Traumatic Brain Injury and Psychogenic Seizures
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Disclosure

UCB Pharma Inc.        Speaker’s bureau
Learning Objectives

• Understand the relationship between TBI and psychogenic non-epileptic seizures.
• Identify risk factors associated with post-traumatic psychogenic seizures.
41 year old woman
- TBI at home; concussion
- Immediate seizure onset
- 6 years AED therapy
- Refractory seizures, disabled

43 year old man
- TBI (military); 10 minute LOC
- Seizure onset 3 months later
- Refractory to AEDs x 15 years
- Disabled; PTSD, depression
TBI and Psychogenic Seizures

Key Points

1. Traumatic Brain Injury + seizures
   = \neq \text{epilepsy}
   » psychogenic non-epileptic seizures
TBI and Psychogenic Seizures

- The evidence
  - civilians, veterans
- Risk factors
Psychogenic Non-Epileptic Seizures (PNES)

- Transient alterations in behavior resembling an epileptic seizure but *not* due to *paroxysmal neuronal discharges*;
  - without other physiologic abnormalities
  - with probable psychological origin
‘Hystero-Epilepsy’

Charcot

Iconographie Photographique de la Salpetriere; 1876
Psychogenic Seizures
Impact on the Patient

- **Antiepileptic Drug therapy (70%)**
  - Side effects
- **Disability**
  - Restrictions on driving
  - Restrictions on work
- **Psychological/Social effects**
- **Cost of assessment and treatment**
Psychogenic Seizures (PNES)  
Frequency

<table>
<thead>
<tr>
<th>Study</th>
<th>Year</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>King et al</td>
<td>1982</td>
<td>20%</td>
</tr>
<tr>
<td>Bowman et al</td>
<td>1996</td>
<td>33%</td>
</tr>
<tr>
<td>Martin et al</td>
<td>2003</td>
<td>32%</td>
</tr>
<tr>
<td>Benbadis et al</td>
<td>2004</td>
<td>30%</td>
</tr>
<tr>
<td>Salinsky et al</td>
<td>2011</td>
<td>26%</td>
</tr>
</tbody>
</table>

King DW et al; Neurology; 1982  
Bowman ES, Markand ON Am J Psychiatry; 1996  
Martin R et al, Neurology; 2003  
Benbadis SR et al, Epilepsia; 2004  
Salinsky MC, Neurology; 2011
Post-traumatic Epilepsy

- **Population-based studies**
  - Chart review, administrative databases\(^1,2\)
  - Seizures assumed to be epileptic

- Few cases confirmed by monitoring

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\(^1\) Annegars JF et al; NEJM 1998
\(^2\) Pugh MJ, Amuan A, Neurology 78:S06.001; 2012
Traumatic Brain Injury

Post-traumatic seizures

Seizures

PNES
Head Injury and Psychogenic Seizures (PNES)

<table>
<thead>
<tr>
<th>Author</th>
<th>Type</th>
<th># of PNES patients</th>
<th>Percent with documented head injury</th>
<th>Mean age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barry et al, Epilepsia 1998</td>
<td>Retrospective; video-EEG monitoring</td>
<td>157</td>
<td>24%</td>
<td>34</td>
</tr>
<tr>
<td>Westbrook et al, Epilepsia 1998</td>
<td>Retrospective; video-EEG monitoring</td>
<td>102</td>
<td>32%</td>
<td>34</td>
</tr>
</tbody>
</table>
PNES
Severity of Head Injury

Mild TBI = Concussions or brief LOC (<30 min.)
PNES

Severity of Head Injury

Annegars et al, NEJM; 1998
TBI and Psychogenic Seizures

Key Points

1. Traumatic Brain Injury + seizures =/= epilepsy

2. Mild TBI
   - Strong association with PNES
   - Weak association with epilepsy
TBI Severity and Seizures
U.S. Veterans

- Hx of mild TBI as cause of seizures
  » 82% with PNES

- HX of severe TBI as cause of seizures
  » 90% with epilepsy
Seizures after moderate-severe TBI

Result of video-EEG monitoring (n=127)

- 55% Epileptic
- 27% Psychogenic
- 18% Nondiagnostic

Hudek et al, J Head Trauma Rehabil; 2004
TBI and PNES
U.S. Veterans

◆ seizure risk (post-traumatic)
  ◆ >50% with severe military TBI\(^1\)

◆ rates of mild TBI (15-19\% \(^2,3\))
  ◆ Associated with PNES

◆ post-traumatic stress disorder (PTSD)
  ◆ Associated with PNES in civilian studies\(^4,5\)
  ◆ 33-65\% in mild military TBI \(^2,3\)
    (Less in moderate-severe TBI)\(^6\)

\(^1\)Raymont et al, Neurology; 2010
\(^2\)Hoge et al, NEJM; 2008
\(^3\)Pietrzak et al, J Nerv Ment Dis; 2009
\(^4\)Bowman and Markand, Am J Psychiatry; 1996
\(^5\)Rosenberg et al, Epilepsia 2000;41:447-52
\(^6\)Zatzick et al, Arch Gen Psychiatry; 2010
Discharge Diagnoses

**Veterans**
- PNES: 25%
- Nondiagnostic: 18%
- Epilepsy: 41%
- Mixed: 12%
- NES Other: 4%

**Civilians**
- PNES: 26%
- Nondiagnostic: 4%
- Epilepsy: 40%
- Mixed: 3%
- NES Other: 27%

Salinsky et al, Neurology; 2011
TBI as Cause of PNES

Civilians vs. Veterans

For veterans - 50% of TBIs were military TBIs
Veterans with PNES vs. ES Mental Health Evaluations

<table>
<thead>
<tr>
<th></th>
<th>Psychogenic</th>
<th>Epileptic</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>68</td>
<td>54</td>
<td></td>
</tr>
<tr>
<td>Age at Admission</td>
<td>48.4</td>
<td>49.9</td>
<td>NS</td>
</tr>
<tr>
<td>Any Axis 1 Diagnosis (%)</td>
<td>77.9</td>
<td>66.7</td>
<td>NS</td>
</tr>
<tr>
<td>Number of Axis 1 Diagnoses</td>
<td>3 (0-8)</td>
<td>2(0-6)</td>
<td>0.01</td>
</tr>
<tr>
<td>Any Axis 2 Diagnosis (%)</td>
<td>27.9</td>
<td>16.7</td>
<td>NS</td>
</tr>
</tbody>
</table>
Axis I Diagnoses by Seizure Type

<table>
<thead>
<tr>
<th>Condition</th>
<th>Psychogenic Cases</th>
<th>Epileptic Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTSD</td>
<td>55.9%</td>
<td></td>
</tr>
<tr>
<td>Major Depression</td>
<td></td>
<td>18.5%</td>
</tr>
<tr>
<td>Alcohol Abuse</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Substance Abuse</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Depression</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjustment d/o</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*** p<0.001

Salinsky et al, Epilepsy and Behavior; 2012
Veterans with PNES vs. ES Multivariate Analysis

<table>
<thead>
<tr>
<th>Psychiatric</th>
<th>Historical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Axis I diagnoses</td>
<td>Age at admission</td>
</tr>
<tr>
<td>Any Axis II diagnosis</td>
<td>Sex</td>
</tr>
<tr>
<td>PTSD</td>
<td></td>
</tr>
<tr>
<td>Major depression</td>
<td></td>
</tr>
<tr>
<td>Other depression</td>
<td></td>
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<td>Alcohol abuse</td>
<td></td>
</tr>
<tr>
<td>Substance abuse</td>
<td></td>
</tr>
<tr>
<td>Adjustment d/o</td>
<td></td>
</tr>
<tr>
<td>Bipolar d/o</td>
<td></td>
</tr>
<tr>
<td>Any Psychiatric Admit</td>
<td></td>
</tr>
<tr>
<td>Number of Psychiatric Admits</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variables</th>
<th>Odds Ratio</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTSD</td>
<td>5.7</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

**Variables:** PTSD

**Odds Ratio:** 5.7

**p:** <0.001
PTSD

TBI (mild)

Health Problems

p<0.05

Hoge et al, NEJM; 2008
Pietrzak et al, J Nerv Ment Dis; 2009
TBI and Psychogenic Seizures

Key Points

1. Traumatic Brain Injury + seizures ≠ epilepsy
   » Some have PNES

2. Mild TBI
   » Strong association with PNES
   » Weak association with epilepsy

3. PTSD is strongly associated with PNES