

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.

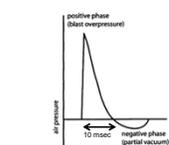


There are 2 types of TBI:

- **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?

Characterisation of interface astroglial scarring in the human brain after blast exposure: a post-mortem case series

Summary
 Background: The understanding of pathogenesis is available for the definitive diagnosis in clinical practice of acute traumatic brain injury (TBI). However, the pathogenesis underlying its chronicity, including the development of interface astroglial scarring, remains unclear. We aimed to use the hypothesis that blast exposure causes a unique pattern of damage, differing from that associated with repetitive mild traumatic brain injury.

Chronic Impact TBI (Civilian - No Blast) > 6 Month Survival

Chronic Substance Abuse

Chronic Blast TBI > 6 Month Survival

Interface Astroglial Scarring

Impact TBI (no blast) Blast TBI

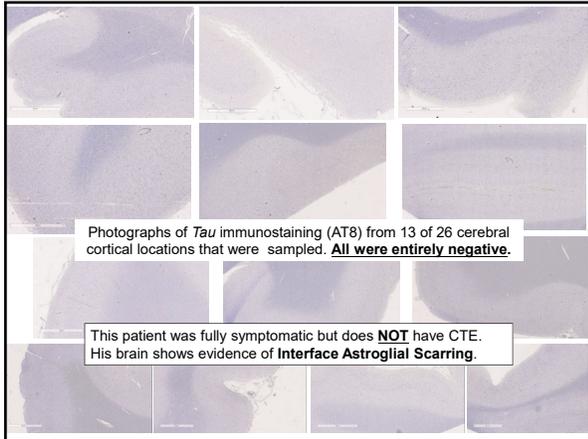
Appearance of GFAP on immunostained slides (brown = brain glial scarring)

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





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** (Neuroimaging 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....

Suicides Among Veterans Show No Sign of Slowing, Confounding V.A. Efforts

President Trump signing an order last month to "improve veterans and post-veterans health."

New York Times, April 15, 2019



Questions

Concerns

Comments

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