TRAUMATIC BRAIN INJURY: SAME OR DIFFERENT

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**Traumatic Brain Injury: Same or Different**

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DISCLAIMER

The views expressed in this presentation are those of the author and do not reflect the official policy of the Department of the Army, Department of Defense, or U.S. Government.
Nothing to disclose
TRAUMATIC BRAIN INJURY

- Mild
- Moderate
- Severe
- Penetrating
- Blast versus blunt TBI
- Male versus female
## BLUNT VERSUS BLAST TBI

<table>
<thead>
<tr>
<th></th>
<th>Blunt TBI</th>
<th>Blast TBI</th>
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</thead>
<tbody>
<tr>
<td><strong>Headache</strong> (Lew et al., 2006)</td>
<td>Tension-type</td>
<td>Migraine-like</td>
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<tr>
<td><strong>Dizziness</strong> (Hoffer et al., 2009)</td>
<td>Vestibular-ocular reflex - normal to high frequency lag times</td>
<td>Vestibular-ocular reflex - low frequency lag times</td>
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<td>Normal motor control testing</td>
<td>Increased latency on motor control testing</td>
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<tr>
<td><strong>Hearing Loss</strong> (Lew et al., 2007)</td>
<td>Pure sensorineural (47%) Conductive (11%)</td>
<td>Pure sensorineural (58%) Conductive (8%) Mixed (19%)</td>
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<tr>
<td><strong>Visual complaints</strong> (Goodrich et al., 2007)</td>
<td>Blunt polytrauma (20%)</td>
<td>Blast injury (52%)</td>
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COMBAT-RELATED TBI

- **Symptom-reporting (3 or more symptoms)**
  - Initial 33.4%
  - Post-deployment 7.5%

- **Most common initial symptoms**
  - Headache
  - Dizziness

- **Most common persistent symptoms**
  - Irritability
  - Memory problems

Terrio et al., 2009
SYMPTOM REPORTING

- **Initial**
  - Somatic complaints

- **Persistent**
  - Psychological
  - Behavioral
  - Social

DVBIC Care Coordination Program- unpublished data
GENDER DIFFERENCES
MORTALITY

➢ No difference in mortality between men and women (Yeung et al., 2011)
➢ Peri/post menopausal women with lower risk for mortality and morbidity
   » Pre-menopausal women no different than men (Berry et al., 2009)
MORTALITY

- Females, especially ≥55 years of age have higher mortality after isolated severe TBI (Dischinger et al., 2009)
MORBIDITY

- Women at increased risk for developing Heterotopic Ossification following TBI (Simonsen et al., 2007)
SEVERE TBI

- Brain tissue oxygenationation ($\text{PbO}_2$)
  - Transfusion of PRBCs has greater effect on PbO$^2$ in women (Arellano-Orden et al., 2011)
Moderate/Severe (Arellano-Orden et al., 2011)

<table>
<thead>
<tr>
<th>Males</th>
<th>Females</th>
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<tbody>
<tr>
<td>Restlessness</td>
<td>Headache</td>
</tr>
<tr>
<td>Sleep Disturbances</td>
<td>Dizziness</td>
</tr>
<tr>
<td>Difficulty with Goal Setting</td>
<td>Loss of Confidence</td>
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<tr>
<td>Phonophobia</td>
<td>Lack of Initiative</td>
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OUTCOMES

- **Meta-analysis**
  - Functional outcomes similar (Ottochian et al., 2008)

- **Women have better outcomes than men** (Slewa-Younan et al., 2008)
  - Shorter length of stay
  - Improved Glasgow Outcome Score
  - Study excluded pre-existing psychological or substance use disorders
NEUROENDOCRINE DYSFUNCTION

- **Male**
  - Testosterone suppression
- **Females**
  - Estrogen suppression
- **Generally transient abnormalities**

(Wagener et al., 2010)
COGNITION

- Similar cognitive outcomes between genders
  » Exception: visual memory may be better in women (Moore et al., 2010)

- Men at higher risk for developing dementia after TBI (2 meta-analysis) (Starkstein & Jorge, 2005)
GERIATRIC study demonstrated that women have:
» Shorter lengths of stay
» Increased use of home health services

(Graham et al., 2010)
SYMPTOM REPORTING

- Adult females with increased reporting of post-concussive symptoms
- Minor females similar reporting to that of males
- No discrimination by sport or safety apparatus utilized

(Preiss-Farzanegan et al., 2009)
PSYCHOLOGICAL SYMPTOMS

- Acutely, women report higher levels of:
  - Depressive symptoms
  - Chronic stress
  - Pain
  - Memory problems

- No longer evident at 6-12 month follow-up

(Bay et al., 2009)
Higher prevalence in women
» 17% vs 6% (Spinos et al., 2010)

Gender is predictive of post-concussive syndrome
» Female>male (Dischinger et al., 2009)
CONCLUSION

➢ Studies regarding gender differences have variable results
  » Selection bias
  » Sample size
  » Injury severity

➢ Scientifically rigorous studies are needed
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