Ryan’s Story
A Warrior Who Got Left Behind

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Required Disclaimer
The opinions expressed herein are those of the presenter(s) and are not necessarily representative of those of the government of the United States, the Uniformed Services University of the Health Sciences (USUHS), the Department of Defense (DoD); or, the United States Army, Navy or Air Force.
I have no conflicts to report.

There are 2 types of TBI:

- Impact TBI (falls, fights, MVAs, contact sports, etc): physical forces of impact, acceleration-deceleration, rotational forces. The pathophysiology and long term effects of impact TBI are relatively well understood.

- Blast TBI (exposure to IEDs, suicide bombs, artillery shells, breaching, etc): physical effects on exposure to the blast wave, blast wind (can result in additional combined blast/impact TBI). The pathophysiology and long term effects of blast TBI in the human are understudied and poorly understood.
The Blast Wave

- Blast wave is a very quick (≈10 msec) pulse of high pressure that spreads in all direction at greater than the speed of sound.
- The blast wave can enter the skull and pass through the brain. What effect on structure and function does this have?

Representative case: former Navy SEAL with multiple blast TBI exposures who developed prominent, persistent behavioral/neurologic symptomatology. Death by self-inflicted gunshot wound (GFAP stain of cerebral cortex shows interface astroglial scarring; tau stain is negative [not shown], that is, no CTE).

Another Case

- Navy SEAL deployed multiple times to Iraq, Lebanon, Afghanistan
- Numerous blast exposures with multiple episodes of ruptured tympanic membranes. Participated in missions in which team members died of acute blast exposure
- Severe, intractable sleep disturbance
- Hearing loss, headache, depression, anxiety, PTSD (nightmares, hyper-vigilance, agitation, avoidance).
- Severe alcohol abuse
- Died of suicide at age 29

GFAP Stain Shows Interface Astroglial Scarring
Photographs of Tau immunostaining (AT8) from 13 of 26 cerebral cortical locations that were sampled. All were entirely negative.

This patient was fully symptomatic but does NOT have CTE. His brain shows evidence of Interface Astroglial Scarring.

Interface Astroglial Scarring: a ‘Game Changer’...
(def – an event, idea or procedure that effects a significant shift in the current manner of doing or thinking about something)

• Currently, Interface Astroglial Scarring can only be diagnosed at autopsy
• Need to find a means to diagnose it in living individuals (Neuromaging or other biomarkers?)
• How common is it among active duty and retired Service Members? SOF combatants?
• Interface Astroglial Scarring could affect a large percentage of post-deployed Service Members who have persistent symptoms following significant blast exposure.
• What dose of blast exposure is required to produce Interface Astroglial Scarring? Do multiple smaller doses = a single larger dose?
• What role does Interface Astroglial Scarring play in the high risk of blast-exposed Service Members to develop PTSD, suicide and other behavioral issues?

We have a problem that is not going away…. 
The USU/CNRM BTR is the only brain tissue repository in the world exclusively dedicated to supporting research on the effects of mild to mild, acute, and chronic military Service Members. We concentrate our efforts on studying the long-term effects of military TBI, especially those related to blast exposure.

The USU/CNRM BTR collection we have obtained brain donation from 25 suicide victims who served in the military. Many of these cases were Special Forces Operators. We are currently analyzing the neuropathology findings in these cases (especially regarding the presence of IAS) and are comparing them to controls dying of natural causes.

We need to pause to thank the Service Members and their families who have agreed to brain donation. Without this precious gift, we could not do our work. Many of our donor families have expressed the feeling that although their loved ones have made the ultimate sacrifice, through brain donation, they continue to serve their Country.
Questions
Concerns
Comments

Plus: I will return to next year's meeting and give a full discussion on our work