>
<td>279 (42.4)</td>
<td>81 (25.3)</td>
<td>0.004</td>
</tr>
<tr>
<td>No treatment</td>
<td>37 (10.3)</td>
<td>21 (5.6)</td>
<td>24 (7.4)</td>
<td>0.009</td>
</tr>
</tbody>
</table>

A Novel Drug: Prazosin

Improving sleep: Initial headache treatment in OIF/OEF veterans with blast-induced mild traumatic brain injury

Robert L. Reif, MD, PhD,1,2,3* Sukho S. Reif, PhD,4,5,6,7 Max-Feng Wang, PhD8

1Neurology Service and Parkinson's Disease Research Center, Louis Stokes Cleveland Department of Veterans Affairs Medical Center, Cleveland, OH. 2Department of Neurology, Case Western Reserve University, Cleveland, OH. 3Department of Neurology, University Hospitals Case Medical Center, Cleveland, OH. 4Department of Neurology, University Hospitals Cleveland Medical Center, Cleveland, OH. 5Department of Neurology, Cleveland Clinic Foundation, Cleveland, OH. 6Department of Neurology, Cleveland Clinic Lerner College of Medicine, Cleveland, OH. 7Department of Neurology, The Cleveland Clinic, Cleveland, OH.

Concussion Care in Afghanistan

Feb 2011 - Aug 2011 Staff
• 2 physicians acupuncture-trained were available.

Level I
• Primary Care Management--BAS
  • Medical/PA/General Physician
  • Follow CPG Algorithms
• Benefits
  • Close to the primary injury
  • Medical Providers “know” the soldier
  • Soldier is proximal close to fellow soldiers, allows better integration
  • No need for evacuation
  • Often preferred site of care for soldier
• Challenges
  • Environment for rest/recovery is sometimes sub-optimal.
  • Provider variability for care
  • Under reporting of symptoms

Courtesy of COL Jamie B. Grimes, MD, MC, USA National Director, Defense and Veterans Brain Injury Center (DVBIC) (by permission)
Level II
Restoration Center

- Dedicated rest center in Brigade Area of Operations
- Staffed by Occupational Therapist, OT-Tech, with Unit Physician Oversight
- Benefits
  - Ensure enforcement of basic mTBI clinical therapeutic strategies
  - Ensured sleep
  - Standardized education
  - Evaluating for and addressing all presenting symptoms
  - Soldier stays “close to home.”
  - Improved Neurology oversight

Courtesy of COL Jamie B. Grimes, MD, MC, USA
National Director, Defense and Veterans Brain Injury Center (DVBIC) (by permission)

Level III
Theater Hospital Base Specialty Care

- Specialty Base Evaluation
  - Neurologist
  - Neuropsychologist
  - OT/OT-Tech
- Can hold soldiers up to 30 days
- Benefits
  - Treat complex case in theater allowing return to duty (RTD)
  - Hold capacity matters as NEX RTD
  - Continue “proximity of care” treatment approach for complex cases
- Challenges
  - Soldiers require evacuation
  - Awareness of disconnection from unit
  - Re-integration, sometimes difficult upon RTD.

Courtesy of COL Jamie B. Grimes, MD, MC, USA
National Director, Defense and Veterans Brain Injury Center (DVBIC) (by permission)

Where we are now!

Management of Headache Following Concussion/Mild Traumatic Brain Injury: Guidance for Primary Care Management in Deployed and Non-Deployed Settings
Table 5.0: Characteristics of Headache Types

<table>
<thead>
<tr>
<th></th>
<th>Migraine</th>
<th>Tension-type</th>
<th>Cerebrogenic</th>
<th>Headache Related to Neuropathic Pain</th>
<th>Medication Overuse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aura</td>
<td>Possible (5%-20%)</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Duration</td>
<td>4-72 hrs.</td>
<td>Migraine to 7 days</td>
<td>Some or all of the day</td>
<td>Some or all of the day</td>
<td>Some or all of the day</td>
</tr>
<tr>
<td>Frequency</td>
<td>Epidemic, variable</td>
<td>Variable</td>
<td>Epidemic, variable</td>
<td>Epidemic, variable</td>
<td>Epidemic, variable</td>
</tr>
<tr>
<td>Site</td>
<td>Unilateral</td>
<td>Bilateral</td>
<td>Unilateral</td>
<td>Unilateral</td>
<td>Unilateral</td>
</tr>
<tr>
<td>Pain Characteristics</td>
<td>Pricking/tightening</td>
<td>Pricking/tightening and/or burning</td>
<td>Burning, radiating</td>
<td>Pricking, tightening, pulsating</td>
<td>Pricking, tightening, pulsating</td>
</tr>
<tr>
<td>Pain Severity</td>
<td>Mild/moderate</td>
<td>Mild/moderate</td>
<td>Mild/moderate</td>
<td>Mild/moderate/ severe</td>
<td>Mild/moderate/ severe</td>
</tr>
<tr>
<td>Aggravated by movement</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Nausea/Vomiting</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Photophobia/ Phonophobia</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

Headache Related to Neuropathic Pain

Physical Exam

Findings on physical exam include:

- Signs of nerve injury detected during neurologic exam
- Pain may be elicited by palpation of face or scalp, especially over previous laceration or bruise
- May be associated with movement

"Medically Ready Force...Ready Medical Force"
A Boo Boo Headache*

*Ann Scher, used by permission

Central or Peripheral?

Onabotulinum toxin a for the treatment of headache in service members with a history of mild traumatic brain injury: a cohort study


Demographics (n = 64)

<table>
<thead>
<tr>
<th>Age</th>
<th>31.3 ± 7.5 (20–50)</th>
<th>ns</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>M: F</td>
<td>63: 1</td>
</tr>
<tr>
<td>Prior history of migraine (%)</td>
<td>7 (11.8)</td>
<td>p = 0.0084*</td>
</tr>
<tr>
<td>Injury Type (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Fight</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Jump</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>MVA</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Blast</td>
<td>41</td>
<td></td>
</tr>
</tbody>
</table>

Mean time from injury to injection (months) 29.8 ± 21.9 (1–96)
**Headache Characteristics**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous (%)</td>
<td>48 (75)</td>
</tr>
<tr>
<td>Aura (%)</td>
<td>1 (1.5)</td>
</tr>
<tr>
<td># of Headaches per patient (range)</td>
<td>1.7 (1 - 3)</td>
</tr>
<tr>
<td>&lt;2 (%)</td>
<td>46 (70.3)</td>
</tr>
<tr>
<td>&gt;2 (%)</td>
<td>10 (15.6)</td>
</tr>
<tr>
<td>Mean Headache Days/30 (range)</td>
<td>28 ± 16 (15 – 30)</td>
</tr>
<tr>
<td>Mean Severe Headache Days/30 (range)</td>
<td>19 ± 8 (0 – 30)</td>
</tr>
<tr>
<td>Headache Free Days/30 (range)</td>
<td>1.6 ± 4.4 (0 – 15)</td>
</tr>
</tbody>
</table>

**Treating Diagnosis – ICHD II**

<table>
<thead>
<tr>
<th>ICHD DX</th>
<th>n = 64</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5.1 (Chronic migraine)</td>
<td>16 (25.0)</td>
</tr>
<tr>
<td>2.3 (Chronic tension-type)</td>
<td>1 (1.6)</td>
</tr>
<tr>
<td>2.3/1.1 (Chronic tension-type/Migraine without aura)</td>
<td>3 (4.7)</td>
</tr>
<tr>
<td>2.3/1.5.1 (Chronic tension-type/Chronic migraine)</td>
<td>26 (40.6)</td>
</tr>
<tr>
<td>2.3/4.7 (Chronic tension-type/Hemicrania continua)</td>
<td>1 (1.6)</td>
</tr>
<tr>
<td>4.7 (Hemicrania continua)</td>
<td>2 (3.1)</td>
</tr>
<tr>
<td>11.2.3 (Craniofacial dystonia)</td>
<td>8 (12.5)</td>
</tr>
<tr>
<td>11.2.3/1.5.1 (Craniofacial dystonia/Chronic migraine)</td>
<td>2 (3.1)</td>
</tr>
<tr>
<td>11.2.3/1.5.1/2.3 (Craniofacial dystonia/Chronic migraine/Chronic tension type)</td>
<td>2 (3.1)</td>
</tr>
<tr>
<td>A13.7.1 (Other terminal branch neuralgia)</td>
<td>3 (4.7)</td>
</tr>
</tbody>
</table>

**INJECTION TECHNIQUE (%)**

- (100%)
- Follow the pain (FTP)

**Approved fixed site, fixed dose (FSFD)**

- 62%

**Follow the pain (FTP)**

- 5%

**FSFD + FTP**

- 14%

**Cervical Dystonia**

- 17%

**Focal (nummular)**

- 2%
Neck pain, 8
Headache, 11
None, 42

SIDE EFFECTS

Reason for Discontinuation

Ineffective
Side Effects
Lost to Follow Up (LTF)
ONGOING

Treatment Outcomes - Overall (n = 61)

Unchanged
Some Better
Much Better
Some Worse
Much Worse
Unknown
Outcomes: Continuous vs. Non-continuous

Outcomes - Occupational

PTSD* vs. GEC

*PTSD was defined as a positive diagnosis given on neuropsychological testing.

Mean PCL-M (n=44) = 36.9 ± 16.2
Using 50 as a cut point:
< 50=34 : Better - much better = 23/34 (67.6)
50 =10: Better - much better = 6/9 (66.7)
Time from injury

Conclusions

- Soldiers sustain concussions leading to Post-Traumatic Headache
- PTH can be varied in type as well as in number
- OBA treatment is a safe and effective treatment for PTH
- 2/3 of all patients were improved with reduced severity and frequency of headaches
- OBA offers a continuous, long acting, localized treatment, less worry over recalling to take oral medication and subsequent side effects, or interactions with other medications and disease states
- 66.7% of SM with PTSD (PCL-M >50) and 67.6% without PTSD reported being better/much better after administration of botox
- Those who were treated further from the injury did better:
  - Warrior effect?
  - Maturation process of secondary to primary headache

Headache in Context

Concussion: Persistent Problems?

<table>
<thead>
<tr>
<th>Thinking/ Remembering</th>
<th>Physical</th>
<th>Emotional/Mood</th>
<th>Sleep</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difficulty thinking clearly</td>
<td>Headache</td>
<td>Difficulty concentrating</td>
<td>Difficulty falling asleep</td>
</tr>
<tr>
<td>Feeling slowed down</td>
<td>Fuzzy or blurry vision</td>
<td>Sensitivity to noise or light</td>
<td>Nervousness or anxiety</td>
</tr>
<tr>
<td>Difficulty remembering</td>
<td>Irritability</td>
<td>Difficulty remembering new information</td>
<td>More emotional</td>
</tr>
<tr>
<td>Difficulty remembering new information</td>
<td>Sleeping more than usual</td>
<td>Difficulty thinking clearly</td>
<td>Trouble falling asleep</td>
</tr>
</tbody>
</table>

http://www.cdc.gov/concussion/signs_symptoms.html

Some other ideas
- What about HPA axis? 1, 2
- What about Chiari? 3
- Is it pressure related?
- Exertion is a trigger:
  - What about autonomics?
  - Adrenaline blockers
    - Alpha
    - Beta
- Mindfulness 4
- Why not use return to activity?


Return to Activity

Figure 2. Use of the BCTT and exercise prescription for RTA in physiologic PCD. APMHR, age-predicted maximum HR. *After 3 wk of symptoms. **5 bpm for nonathletes; 10 bpm for athletes. To obtain a more precise target HR, consider repeating the BCTT every 2 wk.

And Now
For something completely different

Nutritional Study

Targeted alteration of dietary n-3 and n-6 fatty acids for the treatment of chronic headaches: A randomized trial

Experimental: H3-L6 High Omega-3, low Omega-6 diet
Assigned intervention: The intervention will be administered through food products rather than dietary supplements.
Other Name: High omega-3 versus high omega-6 dietary intervention

Active Comparator: L3-H6 Control diet containing average US polyunsaturated fatty acid (PUFA) content with low omega-3 and high omega-6 content
Assigned intervention: The intervention will be administered through food products rather than dietary supplements.
Other Name: High omega-3 versus high omega-6 dietary intervention
Additional Headaches – They are all not Migraine

- TACS
  - Acute = sumatriptan, etc.
  - Preventive
    - Venlafaxine
    - Topiramate, valproate, lithium, etc.
- Including Hemicrania Continua
  - Indomethacin
- Nummular
- Botot
- Neuapvic including occipital
  - Injections
  - Carbamazepines
  - Gabapentinoids

TREATMENT

- The Bad News
  - No completed treatment trials
  - PTSD and other PCS
    - Co-morbidity or concurrency
- The Good News
  - Treating the primary phenomenology works (sometimes)
  - Migraine type
    - Formulary based including Chronic Migraine (?) Tension type
  - Continuous headache?
  - Neuropathic/Focal or nummular types
  - Behavioral and dietary

RESOURCES

- DVBC: https://dvbic.dcoe.mil/clinical-tools-providers-mld-tbi
- King Devick: https://kingdevicktest.com/
Thank you for your attention

The Views Expressed Herein Are Those Of The Author(s) And Do Not Reflect The Official Policy Of The Department Of The Army, Department of Defense, Or The U.S. Government