Epilepsy from the Military Perspective

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Annual Course: Symptomatic Epilepsies: Trauma

American Epilepsy Society  |  Annual Meeting
Disclosure

• Dr. Parko has nothing to disclose
• Disclaimer: The views expressed in this presentation are those of the author and do not reflect official policy or position of the Veterans Affairs or the Department of Defense
Learning Objectives

1. Overview of current military Traumatic Brain Injury (TBI)

2. Evaluate the potential magnitude of post-traumatic epilepsy (PTE) from current military TBI

3. Understand the system of care established for veterans with epilepsy

American Epilepsy Society | Annual Meeting 2012
1. Overview of current military TBI

• Combat TBI
• Gathering the data
  • In Theatre Diagnosis
    • Mandated Screening
    • Neurology Teleconsult
    • Blast Gauge
• Exit from Service
  • VA Screen
Global War on Terror (GWOT)

- **Iraqi** - 9 years of conflict March 2003-December 2011
  - Operation Iraqi Freedom (OIF) Began March 2003
  - Operation New Dawn (OND) Began September 2010

- **Afghanistan** - Oct 2001
  - Operation Enduring Freedom (OEF)
OEF/OIF Patient Characteristics

- Long War
- Multiple Deployments
- Multiple Blast Exposures
- Under Stress for Prolonged Periods of Time
- Chronic Pain
Current Injury Etiology

- Leading cause of combat injuries OIF/OEF
  - 74% Explosions, primarily improvised explosive devices
  - 18-20% Gunshot wounds
- Leading causes Vietnam
  - 65% explosions
  - 35% Gunshot wounds

Owens et al (2012)
DoD Numbers for Traumatic Brain Injury

Total TBI Diagnoses

No. of cases

35,000
30,000
25,000
20,000
15,000
10,000
5,000

'00  '01  '02  '03  '04  '05  '06  '07  '08  '09  '10  '11

Calendar year

Source: Armed Forces Health Surveillance Center

Updated 10 Feb 2012
DoD Numbers for Traumatic Brain Injury

Incidence by Armed Forces Branch

No. of cases
25,000

Calendar year

Army
Navy
Air Force
Marines

Source: Armed Forces Health Surveillance Center
Updated 10 Feb 2012
DoD Numbers for Traumatic Brain Injury

Worldwide – Totals

2000 - 2012 Q1

- Penetrating: 3,877
- Severe: 2,469
- Moderate: 40,449
- Mild: 187,539
- Not Classifiable: 9,883

Total - All Severities: 244,217

Source: Defense Medical Surveillance System (DMSS), Theater Medical Data Store (TMDS)

Prepared by MHS Office of Strategic Communications

2000 - 2012 Q1, as of 16 May 2012
Military vs. Civilian TBI

- Combat troops injured by blast explosive brisance
  - Acute polytrauma, no civilian equivalent
  - Neurological effects may differ from other causes of TBI

- Population is different
  - Unique population Unifying characteristics (age, gender, enlisted, fitness standard, absence of alcohol, illicit drug or criminal behavior, treatment in choreographed continuum of care)

- Risk from mild TBI in this setting is unknown
TBI Screening in-theatre practice guidelines


- Military Leaders required to identify personnel involved in a mandatory event and conduct screening, ensure reporting, and refer anyone with positive screen for full medical evaluation

- Mandated Screening using Military Acute Concussion Examination (MACE)
  - MACE brief screen that combines:
    - acute injury characteristics and symptoms
    - brief validated cognitive screening
Mandatory Events Requiring Evaluation

- Any Service Member in a vehicle associated with a blast event, collision or rollover
- All within X meters of a blast (inside or outside)
- Anyone who sustains a direct blow to the head
- Command directed, especially with repeated exposures to blasts
Army Knowledge Online (AKO) teleconsultation

Centralized system for deployed military care providers to receive expert recommendations on triage and disposition
Quantities of Military Teleconsults Requested per Calendar Year

Yurkiewicz et al 2012
Diagnoses, initial and final

Initial provider diagnoses
- Unknown 8%
- Bell's Palsy 4%
- mTBI/Concussion 7%
- Sleep disorder 4%
- Numbness 6%
- MS 6%
- Migraines 17%
- Seizure/Epilepsy 17%
- Headaches (not migraine) 27%

Final consultant diagnoses
- Unknown 3%
- Bell's Palsy 4%
- mTBI/Concussion 6%
- Sleep disorder 6%
- Numbness 3%
- MS 2%
- Seizure/Epilepsy 18%
- Migraines 23%
- Headaches (not migraine) 29%

Consultant recommendations

Epilepsy/Seizure
- Drug treatment 16%
- Multiple courses of treatment 29%
- Therapy 3%
- Evacuation 34%
- Referral to in-country consultant 5%
- No info 3%
- More info/references/guidance sent 8%
- Imaging 5%

Headaches, including migraine
- Drug treatment 46%
- Multiple courses of treatment 10%
- Therapy 10%
- Referral to in-country consultant 12%
- No info 6%
- More info/references/guidance sent 8%
- Imaging 8%
- Evacuation 6%

Yurkiewicz et al 2012
Blast Exposure
DARPA Blast Gauge

- Measures blast exposure
- Recording 20 msec per episode and then resets itself
  - Measures blast wave form, duration, change in air pressure, head axis acceleration
- Data can be downloaded via mini-USB port
- Data stored in a central database
- Currently being used on 11,000 service members in Afghanistan

Status lights:

- H-strap
- MACE (Military Acute Concussion Evaluation) only if other indicators
- MACE
- MACE, potentially require evac

Jeff Rogers, PhD
MTO, DARPA
TBI in Veterans who seek VA care
April 2007-August 2012

- 1,515,707 OEF/OIF/OND Veterans have left active duty and become eligible for VA health care since FY 2002
- 834,463 (55%) of these Veterans obtained VA health Care
- 647,197 Screen positive for possible mild TBI
- 128,617 (19.9%) are screen positive for TBI
- 51,159 have diagnosis of TBI (7.9 % of initial possible screens)

Sources:
http://vssc.med.va.gov/tbireports/comprehensivetbi.aspx
2. Evaluate the potential magnitude of post-traumatic epilepsy (PTE) from current military TBI

- Prevalence: Historical evidence from military trauma
- Latency, Incidence
  - Vietnam
  - Iran-Iraq
- OIF/OEF/OND-emerging data
- Combat Mild TBI
Posttraumatic epilepsy following craniocerebral missile wounds in armed conflicts during the 20th century

<table>
<thead>
<tr>
<th>Conflict</th>
<th>Author(s), year</th>
<th>No. of patients</th>
<th>Posttraumatic epilepsy (%)</th>
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<tr>
<td></td>
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<td>Russell &amp; Whitty, 1952</td>
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<td>Walker &amp; Ercolei, 1969</td>
<td>739</td>
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<td>Korean War</td>
<td>Caveness et al., 1962</td>
<td>211</td>
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<td>Salazar et al., 1985, 1987</td>
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<td>Aarabi, 1990</td>
<td>489</td>
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<td>Lebanon</td>
<td>Brandvold et al., 1990</td>
<td>46</td>
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Lowenstein 2009 - adapted from Salazar 1999
Korean and Vietnam War Veterans
Risk with other TBI severity

- 53% risk with penetrating TBI
- 10-25% closed head injury (combat) with positive brain imaging
- 5% in moderate CHI without imaging findings

Chen et al 2009
Vietnam PTE Latency

- Report of the Vietnam Head Injury Study showed that the overall seizure occurrence 15 years after head injury was 53% with the vast majority developing epilepsy (Salazar 1985)
- Recent Vietnam Head Injury Study showed that 12.6% of Veterans with TBI had initial onset of epilepsy more than 14 years after their injury (Raymont 2010)
Recent Conflict (Iran-Iraq War)

- 32% with penetrating TBI developed epilepsy during an average of 39.4 months of follow-up
- 489 patients with penetrating head trauma over 8 year period followed for up to 154 months
- 32% (157) developed epilepsy during follow-up period of almost 13 years
  - Latency
    - 6 months 63 72% in first year
    - 12 months-50
    - 24 months-17
    - 48 months-19 95% in first four years
    - 111 months-8

Aarabi et al 2000
US Veterans in OIF/OEF/OND

- 256,286 veterans who received care in FY09-10
- 2,684 (1.0%) met criteria for epilepsy (ICD-9 diagnostic code and on AED x GBP/PGB)
- Prevalence estimates 6.8-11.3 per 1000
- TBI severity levels associated with epilepsy in a linear pattern
- Association between mTBI and epilepsy even after controlling for co morbid PTSD.

Pugh et al, under review
Veterans of Iraq and Afghanistan Wars - Epilepsy in FY10

Adjusted Odds Ratios for TBI Severity in Logistic Regression Analyses Predicting Epilepsy:

Pugh et al, under review
3. Understand the system of care established for veterans with epilepsy

- Numbers of Veterans with epilepsy
- Epilepsy Centers of Excellence (ECoE)
- Veterans receive care for epilepsy
  - DoD and civilian
- Non-epileptic seizures in veterans
Epilepsy population demographics

- About 85,000 Veterans treated at VA are diagnosed with epilepsy or seizures
- 20% were seen within a Medical Center with an Epilepsy Center
- 75% are age 50 and older
- 7% are female
- Many medically and surgically refractory
- Non-epileptic seizures
Increasing Number of VA Seizure Patients

Data Source: Office of Specialty Care Transformation
Data collected using ICD-09 codes 345.xx, 780.3, 780.33, 780.39, 780.02, 780.09, 649.40, 649.41, 649.43, 649.44
Establishment of Epilepsy Centers of Excellence (ECoE)

- Public Law 110-387: Veterans Mental Health and Other Care Improvements Act of 2008
- Centers must:
  - link to existing VHA Polytrauma Centers
  - link to academic centers and conduct research
  - be established by a Peer Review Panel
  - be involved with education and fellowship training
- Funding Cycle October 2008-September 2013
ECOE Goals

- Delivery the highest quality care to veterans with epilepsy, regardless of their geographic location
- Streamline epilepsy referrals to sites with expertise and services
- Take epilepsy care to veterans in remote areas
- Promote outreach and educational efforts
- Provide an efficient and cost-effective mechanism of care delivery
- Establish a national clinical database
Non-epileptic seizures within Veterans in the VA

- FY 12 EMU diagnosis from 14 Epilepsy Center of Excellence sites
- 652 total EMU admissions
- 192 (29%) confirmed diagnosis of PNES

192 PNES Diagnosis of 652 EMU Admissions
We wish to acknowledge and thank veterans who have made enormous sacrifices for our country.

Medical Evacuation runway at Landstuhl Army Hospital, Germany
Impact on Clinical Care and Practice

• Army veterans who served in Iraqi, especially in the early years, have sustained more TBI than other services

• Risk of developing PTE from mild TBI in OEF/OIF veterans remains unknown