TRAUMATIC BRAIN INJURY

presented by

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UNINTENTIONAL CAUSES of TBI

- FALLS
- MOTOR VEHICLE-RELATED OCCURRENCES
- SPORTS/RECREATIONAL ACTIVITIES
- INDUSTRIAL/WORK-RELATED INJURIES
INTENTIONAL CAUSES of TBI

- MILITARY COMBAT
- VIOLENT CRIMINAL BEHAVIOR
- HOMICIDE and SUICIDE ATTEMPTS
- DOMESTIC VIOLENCE
- CHILD ABUSE
TBI SUBTYPES

• CLOSED HEAD INJURY
• PENETRATING HEAD INJURY
• CRUSH INJURY
• BLAST INJURY
• BIRTH INJURY
EPIDEMIOLOGY of TBI
(SEX RATIOS)

MALES >> FEMALES

(1.5-2 : 1)
TBI in the UNITED STATES

ESTIMATED 1.7 MILLION PERSONS/YEAR

- HOSPITALIZED: 275,000 PERSONS/YEAR
- EMERGENCY ROOM TREATMENT: 1.4 MILLION PERSONS/YEAR
- DEATHS: 52,000

Centers for Disease Control & Prevention
TBI in MASSACHUSETTS

5,393  HOSPITALIZED (NON-FATAL)
1,276  OBSERVATIONAL STAYS
43,698  ER VISITS
685  FATALITIES

51,052 ANNUAL TOTAL

MA DPH, 2008
TRAUMATIC BRAIN INJURY
EPIDEMIOLOGY: BLAST INJURY and TBI

- Incidence and Prevalence (worldwide): Unknown
- “Signature Injury” Among Veterans of Iraq/Afghanistan War
- Most Common Cause: Explosion
CAUSES of BLAST INJURY

- RPG’ S (Rocket-Propelled Grenades)
- Land Mines
- IED’ s (Improvised Explosive Devices)
TYPES of EXPLOSIVES

- HE (High Order Explosives) which produce a supersonic over-pressurization shock (blast) wave (e.g. TNT, ammonium nitrate fuel oil-ANFO, etc.)
- LE (Low Order Explosives) which produce a subsonic explosion (without over-pressurization wave) – e.g. pipe bombs, gunpowder, pure petroleum, etc.
- Both HE’s and LE’s can produce a “blast wind” (forced super-heated air flow), and both HE’s and LE’s can be IED’S.
MECHANISMS of BLAST INJURY

- PRIMARY – Due to an HE and affecting gas-filled structures (e.g. blast lung – most common fatal injury) and organs surrounded by fluid-filled cavities (e.g. brain and spinal cord)

- SECONDARY – Results from airborne debris and fragments which may cause penetrating or blunt force injury
MECHANISMS of BLAST INJURY

- **TERTIARY** – Results from blast wind which throws/displaces victim and may result in polytrauma, including CHI and skull fractures

- **QUARTERNARY** – Other explosion-related injuries, illnesses, or diseases; exacerbations and complications (e.g. smoke/toxic fume inhalation; burns, etc.)
CNS EFFECTS of BLAST

- TRAUMATIC BRAIN INJURY ± SKULL FRACTURE
- SPINAL CORD INJURY
- RUPTURE of GLOBE (EYE) AND PENETRATING EYE INJURY
- RUPTURE of TYMPANIC MEMBRANE (TM)
COMMON ASSOCIATED/SECONDARY DISORDERS

- INJURIES NECESSITATING AMPUTATION (LOWER EXTREMITIES – MOST COMMON)
- ASPHYXIA and RESIDUAL PULMONARY DISORDER
- BURNS of VARYING SEVERITY
- SEIZURE DISORDER
- NEUROTOXIC INJURY
- CARDIOMYOPATHY
TRAUMATIC BRAIN INJURY

POST-CONCUSSION SYNDROME
POST-CONCUSSION SYNDROME (PCS)

- MINOR/MILD TBI
- ASSOCIATED WITH BRIEF or NO LOC
- MAY BE ASSOCIATED WITH WHIPLASH EVENT
CLINICAL SYMPTOMS in PCS

- HEADACHE
- DIZZINESS/VERTIGO
- VISUAL SYMPTOMS (e.g., photophobia)
- NAUSEA/VOMITING
- SLEEP DISORDER
- AUDITORY SYMPTOMS (tinnitus, phonophobia, hearing loss)
CLINICAL SYMPTOMS in PCS

- IRRITABILITY/EMOTIONAL LABILITY
- DIMINISHED STAMINA/FATIGUE
- IMPAIRMENT OF ATTENTION/ CONCENTRATION
- SECONDARY MEMORY IMPAIRMENT
PERSISTENT PCS SYMPTOMS
(RISK FACTORS)

• AGE

• HISTORY OF MULTIPLE CONCUSSIONS

• PRE-EXISTING PSYCHIATRIC DISORDER

• CIRCUMSTANCES of INJURY ASSOCIATED with PSYCHOLOGICAL TRAUMA
PERSISTENT PCS SYMPTOMS (RISK FACTORS)

- SIGNIFICANT SEQUELAE RESULTING FROM APPARENT “MINOR” INJURY
- LACK of EVALUATION at TIME of INJURY
- MISDIAGNOSIS
- UNTREATED SYMPTOMS/DISORDER
SECOND IMPACT SYNDROME

- RARE DISORDER; HOWEVER, INCIDENCE, UNKNOWN
- MOST COMMONLY ASSOCIATED WITH SPORTS INJURY
- RESULTS FROM A SECOND CONCUSSION WITHIN HOURS, DAYS, WEEKS
- ACUTE CEREBRAL EDEMA, VASCULAR CONGESTION, and ↑ICP
- MORTALITY: 50%
- MORBIDITY: 100% in SURVIVORS
CHRONIC TRAUMATIC ENCEPHALOPATHY (CTE)

- NEURODEGENERATIVE DISORDER
- OBSERVED in CONTACT SPORTS ATHLETES
  - e.g., hockey, football
  - amateur and professional boxers (dementia pugilistica)
- ? OIF/OEF VETERANS
CHRONIC TRAUMATIC ENCEPHALOPATHY (CTE)

- DEMENTIA
- NEUROPSYCHIATRIC SYMPTOMS, including suicide
- PARKINSONISM
- NEUROPATHOLOGICAL CHANGES
  - Tau deposition
  - Atrophy of cerebral hemispheres and subcortical structures
  - Fenestrated cavum septum pellucidum
LONG-TERM SEQUELAE of
TRAUMATIC BRAIN INJURY
TBI: POST-ACUTE SEQUELAE

- PHYSICAL DISABILITY
- SENSORY IMPAIRMENT
- NEUROCOGNITIVE DEFICITS
- NEUROBEHAVIORAL/PSYCHIATRIC DISORDER
CEREBRAL HEMISPHERE: LATERAL VIEW

**FRONTAL LOBE**
- Primary Motor Cortex
- Motor Planning/Initiation
- Eye Movement
- Expressive Language (Broca’s Area-L Hemisphere)
- Prosody (R Hemisphere)
- Working Memory/Attention
- Executive Skills
- Behavioral Regulation

**PARIETAL LOBE**
- Primary Somatosensory Cortex
- Cognitive-Linguistic Skill (L Hemisphere)
- Visual Spatial Skills
- Mathematical Skills

**OCCIPITAL LOBE**
- Primary Visual Cortex
- Complex Visual Processing
- Color Perception

**TEMPORAL LOBE**
- Primary Auditory Cortex
- Comprehension of Language (Wernicke’s Area-L Hemisphere)
- Comprehension of Affective Aspects of Language (R Hemisphere)
- Memory and Learning
- Auditory and Visual Perception
NEUROCOGNITIVE CONSEQUENCES of TBI
Disorders of Attention/Arousal

- Difficulty sustaining concentration or dividing attention
- Distractibility and diminished capacity to resist interference from competing stimuli
- Inattention or neglect (ignores stimuli typically on one side of space)
- Hypoarousal and persistent lethargy
NEUROCOGNITIVE CONSEQUENCES of TBI
Disorders of Memory

- Post-Traumatic Amnesia (PTA)
- Impaired ability for acquisition of new information, verbal and/or non-verbal
- Difficulty with retrieval of information
- Persistent amnesia
NEUROCOGNITIVE CONSEQUENCES of TBI
Disorders of Language

- Word-finding or naming difficulty (anomia)
- Diminished verbal fluency
- Difficulty with articulation of speech (dysarthria)
- Difficulty with expression and/or comprehension of language (traumatic aphasia)
- Impairment of cognitive-linguistic skills (e.g., reading, spelling)
NEUROCOGNITIVE CONSEQUENCES of TBI
Disorders of Executive Skill

- Difficulty with initiating and/or sustaining purposeful activity
- Impairment of organizational and problem-solving skills
- Diminished capacity to develop and execute well-formulated plans
NEUROCOGNITIVE CONSEQUENCES of TBI
Disorders of Executive Skill

- Cognitive inflexibility, evidenced in perseveration and limited capacity to generate alternative strategies/integrate feedback
- Limited capacity for insight and reasoning
- Diminished capacity for recognizing or anticipating the consequences of one’s own behavior
NEUROBEHAVIORAL CONSEQUENCES of TBI

- DEPRESSION
- PERSONALITY CHANGE
MILITARY SEXUAL TRAUMA

VETERANS:
DID YOU EXPERIENCE ANY UNWANTED SEXUAL ATTENTION, UNINVITED SEXUAL ADVANCES, OR FORCED SEX WHILE IN THE MILITARY?
DOES THIS EXPERIENCE CONTINUE TO AFFECT YOUR LIFE TODAY?

Both men and women can experience Military Sexual Trauma (MST) during their service. MST can affect a person's physical and mental health, even many years afterward. The VA provides free, confidential counseling and treatment for conditions related to experiences of MST. You do not need to be service connected and may be able to receive this benefit even if you are not otherwise eligible for VA care.
COMORBIDITY in OIF/OEF VETERANS

- MILITARY SEXUAL TRAUMA (MST) ± TBI
- PTSD
- SUBSTANCE ABUSE DISORDER
- UNDIAGNOSED/UNTREATED MENTAL DISORDER
- ↑ RISK of SUICIDE
SUICIDE RISK in TBI SURVIVORS

- INCREASED RISK of MAJOR DEPRESSION, ASSOCIATED WITH DISINHIBITION

- INCREASED RISK of SUICIDE ATTEMPTS
  - Prior to TBI
  - Years after TBI
  - Associated with Premorbid History of Aggression
AGGRESSION and TBI

- REACTIVE in NATURE, OFTEN in RESPONSE to MINIMAL STIMULUS
- IS NOT USUALLY PLANNED or PREMEDITATED
- NOT USUALLY GOAL-DIRECTED
- EPISODIC/EXPLOSIVE
- POST-EVENT REMORSE and EMOTIONAL DISTRESS
OTHER RISKS in OIF/OEF VETERANS

- DISHONORABLE DISCHARGE
- CRIMINAL CHARGES/INCARCERATION
- UNEMPLOYMENT
- HOMELESSNESS
DID YOU EXPERIENCE ANY OF THE FOLLOWING WHILE SERVING IN THE MILITARY?

- VEHICULAR ACCIDENT (Humvee, Helicopter, Tank)
- CLOSE EXPOSURE to an IED or other EXPLOSION
- MILITARY SEXUAL TRAUMA, involving Injury to the Head

ARE YOU STILL EXPERIENCING PERSISTENT PROBLEMS WITH:

- Reasoning
- Problem Solving
- Hearing Loss
- Ability to Concentrate
- Ringing in the Ears
- Memory
- Finding Words
- Making Decisions
- Personality Changes
- Vision Changes

YOU MAY HAVE SUSTAINED A CONCUSSION or MILD TRAUMATIC BRAIN INJURY (mTBI)

WE CAN HELP
STATEWIDE HEAD INJURY PROGRAM
Massachusetts Rehabilitation Commission
27 Wormwood St. Suite 600
Boston, MA 02210-1616
617-204-3852
Toll Free Number: 1-800-223-2559
Email: shipu@mrc.state.ma.us
Website: http://www.mass.gov/mrc/ship

all photos compliments of www.freemilitaryphotos.com and dvidshub.net
STATEWIDE HEAD INJURY PROGRAM (SHIP) ELIGIBILITY CRITERIA

- MASSACHUSETTS RESIDENT of ANY AGE
- DOCUMENTED HISTORY of TRAUMATIC BRAIN INJURY (TBI)
- COGNITIVE, BEHAVIORAL and/or PHYSICAL IMPAIRMENT(S) RESULTING FROM TBI
- ABILITY to PARTICIPATE IN COMMUNITY-BASED SERVICES
SHIP CONTACT INFORMATION

- ADDRESS: 600 WASHINGTON STREET
  BOSTON, MA 02111
- PHONE: (617) 204-3852
  (800) 223-2559 (Toll Free)
  (617) 204-3817 (TDD)
  (617) 204-3889 (FAX)
- E-MAIL: shipu@mrc.state.ma.us
- WEBSITE: http://www.mass.gov/mrc/ship/
SHIP SERVICES for VETERANS

- Resources and referral information and assistance for veterans and their families/significant others

- Confidential screening for traumatic brain injury (TBI)

- Assistance with completing the eligibility process for SHIP
SHIP SERVICES for VETERANS

- Comprehensive Neuropsychological Evaluation, when indicated
- Assistance with linkages to other programs/services available for veterans with TBI, including disability benefits (e.g., SSI/SSDI), Medicaid, legal counsel, as well as Veterans Administration – funded benefits
SHIP SERVICES for VETERANS

- CASE MANAGEMENT
- TECHNICAL ASSISTANCE and TRAINING
- CLINICAL CONSULTATION (with consent)
Sometimes the real battle starts when they come home.

The Brain Injury Association of MA can help 888-VET-1-TBI
BRAIN INJURY ASSOCIATION of MASSACHUSETTS (BIA-MA)

- ADDRESS: 30 LYMAN STREET WESTBOROUGH, MA 01581
- HOTLINE: 1-800-242-0030
- PHONE: (508) 475-0032
- TTY: (508) 475-0042
- WEBSITE: www.biama.org
- VETERANS: 1-888-VET-1-TBI (1-888-838-1824)