



**Indian Health Service**  
**2012 NATIONAL BEHAVIORAL  
HEALTH CONFERENCE**

**WELCOME**

**TRAUMATIC BRAIN INJURY**

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*Mobilizing Partnerships to Promote Wellness*

# HOUSE KEEPING

- Please be sure to sign in and out on the Sign In Sheets located near the entrance to this room.
- Please complete the evaluation at the end of this presentation.
- For more information on Continuing Education Units (CEUs), please visit the Registration Desk

# COMFORT ROOM

- To promote wellness and self-care, a Comfort Room is available in Atrium Room 8 for your use.
- If you need further assistance, please visit the Indian Health Service Division of Behavioral Health booth.

# **PARTNERSHIPS**

- **MASSACHUSETTS REHABILITATION COMMISSION**
- **HEALTH RESOURCES and SERVICES ADMINISTRATION (HRSA)**

# TRAUMATIC BRAIN INJURY



## EPIDEMIOLOGY

# ACQUIRED BRAIN INJURY (ABI)

**INFECTIOUS**

**NEUROTOXIC**

**METABOLIC**

**TRAUMATIC**

**NEOPLASTIC**

**VASCULAR**

**DEGENERATIVE/DEMENTING**

# EPIDEMIOLOGY of TBI



- **CHILDREN / ADOLESCENTS**
- **YOUNG ADULTS**
- **ELDERLY (  $\geq$  75 YEARS OF AGE)**

# EPIDEMIOLOGY of TBI (SEX RATIOS)



**MALES >> FEMALES**  
**(1.5-2 : 1)**



# 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**

# **EPIDEMIOLOGY of TBI (RISK FACTORS)**



- **NON-USE of PREVENTION STRATEGIES  
(e.g. seatbelt, helmet)**
- **PSYCHIATRIC/BEHAVIORAL DISORDER**
- **PSYCHOSOCIAL/ENVIRONMENTAL FACTORS**
- **SUBSTANCE ABUSE**

# TBI SUBTYPES



- **CLOSED HEAD INJURY**
- **PENETRATING HEAD INJURY**
- **CRUSH INJURY**
- **BLAST INJURY**
- **BIRTH INJURY**

# GLASGOW COMA SCALE

*(Teasdale & Jennett, 1974)*

- **MOTOR RESPONSE**
- **VERBAL RESPONSE**
- **EYE OPENING RESPONSE**

# GLASGOW COMA SCALE

**≤ 8 = SEVERE TBI**

**9 -12 = MODERATE TBI**

**13 -15 = MILD TBI**

# 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

# **NATIVE AMERICANS and INJURIES**



**Injuries are Leading  
Cause of Death  
Ages 1 – 44 years**

**Centers for Disease  
Control and Prevention,  
2003**



# TBI and AMERICAN INDIAN/ALASKAN NATIVES

- **HIGHEST ANNUAL AVERAGE TBI-RELATED DEATH RATES**
- **HIGHEST RATE of MV-RELATED TBI DEATHS**
- **67.5% of FIREARM-RELATED TBI DEATHS DUE to SUICIDE, with HIGHEST RISK on AI/AN MALES 15-34 YEARS**


CDC  
Surveillance for TBI  
May, 2011

# 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**

# NEURODIAGNOSTIC FINDINGS



- **GLASGOW COMA SCALE: 13-15**
- **CT/MRI FINDINGS TYPICALLY NEGATIVE**
- **EEG USUALLY NORMAL**
- **NEUROPSYCHOLOGICAL TEST RESULTS WNL**

# **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**





**IN MEMORIAM**

**DAVE DUERSON**

**November 28, 1960 - February 17, 2011**

PLEASE!

SEE THAT MY DRAIN IS  
GIVEN TO THE NFL'S BRAIN BANK



ATHLETIC COMMUNICATIONS UNIV. OF PENN.

Owen Thomas (age 21)  
University of Pennsylvania

# 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**



**Brain sections**

**Tau**

# CHRIS BENOIT

CANADIAN CRIPPLER



CHRIS BENOIT.....

# THE RABID

# WOLVERINE

CRIPPLER CROSSFACE.....

# 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**





Nathan Stiles (age 17)

# TRAUMATIC BRAIN INJURY



**MODERATE/SEVERE INJURY**

# PATHOPHYSIOLOGY of TBI



- **LOC/COMA**
- **COUP AND CONTRECOUP CONTUSIONS**
- **FRONTOTEMPORAL CONTUSIONS**

# PATHOPHYSIOLOGY of TBI

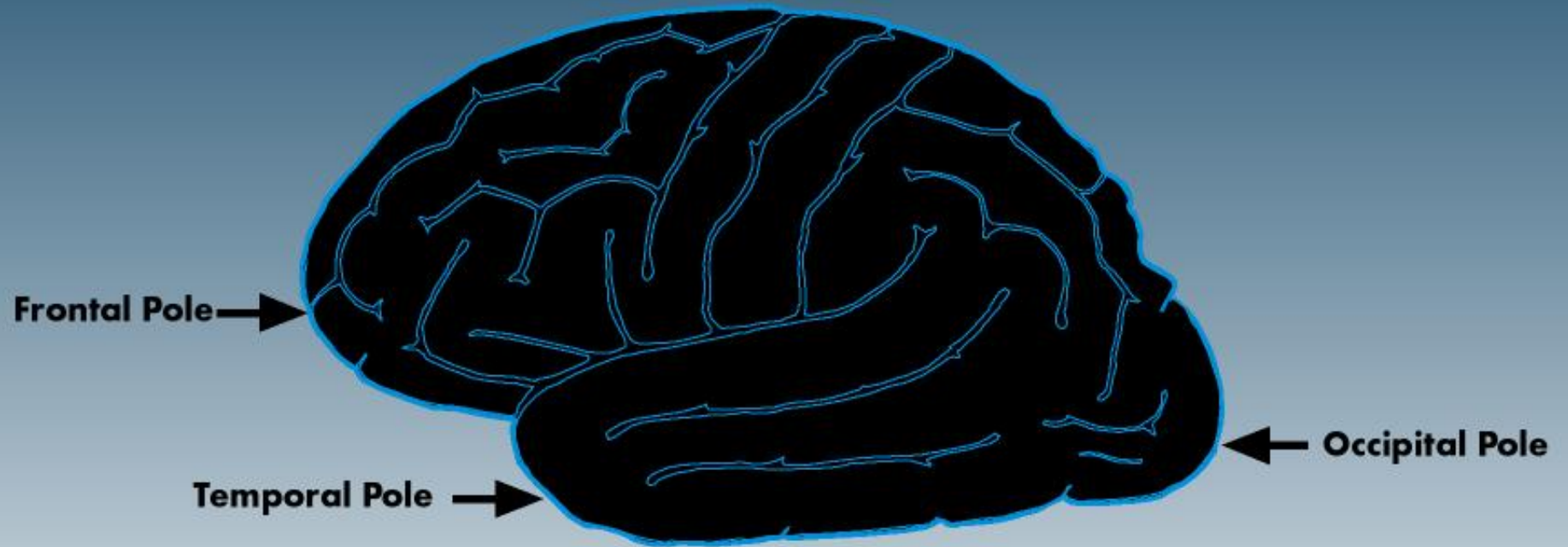
COUP INJURY

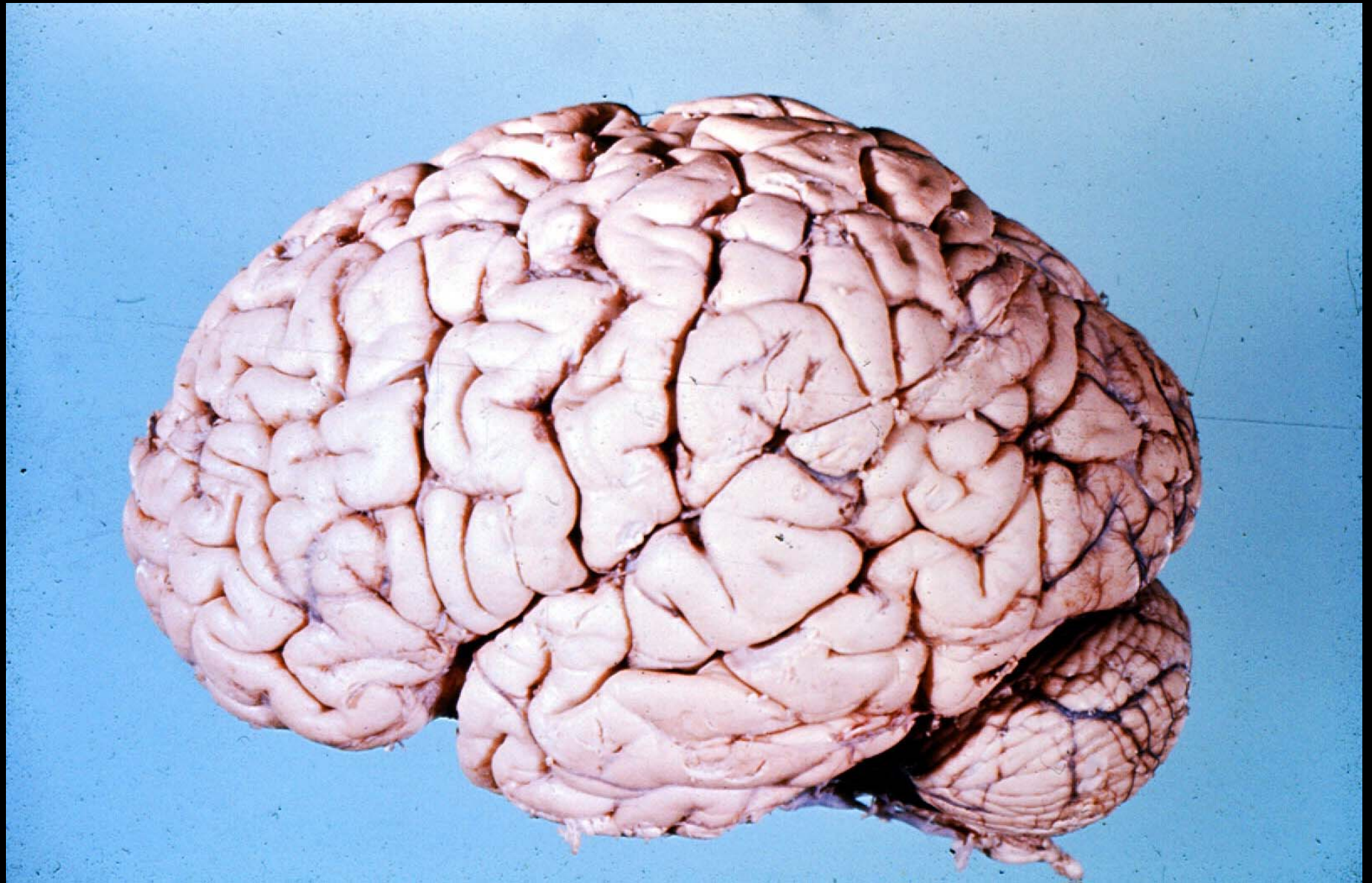


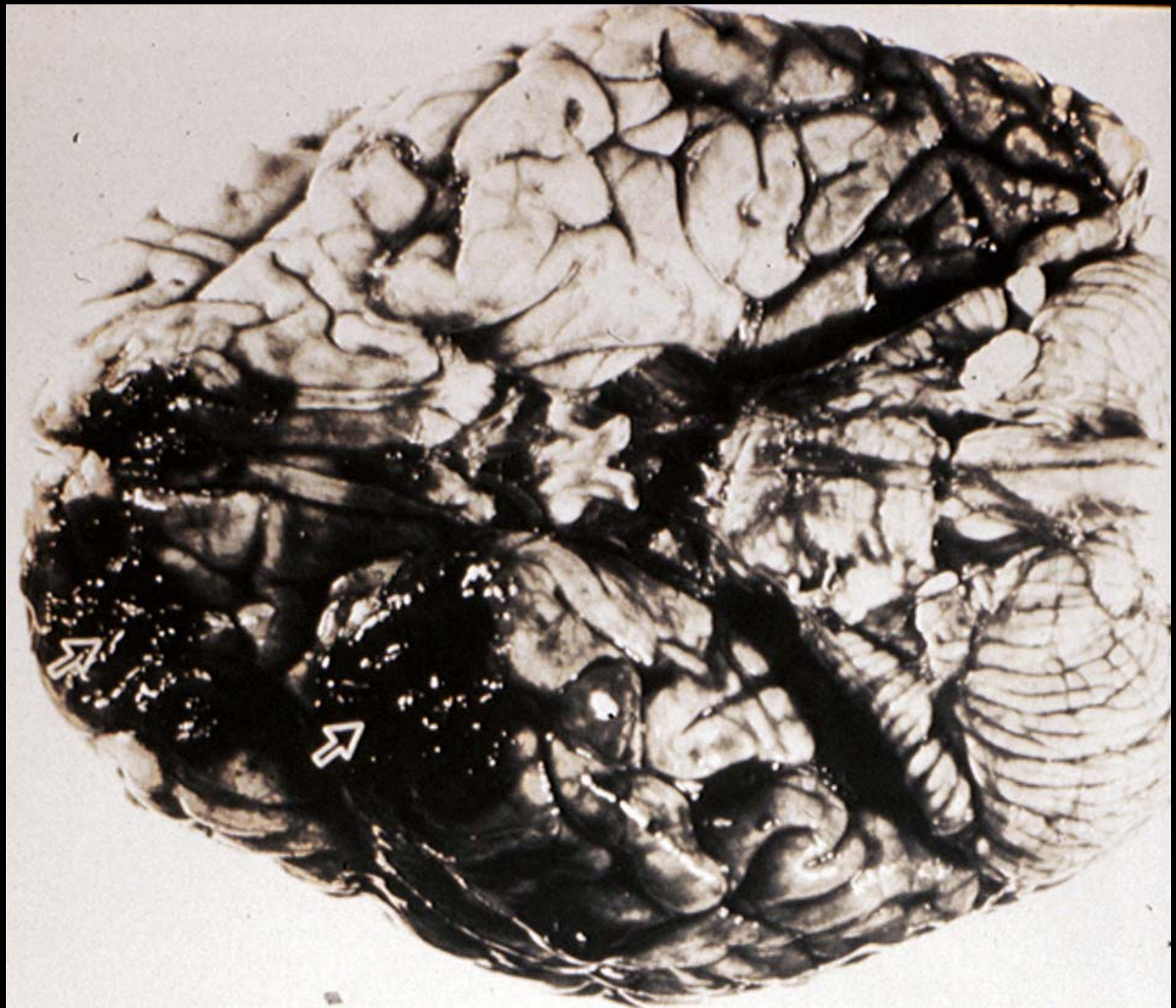
CONTRECOUP  
INJURY



# CEREBRAL CONTUSIONS and TBI







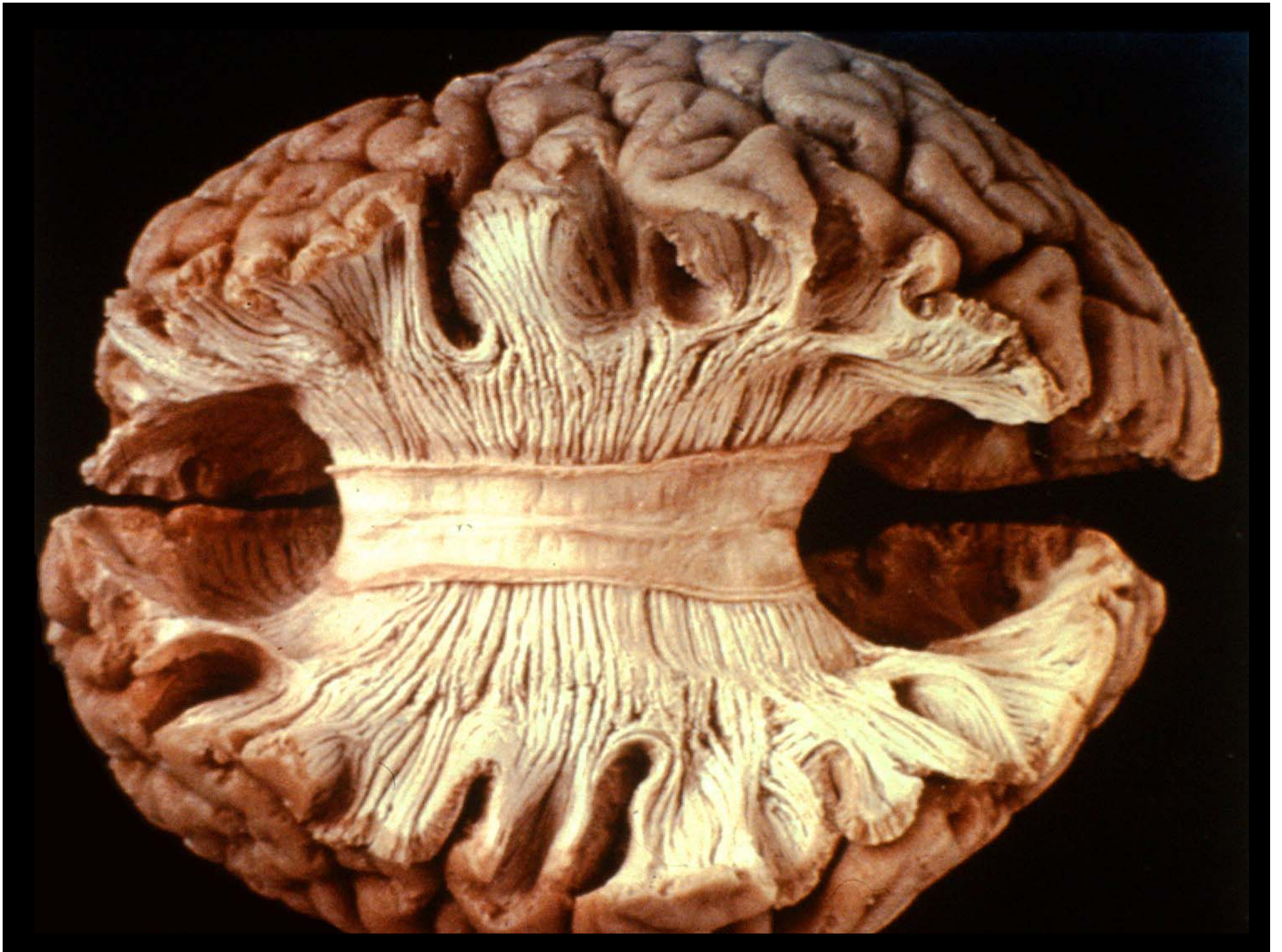
# PATHOPHYSIOLOGY of TBI



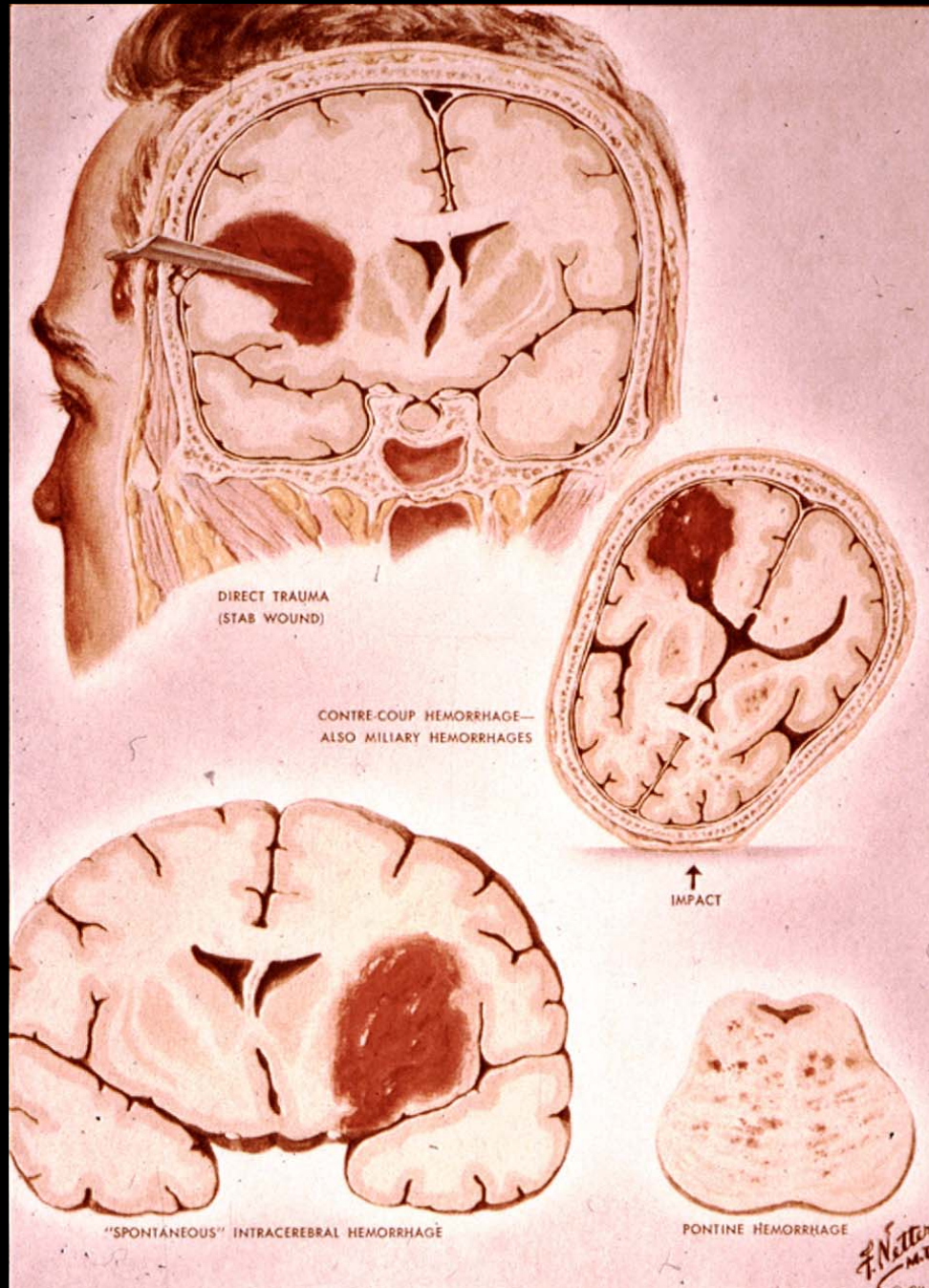
- **CEREBRAL EDEMA**
- **COMPRESSION and HERNIATION**
- **DIFFUSE AXONAL INJURY (DAI)**











DIRECT TRAUMA  
(STAB WOUND)

CONTRE-COUP HEMORRHAGE—  
ALSO MILIARY HEMORRHAGES

↑  
IMPACT

"SPONTANEOUS" INTRACEREBRAL HEMORRHAGE

PONTINE HEMORRHAGE

*F. Netter*  
M.D.

# ACUTE COMPLICATIONS of TBI



- **CARDIOPULMONARY ARREST**
- **SKULL FRACTURE**
- **HEMORRHAGE/HEMATOMA**
  - **Epidural**
  - **Subdural**
  - **Intracerebral**
- **HYDROCEPHALUS**

# ACUTE COMPLICATIONS of TBI




- **SYSTEMIC COMPROMISE (e.g., shock)**
- **INFECTION**
- **ENDOCRINOPATHY**
- **POST-TRAUMATIC SEIZURES**



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**



# PREVALENCE of MENTAL CONDITION and TBI OIF/OEF VETERANS (N= 1.64 million)



- **300,000 PTSD or MAJOR DEPRESSION**
- **320,000 PROBABLE TBI**

As of October, 2007  
Rand Report  
Center for Military Health  
Policy Research

# 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.

# 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



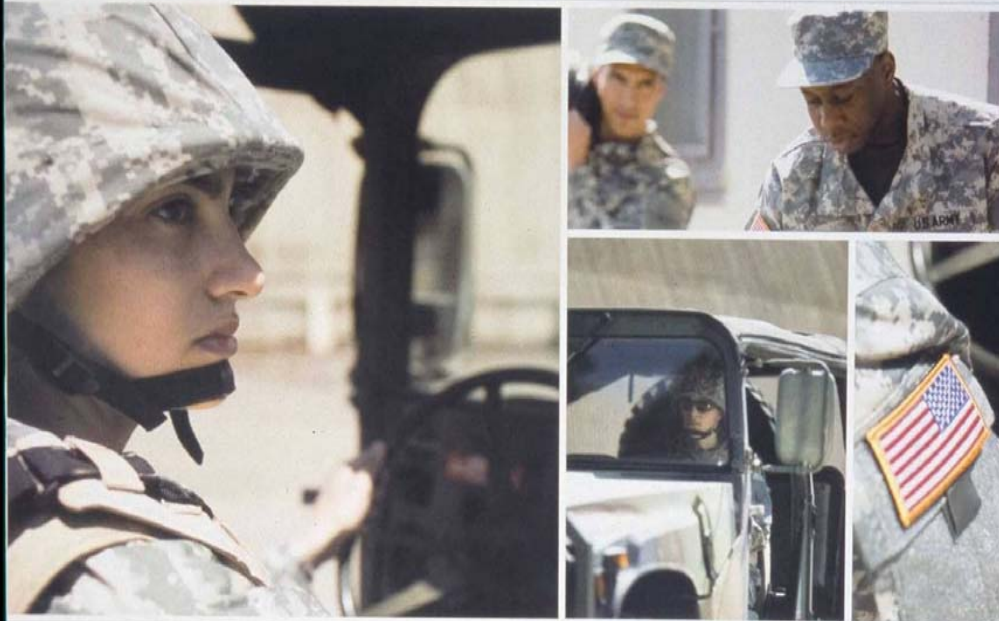
- **INJURIES NECESSITATING AMPUTATION (LOWER EXTREMITIES – MOST COMMON)**
- **ASPHYXIA and RESIDUAL PULMONARY DISORDER**
- **BURNS of VARYING SEVERITY**
- **SEIZURE DISORDER**
- **NEUROTOXIC INJURY**
- **CARDIOMYOPATHY**

# KILLED – to – WOUNDED RATIOS



- **VIETNAM** **1: 2.6**
- **DESERT STORM/DESERT SHIELD** **1: 1.2**
- **IRAQ/AFGHANISTAN** **1: 16**

# 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.



# FEMALE VETERANS SERVED by VA HEALTH SERVICE



**1/3 Experienced Rape/Attempted Rape  
during Military Service**

- **37% Multiple Rapes**
- **14% Gang-Raped**



# **DOD SEXUAL ASSAULT PREVENTION and RESPONSE PROGRAM**



- **Established in 2005**
- **Provides for Confidential, “Restricted Reports”**
- **Increase in Reported Assaults = 40%**

# COMORBIDITY in OIF/OEF VETERANS

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

WOMEN VETERANS HEALTH CARE



Nearly **one-third**  
of the adult  
**homeless**  
population has  
served their country in the  
Armed Services.

**SHE SERVED**

DOESN'T SHE DESERVE BETTER?

# **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:**

- |                                 |                              |
|---------------------------------|------------------------------|
| ★ <b>Reasoning</b>              | ★ <b>Memory</b>              |
| ★ <b>Problem Solving</b>        | ★ <b>Finding Words</b>       |
| ★ <b>Hearing Loss</b>           | ★ <b>Making Decisions</b>    |
| ★ <b>Ability to Concentrate</b> | ★ <b>Personality Changes</b> |
| ★ <b>Ringing in the Ears</b>    | ★ <b>Vision Changes</b>      |

**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  
or Toll Free Number: 1-800-223-2559

Email: [shipu@mrc.state.ma.us](mailto:shipu@mrc.state.ma.us)  
Website: <http://www.mass.gov/mrc/ship>



All photos compliments of www.freemilitaryphotos.com and davidshub.net



**LONG-TERM SEQUELAE  
of  
TRAUMATIC BRAIN INJURY**

# TBI: POST-ACUTE SEQUELAE



- **PHYSICAL DISABILITY**
- **SENSORY IMPAIRMENT**
- **NEUROCOGNITIVE DEFICITS**
- **NEUROBEHAVIORAL/PSYCHIATRIC DISORDER**

# **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**

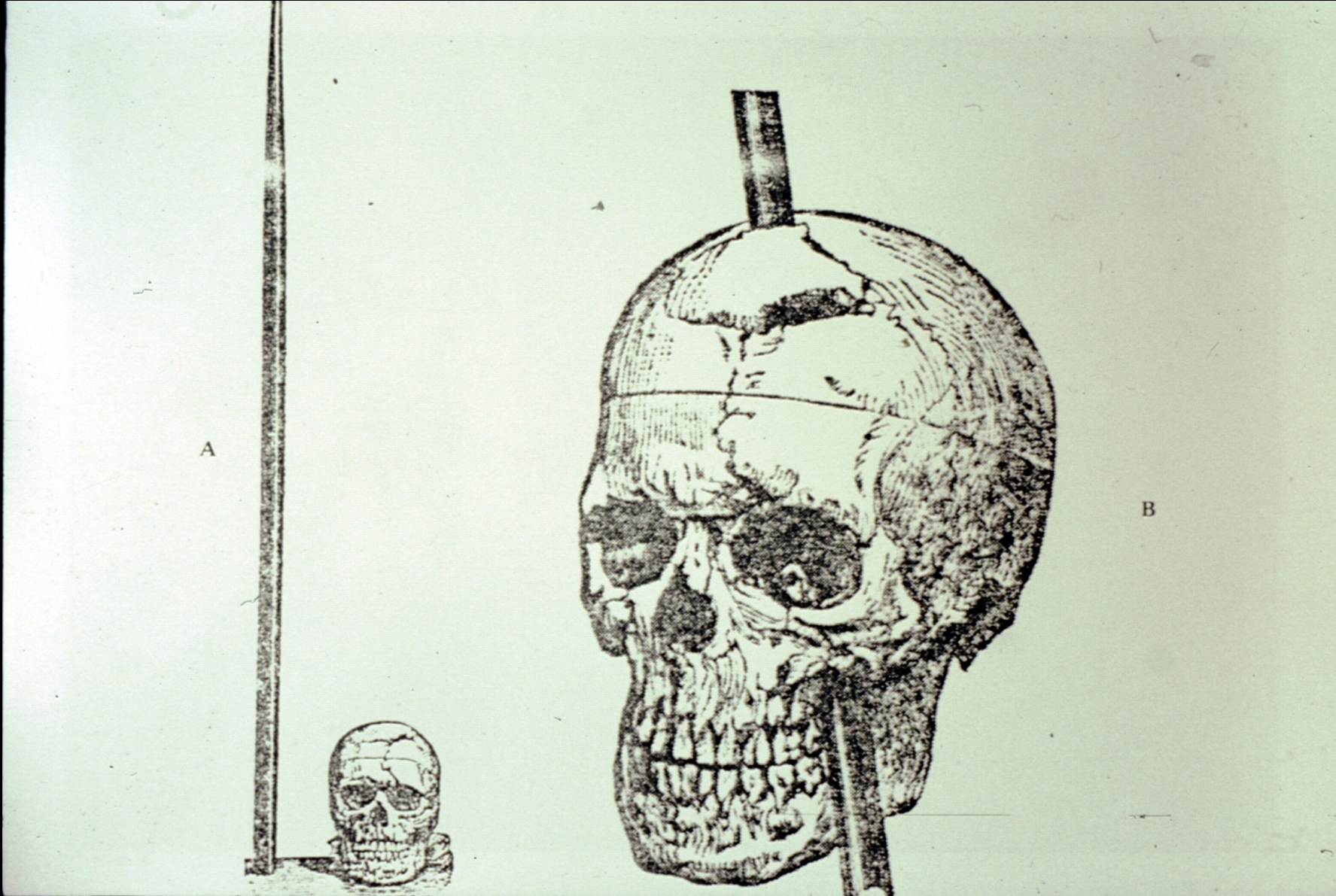


- **Cognitive inflexibility, evidenced in perseveration and limited capacity to generate alternative strategies/integrate feedback**
- **Limited capacity for insight and reasoning**
- **Diminished capacity for recognizing or anticipating the consequences of one's own behavior**

# NEUROBEHAVIORAL CONSEQUENCES of TBI



- **DEPRESSION**
- **PERSONALITY CHANGE**



A

B

# CASE of PHINEAS GAGE

(September 13, 1848)

- **PREMORBID PERSONALITY**  
“Efficient, well balanced, energetic, shrewd”
- **POST-INJURY**
  - Loss of the “balance between his intellectual faculties and animal propensities”
  - “Impatient of restraint or advice, when it conflicts with his desires”
  - “At times obstinate, yet capricious and vacillating-devising many plans of future operations which are no sooner arranged then are abandoned in turn for others appearing more feasible”
- “No longer Gage”

John Martyn Harlow, M.D.

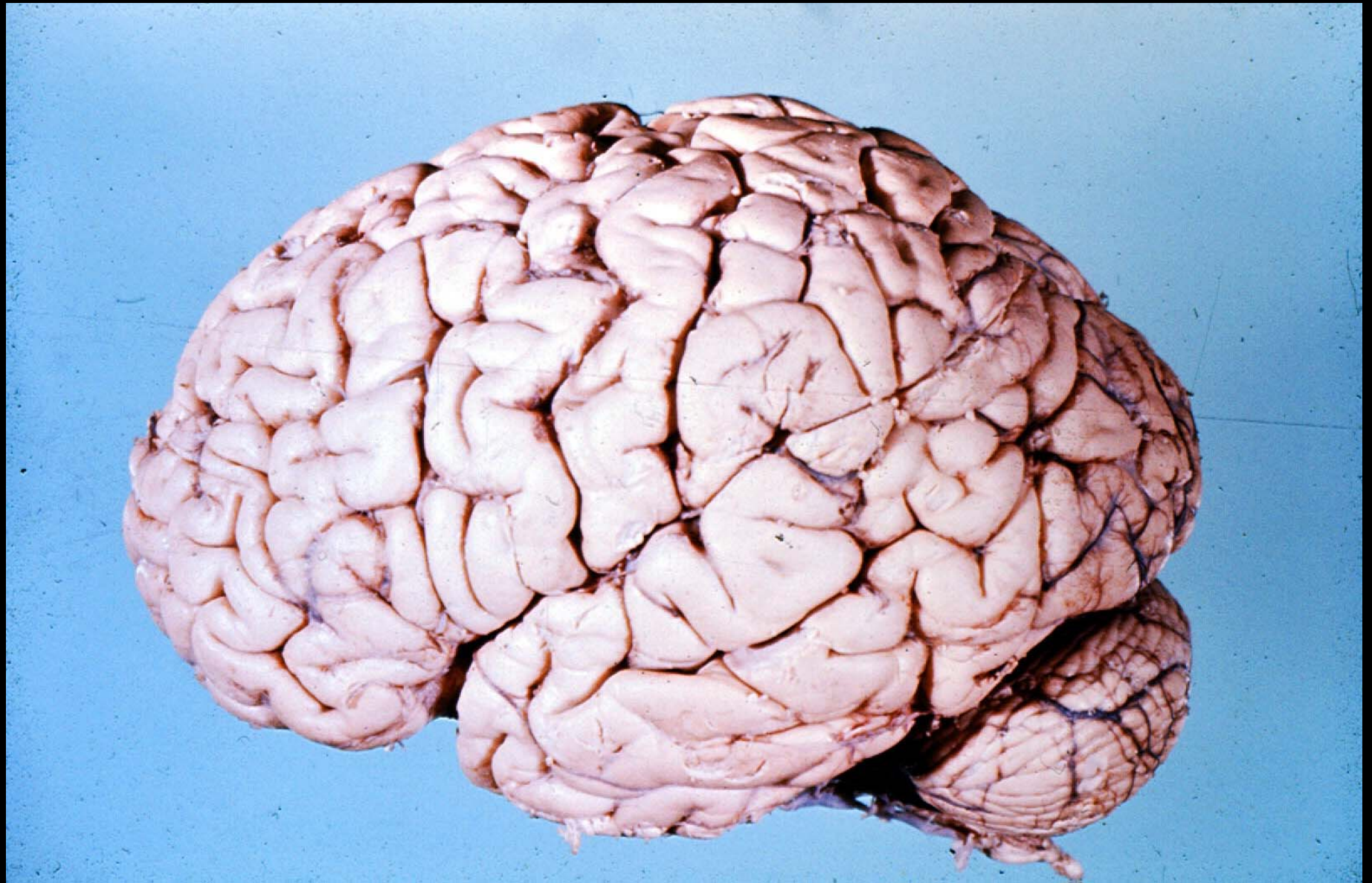


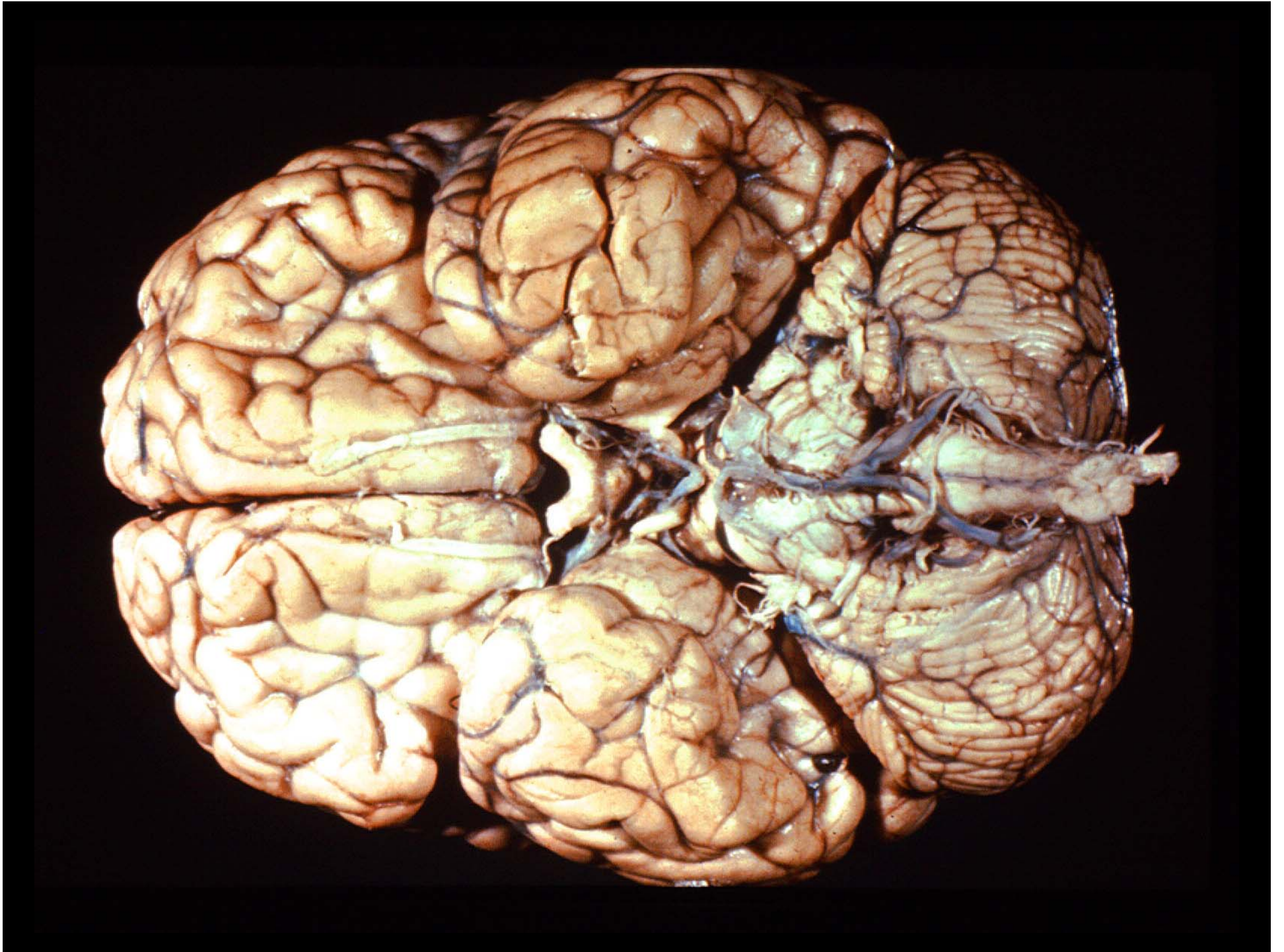


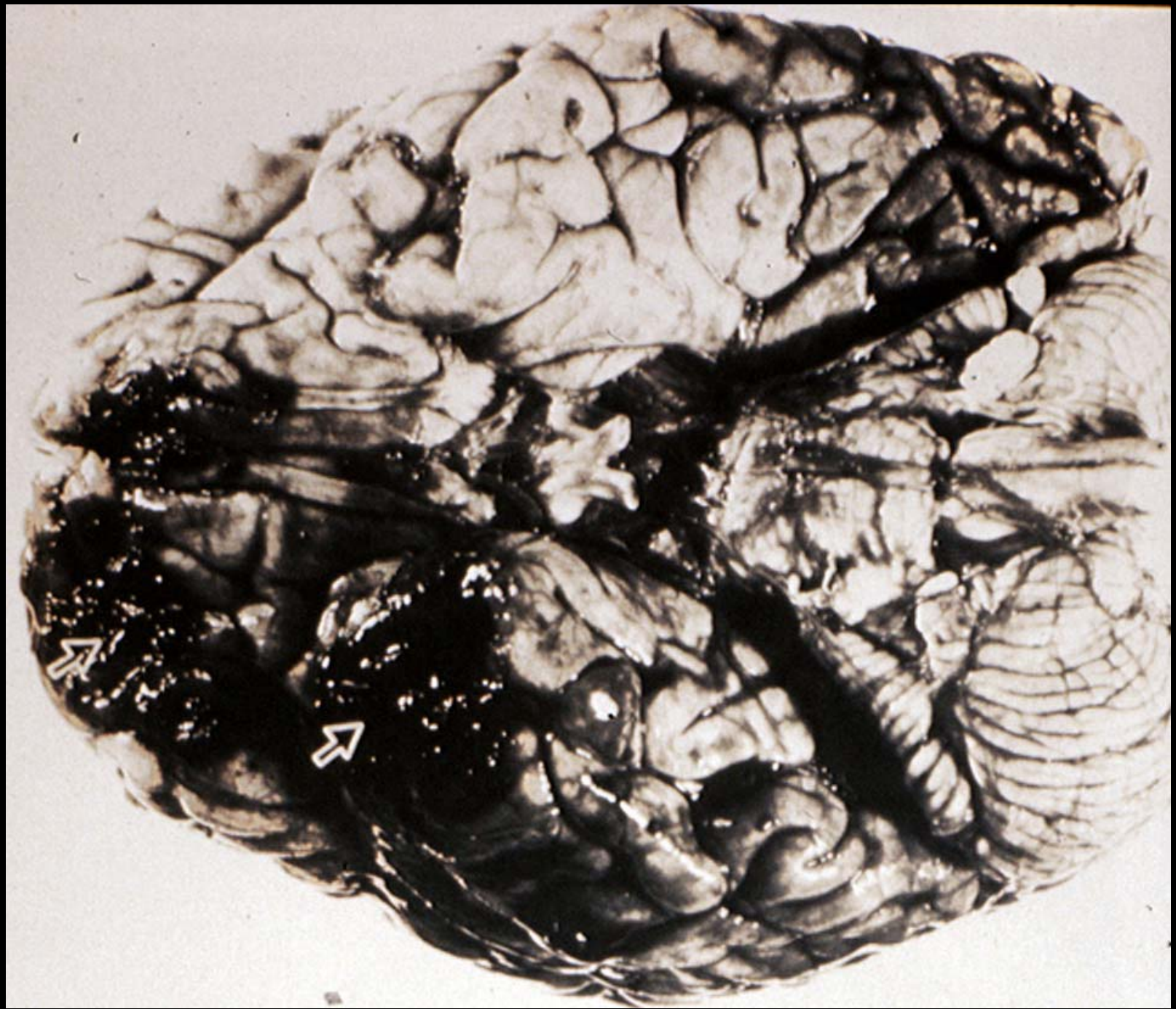
# **NEUROBEHAVIORAL CONSEQUENCES of TBI DORSOLATERAL PFC SYNDROME**



- **EXECUTIVE SKILL DEFICITS**
- **IMPAIRMENT OF WORKING MEMORY**
- **FLAT AFFECT/PSEUDODEPRESSION**
- **STIMULUS-BOUND BEHAVIOR**







# **NEUROBEHAVIORAL CONSEQUENCES of TBI ORBITOFRONTAL PFC SYNDROME**



- **RELATIVELY PRESERVED NEUROCOGNITIVE SKILLS**
- **IMPAIRED SOCIAL SKILLS/PSEUDOSOCIOPATHY**
- **DISINHIBITION/EMOTIONAL DYSREGULATION**
- **HYPOMANIA-MANIA/PSEUDOPSYCHOPATHY**

# 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**

# **SUICIDE RISK in TBI SURVIVORS**



**↑ RISK of MAJOR DEPRESSION, ASSOCIATED WITH DISINHIBITION**

**↑ RISK of SUICIDE ATTEMPTS**

- **Prior to TBI**
- **Years after TBI**
- **Associated with Premorbid History of Aggression**

# **SUICIDE RISK in TBI SURVIVORS**



- **CHRONIC FEELINGS of HOPELESSNESS**
- **SOCIAL INSOLATION**
- **BELIEF that LIFE is not WORTH LIVING**



# MANAGING ACUTE SUICIDAL/HOMICIDAL RISK



- **NECESSITATES IMMEDIATE ASSESSMENT** by a **QUALIFIED/LICENSED MENTAL HEALTH CLINICIAN**
- **DETERMINE NEED** for **ACUTE PSYCHIATRIC HOSPITALIZATION (VOLUNTARY or INVOLUNTARY)**
- **PRIMARY GOALS** for **INDIVIDUAL** are to **ENSURE SAFETY** and **FACILITATE STABILIZATION**
- **ENSURE SAFETY** of **OTHERS** or **SPECIFIED INTENDED VICTIMS**

# CHALLENGES RE: ACCESSING MENTAL HEALTH SERVICES



- **EXAMINER INEXPERIENCED in EVALUATING PERSONS WITH ABI**
- **PRESENTATION in ER is PERCEIVED to be in CONFLICT with REPORTED CONCERNS REGARDING BEHAVIOR**
- **PRESUMPTION of COMPETENCY and ABILITY to CONTRACT for SAFETY**

# CHALLENGES RE: ACCESSING MENTAL HEALTH SERVICES



- **PRESUMPTION that INDIVIDUAL is LESS/NOT at RISK BECAUSE of MOTOR, NEUROCOGNITIVE or OTHER DEFICITS**
- **INABILITY/REFUSAL of PSYCHIATRIC HOSPITAL/FACILITY to ACCOMMODATE INDIVIDUAL IN MILIEU (e.g., physical care needs, neurocognitive impairments, etc.)**
- **CONCERNS RE: DISCHARGE and DISPOSITION (e.g., post-discharge placement options, homelessness, etc.)**

# ASSESSMENTS TO CONSIDER



- **NEUROPSYCHOLOGICAL EVALUATION**  
(e.g., assessment of neurocognitive impairments which may compromise functioning and treatment goals/objectives)
- **NEUROPSYCHIATRIC ASSESSMENT** (e.g., mental status changes, medication questions)
- **NEUROLOGICAL ASSESSMENT** (e.g., R/O seizures; neurodiagnostic testing; evaluation of shunt status)

# CRISIS HOTLINE NUMBERS



**Suicide Prevention Lifeline Number:**

**1-800-273-TALK (8255)**

**National Domestic Violence Hotline:**

**1-800-799-SAFE (7233) or TTY 1-800-787-3224**

**National Child Abuse Hotline: 1-800-4-A-CHILD**

**Sexual Assault Hotline: 1-800-262-9800**

**Veterans Crisis Line: 1-800-273-8255 (PRESS 1)**

# **BRAIN INJURY ASSOCIATION of AMERICA**



**TO FIND BIA IN YOUR STATE:**

**[www.biausa.org/state-affiliates.htm](http://www.biausa.org/state-affiliates.htm)**

**NATIONAL ASSOCIATION of STATE HEAD  
INJURY ADMINISTRATORS**



**NASHIA  
PO BOX 878  
WAITSFIELD, VERMONT 05673**

**PHONE: 802-498-3349  
[www.nashia.org](http://www.nashia.org)**

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