Neurological Findings & Symptoms Associated with Acute Combat–related Concussion:

*Impact of Migraine and Other Co-morbidities*

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Disclosures

• The views expressed are those of the author and do not reflect the official policy of the Department of the Army, the Department of Defense or the U.S. Government.

• No commercial support.

Concussion/mTBI Among Returning Service Member
Neurological Findings & Symptoms Associated With Acute Combat-Related Concussion: Impact Of Migraine And Other Co-morbidities

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Causes of Concussion

Concussion - 4 Symptom Categories

- Physical (10)
  - Headache
  - Fatigue
  - Dizziness
  - Sensitivity to light and/or noise
  - Nausea/vomiting
  - Balance problems
  - Numbness/tingling
  - Visual problems

- Emotional (4)
  - Irritability
  - Sadness
  - Feeling more emotional
  - Nervousness

- Cognitive (4)
  - Difficulty remembering
  - Difficulty concentrating
  - Feeling slowed down
  - Feeling mentally foggy

- Sleep (4)
  - Drowsiness
  - Sleeping less than usual
  - Sleeping more than usual
  - Trouble falling asleep

Factors that Influence Reporting of Post-Concussion-Like Symptoms

From Iverson et al., 2009
**Concussion in Deployed Setting**

Does NOT Occur in Isolation

<table>
<thead>
<tr>
<th>Co-morbid Conditions</th>
<th>Pre-morbid Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concurrent Injuries</td>
<td>Past experiences</td>
</tr>
<tr>
<td>Prior concussion(s)</td>
<td>Perception of experience</td>
</tr>
<tr>
<td>Acute Stress Reaction/PTSD</td>
<td>Coping Skills/ Resilience</td>
</tr>
<tr>
<td>Migraine</td>
<td>Combat Operational Stress (COSR)</td>
</tr>
<tr>
<td>Sleep Disorder</td>
<td>Psychosocial stressors</td>
</tr>
<tr>
<td>Mood Disorder</td>
<td>Sleep impairment</td>
</tr>
<tr>
<td>Chronic pain</td>
<td>Personality (motivation)</td>
</tr>
<tr>
<td>Medication misuse</td>
<td>Expectations</td>
</tr>
<tr>
<td>Substance abuse</td>
<td>Unit Cohesion</td>
</tr>
</tbody>
</table>

**MTBI and PTSD – Overlapping Conditions?**

Flynn, Frederick. Combat Related mTBI and Co-morbidities, AAN 2010

**Post-traumatic Headache (PTHA)**

- HA onset within 7 days after trauma
- Most common post-concussive symptom (31-96%)
- Heterogeneous group, ± trauma related
- 70-96 % meet criteria for primary HA disorder
- Post-traumatic migraine common (28-60%); most common subtype in military (≈ 89%)
- Risk factors for chronic HA: females, prior HA, medication overuse, mild head trauma, migraine features
- Co-morbidities often present
Objectives

• Describe the clinical characteristics of a sample of SMs with concussion
  – Concussion symptoms
  – Acute and chronic co-morbidities
  – Association of co-morbidities with return to duty
  – Pre-deployment & Post-traumatic headache features
• Discuss the implications for clinicians
  – Importance of careful evaluation and symptom attribution to optimize care and recovery

Methods

• 40 Service Members with acute concussion evaluated and followed in theater by a neurologist
  – Average follow-up = 33 days (median 18 days)
  – Average visits = 4 (median 3)
• Reviewed and abstracted clinical records
• Calculated frequencies for concussion symptoms, acute and chronic co-morbidities
• Investigated characteristics of headaches, highlighting migrainous features
• Explored the association of co-morbidities with return to duty

Characteristics of the Study Population

N = 40

Neurological Findings in Concussion

• Mean age: 29±9 years
• Gender
  – Male: 37 (92%)
  – Female: 3 (8%)
• Returned to duty
  – Full: 19 (50 %)
  – Limited: 10 (26 %)
  – Evacuated: 9 (24 %)
• Concussion Grade
  – Grade 1: 14 (35 %)
  – Grade 2: 21 (53 %)
  – Grade 3: 5 (12 %)
• h/o prior concussion
  – Recent : 19 (48%)
    • ≥ 3 past year: 9 (23%)
  – Remote: 8 (20%)
**Concussion Symptoms**

Neurological Findings in Concussion

- **Acute**
  - Concurrent Injury
  - Anxiety/Depression
  - Analgesic Overuse
  - Acute Stress Reaction/PTSD
  - Refractory Headaches
  - Other

- **Chronic**
  - Anxiety/Depression
  - Analgesic Overuse
  - PTSD
  - Chronic stressors
  - Headache
  - Insomnia
  - Musculoskeletal conditions
  - Recurrent Concussion
  - Recurrent Blast Exposure
  - Other

**Co-morbid Conditions**

Neurological Findings in Concussion

- Mechanism of Injury
- Concussion Symptoms
- Co-morbid Conditions
Pre-deployment Headache History
N=40

- h/o migraine DX : 5 (12.5%)
- Known FH migraine : 10 (25%)
- Prior h/o of any headaches: 25 (62.5%)
  - Presence of migrainous features or triggers: 21 (52%)

Pre-deployment Headaches
n = 25

<table>
<thead>
<tr>
<th>Frequency</th>
<th></th>
<th>Severity</th>
</tr>
</thead>
<tbody>
<tr>
<td>“infrequent”:</td>
<td>15 (60%)</td>
<td>Mild - moderate: 6 (24%)</td>
</tr>
<tr>
<td>1-4/month:</td>
<td>7 (28%)</td>
<td>Mod-severe: 10 (40%)</td>
</tr>
<tr>
<td>&gt;4/month:</td>
<td>1 (4%)</td>
<td>Unreported: 9 (36 %)</td>
</tr>
<tr>
<td>Unreported:</td>
<td>2 (8%)</td>
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</tr>
</tbody>
</table>

- Headache Features & Triggers*
  - Typical migraine triggers: 9 (36%)
  - Typical migraine features: 8 (32%)
  - Childhood HAs w/ migrainous features: 1 (4%)
  - “Sinus HAs”: 1 (4%)
  - Motion Sickness: 1 (4%)

* Presence of ≥ 1 of these features: 21 (84%)

Post-traumatic Headaches
n = 38

<table>
<thead>
<tr>
<th>Frequency</th>
<th></th>
<th>Severity</th>
</tr>
</thead>
<tbody>
<tr>
<td>“infrequent”:</td>
<td>2 (5.2%)</td>
<td>Mild-moderate: 10 (26%)</td>
</tr>
<tr>
<td>2-4/month:</td>
<td>2 (5.2%)</td>
<td>Mod-severe: 28 (74%)</td>
</tr>
<tr>
<td>1-6/week:</td>
<td>9 (23.5%)</td>
<td></td>
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<tr>
<td>Daily:</td>
<td>26 (68%)</td>
<td></td>
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</tbody>
</table>

- Headache Features
  - Unilateral: 26 (68%)
  - Aura: 2 (5%)
  - Throbbing: 32 (84%)
  - Dizziness/Vertigo: 10 (26%)
  - Photophobia: 28 (74%)
  - Nausea/Vomiting: 25 (66%)
  - Phonophobia: 20 (53%)
  - Relief with sleep: 27 (71%)
Post-traumatic Headache Triggers
n=38

Post-traumatic Headache Treatment
n=38

• Abortive treatment
  – Triptan use: 16 (42%)  75% response rate
  – NSAID use: 32 (84%)  81% response rate

• Prophylaxis
  – Amitriptyline: 24 (63%)
  – Other: 2 (5%)

• All patients received headache/migraine
  education on potential triggers and lifestyle
  factors

Study Limitations

• Very small number of participants
  (statistical testing not possible)
• Findings may not be representative of all
  Service Members with concussion
• Data based on self-report and clinical
  impression
Conclusions

• Concussion in deployed settings does not occur in isolation. Co-morbidities are common.
• Presence of multiple co-morbidities appears to influence recovery; more research is needed.
• Post-traumatic headaches often fully c/w migraine, potentially related to pre-deployment susceptibility as supported by detailed history. Acute post-traumatic migraine responds to appropriate therapy.
• Despite widespread screening and advances in technology, detailed clinical assessment remains the hallmark of successful diagnosis and management of concussion.

Knowledge Gaps, Challenges, and Future Research

• Is post-traumatic migraine generated by the same mechanisms as idiopathic migraine?
• How do we best care for Service Members with multiple co-morbidities?
• Does migraine and other co-morbidities account for many of the symptoms attributed to acute concussion?

Further clinical research required for co-morbidity recognition and management, including post-traumatic migraine.
We need a standardized data collection system to support rigorous prospective studies.

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... in gaining new perspectives

References

References

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Role 3 Concussion Care Program, BAF 10/10-12/10

Theater Neurology Consultant Travel 10/10-4/11
Scenes of Afghanistan

Role 1/2, Concussion Care Centers, CRCC

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