S7 Traumatic Brain Injuries in Veterans

How is MRI used to diagnose TBIs?

- Magnetic resistance imaging (MRI) creates highly sensitive imaging by detecting minuscule parts of bone, soft tissue, and organs.
- Closed head injuries sustained by soldiers from explosions cause the over-pressurization of waves, which strain neuronal fibers in the brain.
- Indications of TBIs reveal lesions (that can be monitored over months to visualize an increase in growth), soft tissue damage, and the disruption of venous blood flow, all of which are associated with suicidal thoughts and depression.

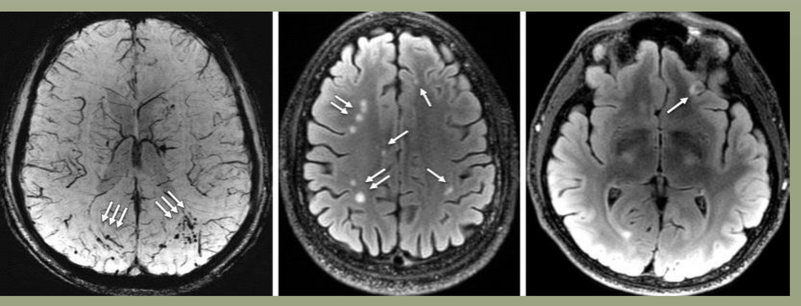


Image 1 – Extensive microhemorrhage detection
Image 2- 76 lesions identified in combat TBI case
Image 3- Evidence of Encephalomalacia (cerebral soft tissue damage) and gliosis (central nervous system damage) in the inferior left frontal lobe.

Objective:

- Define Traumatic Brain Injuries (TBIs) and their impact on veterans
- Explain how imagining techniques (MRI and PET) enhance the findings of Traumatic Brain Injuries

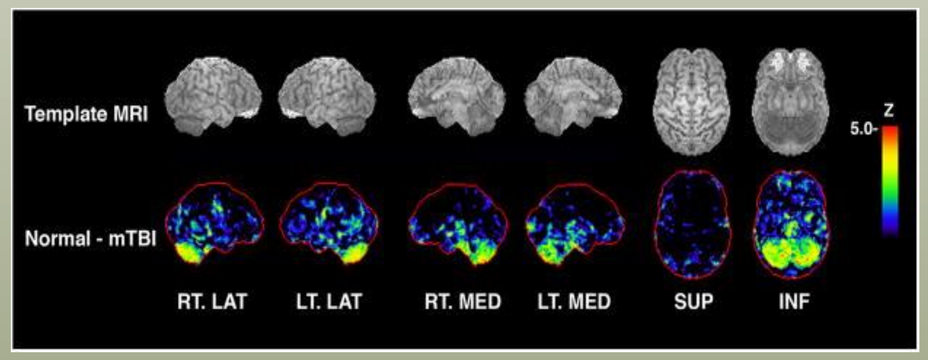
Traumatic Brain Injuries:

Traumatic Brain injuries are when one's brain is injured by a sudden external force to the head. In combat, explosives are the primary cause of injuries in foreign territories that alter the brain. It has major connections to the cerebellum, thalamus, basal ganglia, and limbic system in veterans.

How is PET imaging used to diagnose TBIs?

Nuclear medicine examines organ functionality and physiology at the cellular and molecular levels. This noninvasive radiopharmaceutical, F-fluorodeoxyglucose, will be administered intravenously (IV). Two high-energy photons will travel in opposite directions to identify locations with enhanced glucose uptake in metabolically active cells. PET imaging is then performed, revealing decreased uptake in the cerebellum, vermis, pons, and medial temporal lobe Impairing verbal fluency and memory.

- Z score- Hypometabolic indicating decreased metabolic activity. Blue- Low (Healthy Tissue) Red- Very High (Cancer)



Conclusion:

Veterans who suffer from traumatic brain injuries encounter auditory impairment, suicidal thoughts, depression, verbal fluency, and memory loss. With the advancement of imaging, we can use MRI to diagnose lesions, soft tissue damage, and the disruption of venous blood flow. We also use non-invasive radiopharmaceuticals in PET imaging to reveal the severity level of glucose uptake in soldiers. With these diagnoses, we can analyze veterans coming out of combat regardless of the severity of their head injuries.