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Friday, June 9, 2017

(Room 11)

16:30 - 17:25 WS#71: Concussion - Clinical Considerations, Cares and Controversies
17:35 - 18:30 WS#83: Concussion - Clinical Considerations, Cares and Controversies
(Repeated)

What's new in Traumatic Brain Injury Clinical consideration, cares and , Controversies ,

Dr Peter Stormer
August 2008

- ▶ Traumatic brain injury (TBI) is a leading cause of death and disability
- ▶ Projected to become the third largest cause of global disease burden by 2020
- ▶ Significant impact on the injured person, their family/whānau and society
- ▶ Previous population-based methodologies have failed to capture the total incidence of TBI
- ▶ A new approach is needed to obtain accurate incidence data

- ▶ “MTBI is an acute brain injury resulting from mechanical energy to the head from external physical forces. Operational criteria for clinical identification include: (i) 1 or more of the following: confusion or disorientation, loss of consciousness for 30 minutes or less, post-traumatic amnesia for less than 24 hours, and/or other transient neurological abnormalities such as focal signs, seizure, and intracranial lesion not requiring surgery; (ii) Glasgow Coma Scale score of 13-15 after 30 minutes post-injury or later upon presentation for healthcare. These manifestations of MTBI must not be due to drugs, alcohol, medications, caused by other injuries or treatment for other injuries (e.g. systemic injuries, facial injuries or intubation), caused by other problems (e.g. psychological trauma, language barrier or coexisting medical conditions) or caused by penetrating craniocerebral injury” (page 115; 8)
- ▶ **Complicated**

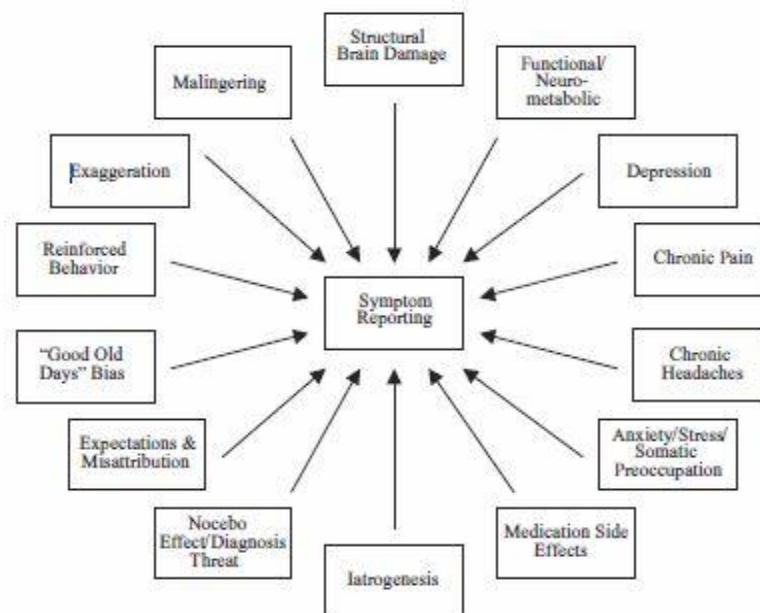
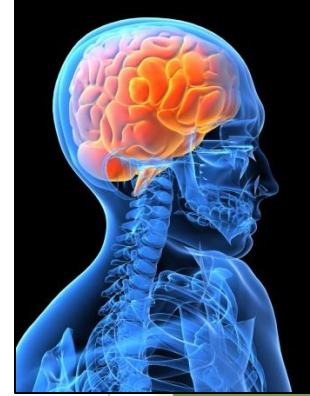


FIGURE 23-4

Possible factors influencing symptom reporting acutely, post-acutely, and long after a mild traumatic brain injury

Defining TBI



- ▶ TBI was defined according to World Health Organization (WHO) criteria as:
‘an acute brain injury resulting from mechanical energy to the head from external physical forces’

DEFINITIONS

SEVERITY OF TBI	GLASGOW COMA SCALE	POST TRAUMATIC AMNESIA
MILD	13-15	<24HOURS
MODERATE	9-12	1-6 DAYS
SEVERE	3-8	>7DAYS

Brain injury pathology ...

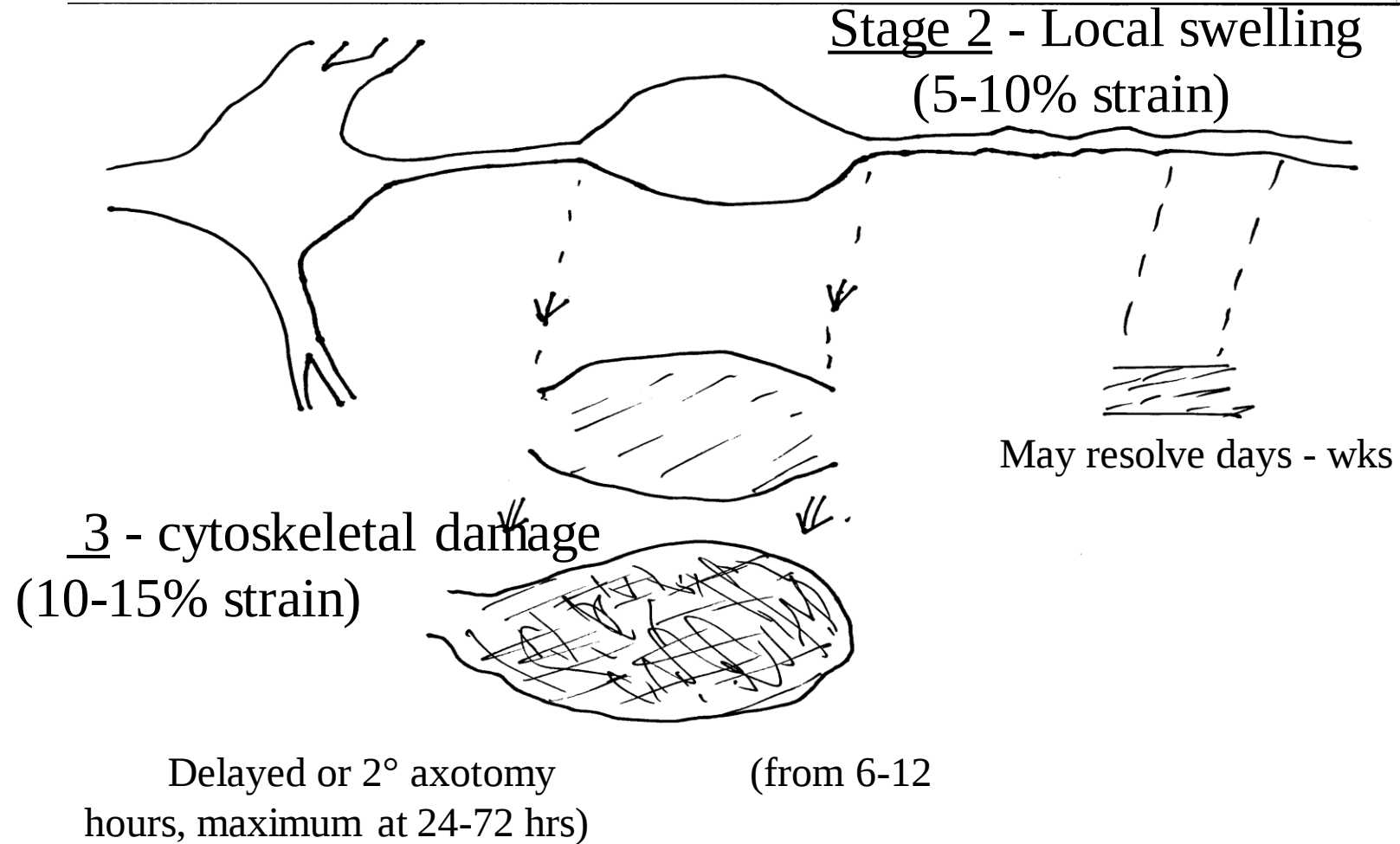
- ▶ **Focal injury – may be seen on CT/ MRI**
 - ▶ usually from contact between cerebral tissue & inner skull
 - ▶ contusion / haemorrhage (SDH, EDH, SAH) / infarct
 - ▶ defined, localised, relatively homogenous

- ▶ **Diffuse injury – mostly invisible on std CT/MRI**
 - ▶ non-homogenous, can be localised or widespread
 - ▶ reflects acceleration / deceleration / rotation loading within brain
 - ▶ veins rupture when focal b.v. stretch > 50% length ▲
 - ▶ axons shear when focal axon stretch > 20% stretch ▲

(1° or Stage IV axotomy)

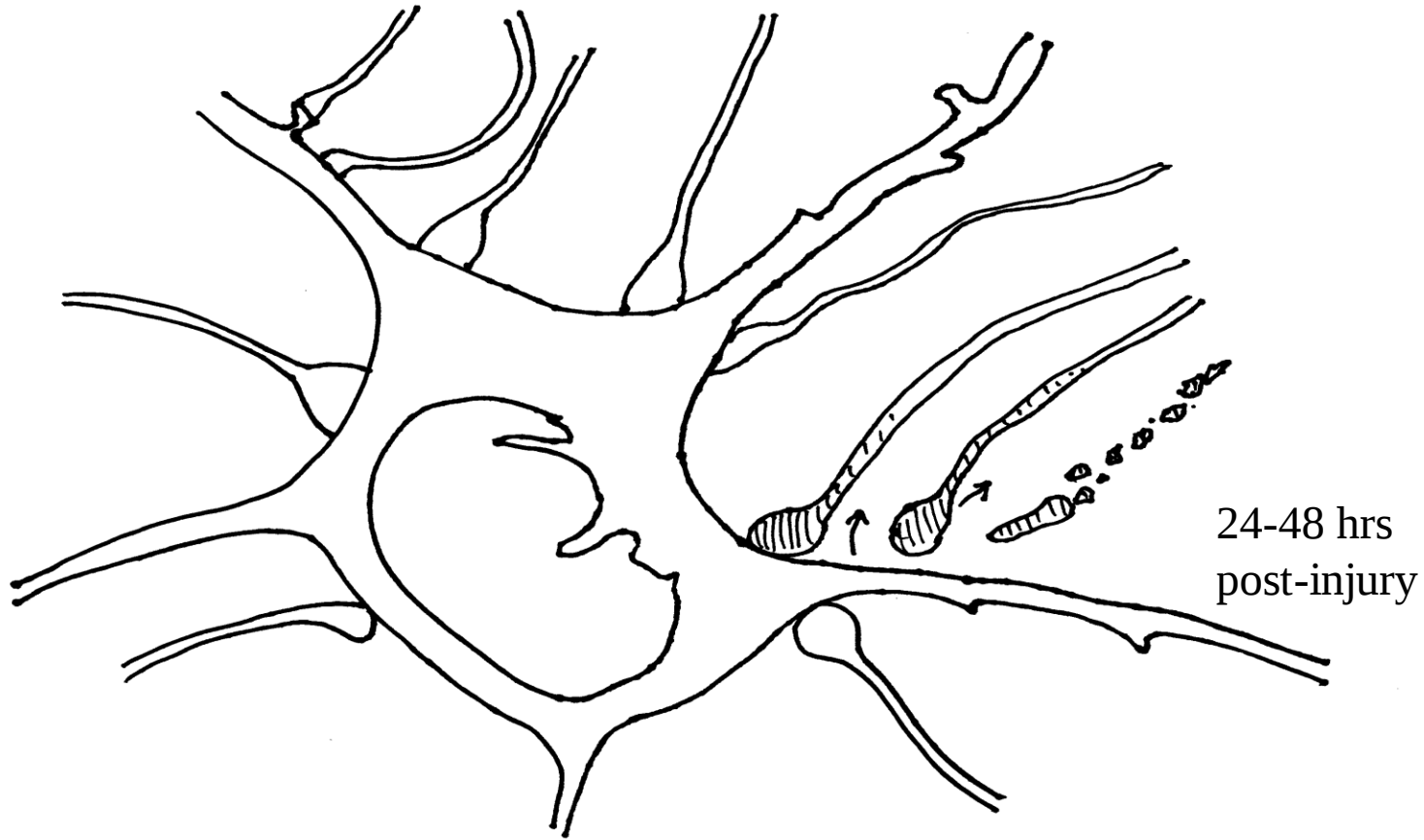
shear & tensile

Stage II & III axon injury occurs at 5-15% axon stretch



Other Stage III axon injury -

Even if axon structure persists, deafferentation may occur



CT / MRI Scans

Barry Jordon

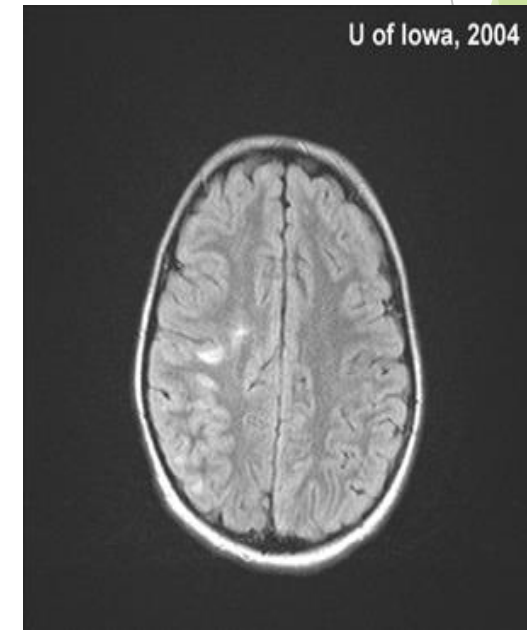
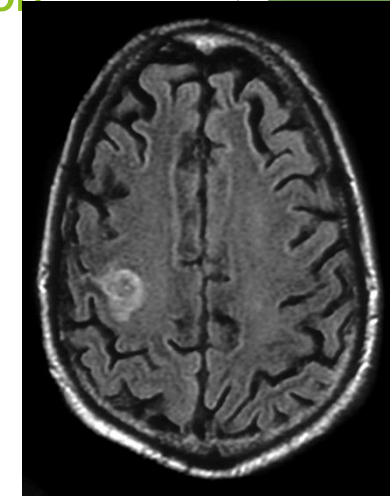
► Computer Tomography (CT)

- normal in most MTBI but

useful to exclude ICB

► Magnetic Resonance Imaging (MRI)

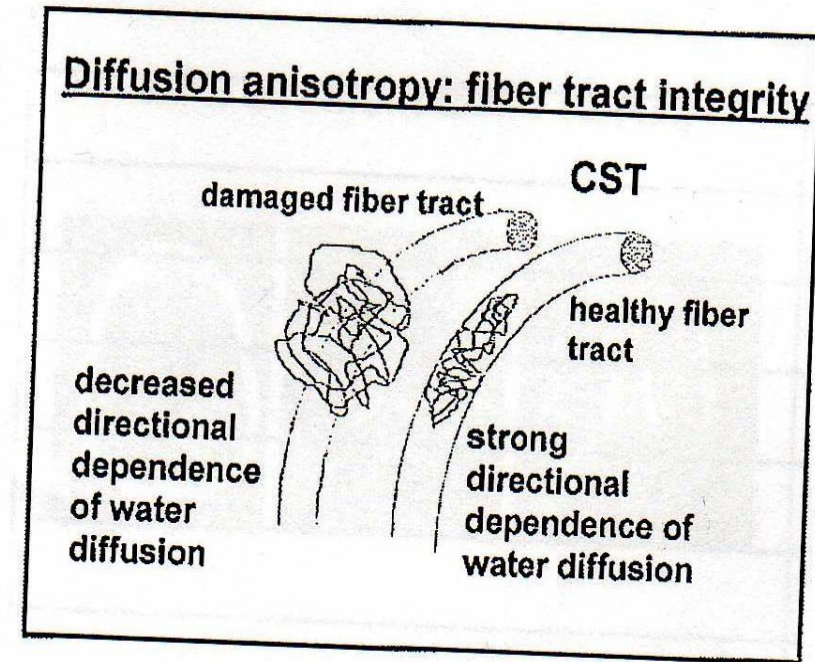
- superior to CT, especially if
gradient echo (GRE) included



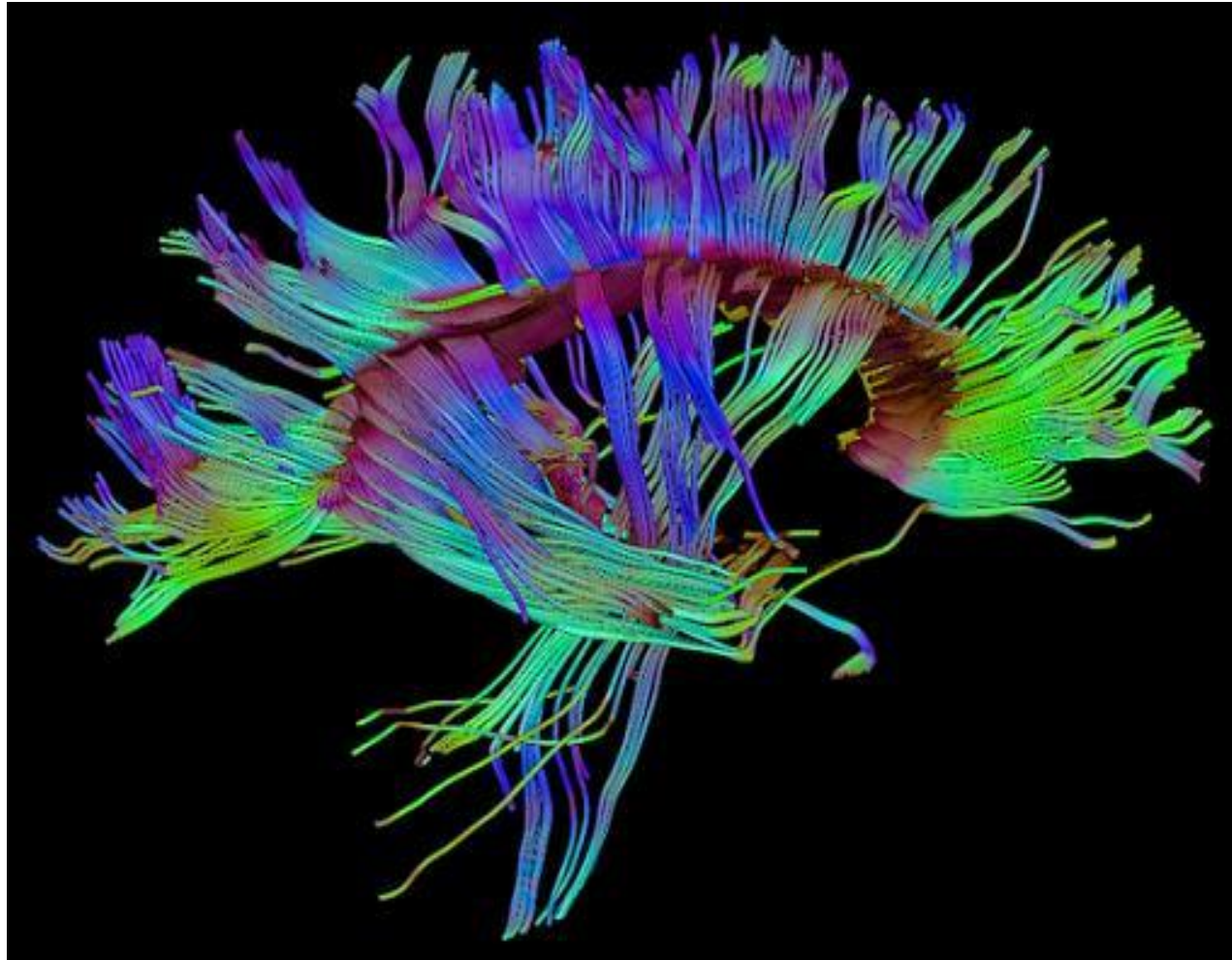
Diffusion Tensor

Imaging

- ▶ Senses directionality of
- ▶ Maps white matter tracts
- ▶ Assesses myelination in vivo
- ▶ Demonstrates connectivity & connectivity
- ▶ Tool of choice for DAI in mild TBI?
- ▶ Detects structural anomaly missed by routine imaging
- ▶ Sensitive to DAI but not outcome?



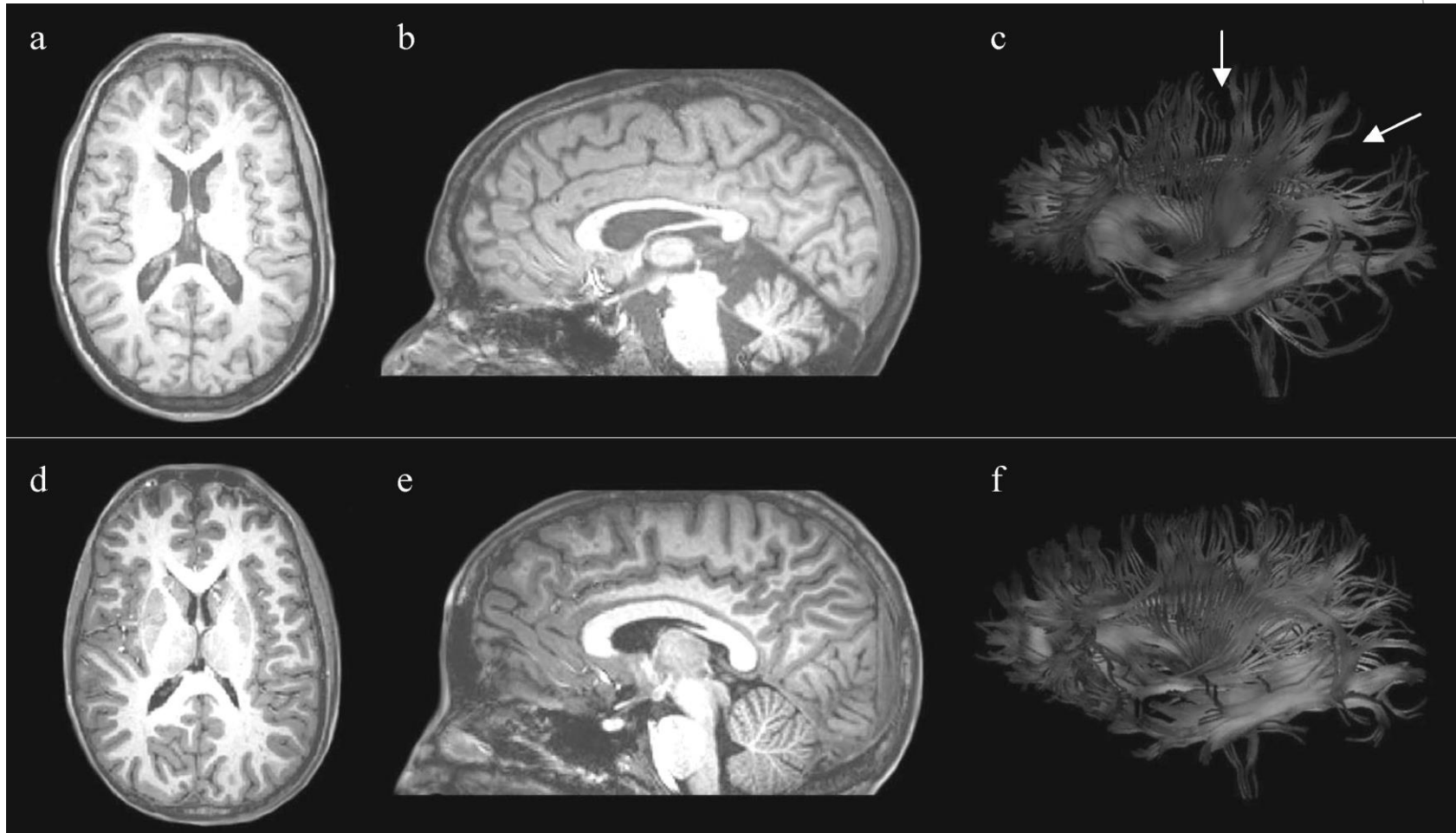
3 D tractography



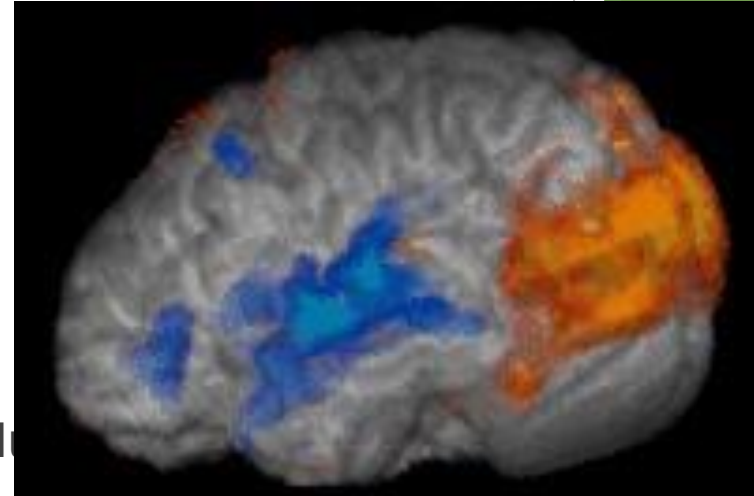
DTI - child with TBI (a-c) cf age-matched OI (d-e)

J Head Trauma Rehab 23; 4

Levin et al (2008)



Functional MRI (fMRI)



- ▶ Maps brain activity during task (CBF or glucose metabolism)
 - ▶ Single Photon Emission Comput. Tomography (SPECT)
 - uses photon emitting radioisotopes to measure CBF
 - ▶ Positron Emission Tomography (PET) - uses positron emitting isotopes to measure gluc. metab.
- ▶ SPECT & PET – demonstrate abnormalities (primarily in fronto-temporal lobes) when CT and MRI are normal BUT also may be positive in somatoform disorders

Many TBI trials have disappointed...Why?

John Povlishock

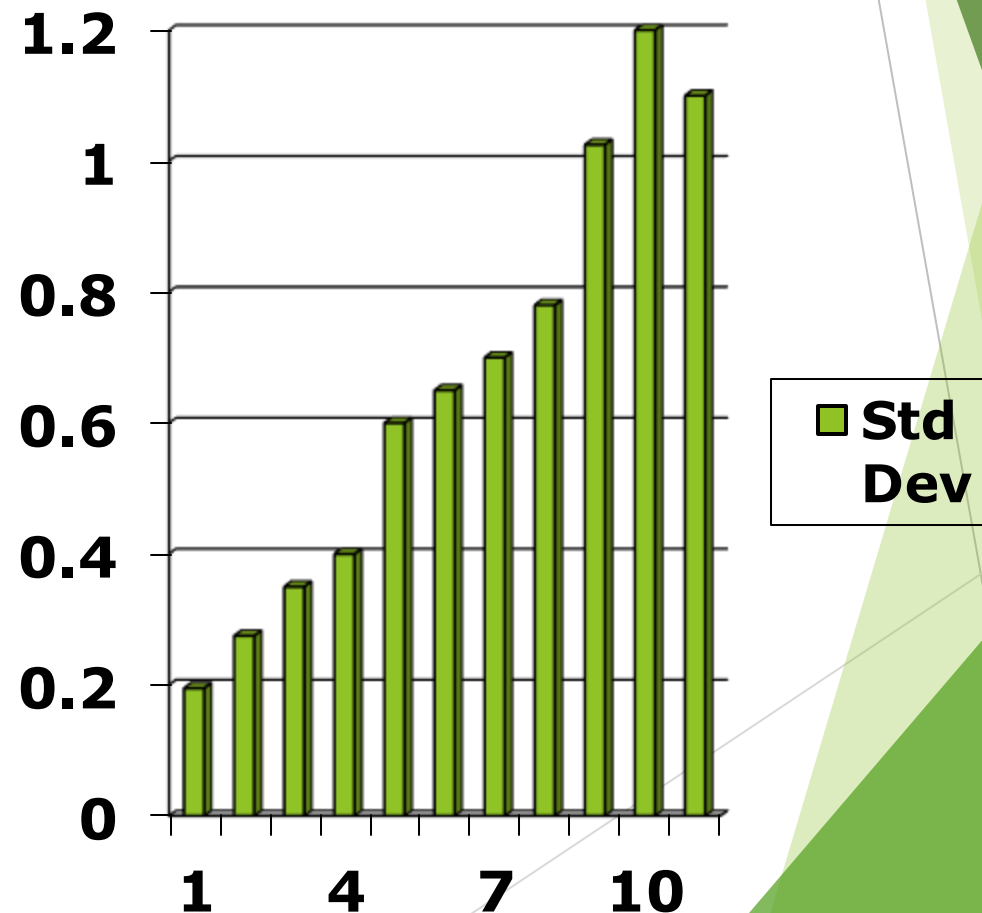
- ▶ Too simplistic injury classification? - really several overlapping diseases ? (contusion / infarction / DAI / ICB / SAH / SDH)
- ▶ Insufficient specificity & resolution in assessments ?
- ▶ Lack of detailed post-mortem studies for MTBI?
 - ▶ Perception that morbidity demands macroscopic path?
 - ▶ Perception that without positive imaging injury dubious?
- ▶ Animal models too reductionist ?
 - ▶ in vitro, or don't address DAI – rodent models
- ▶

Effect sizes on memory functioning

2008)

(Iverson, IBIA

1. MTBI
2. Cannabis
3. Benzodiaz. withdrawal
4. Depression - OP
5. Systemic Ca Tx
6. Chronic benzod.
7. Ecstasy
8. Depression - IP
9. MCI - early dementia
10. Schizophrenia
11. Exaggeration / Maling.



Concussion

- ▶ Physical - headaches, abnormal sleep, fatigue, vertigo/dizziness, tinnitus, noise and light sensitivity, blurred vision, nausea
- ▶ Cognitive - short term memory problems, attention/concentration problems, word finding difficulty, processing and organisation difficulties
- ▶ Emotional - mood lability, depression, anxiety

Kids More evidence is important.....

age

- ▶ MTBI Follow-up after 23 years (Norway, Erik Hessen)
- ▶ children had poorer neuro-psychological and behavioural function outcomes than adults
- ▶ greater vulnerability of the younger brain, even after a mild insult
- ▶ greater need to monitor children after MTBI
- ▶ attention, learning and memory risk may be particularly at

Progression of symptoms

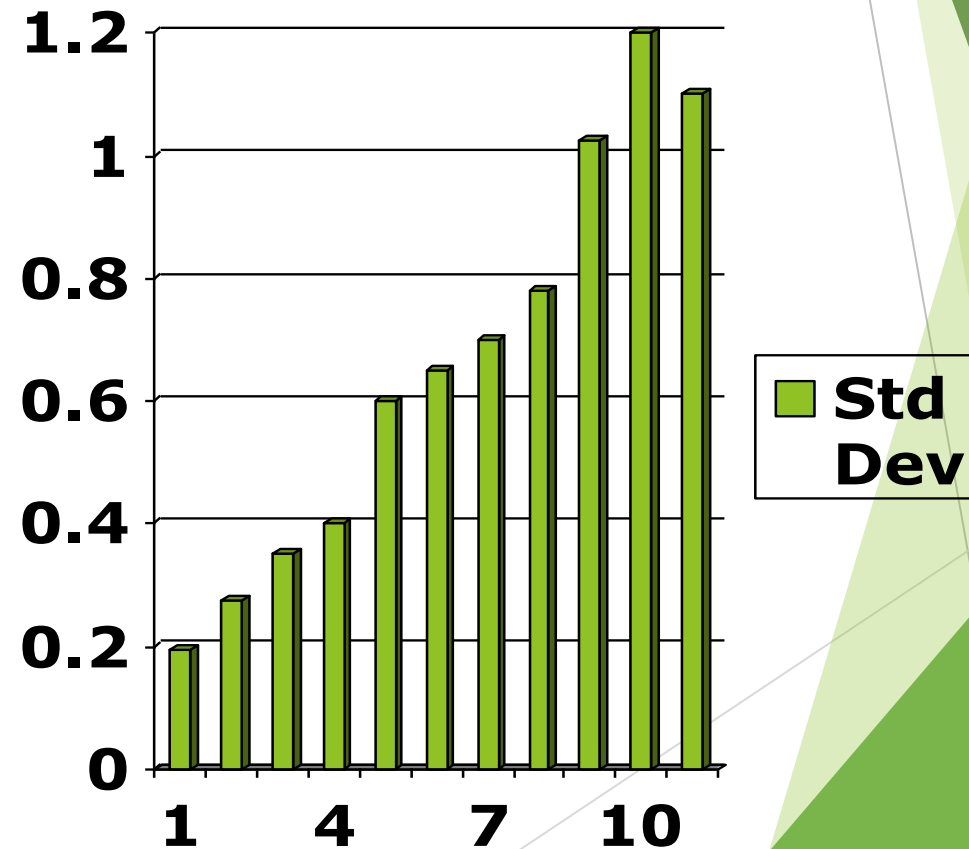
- ▶ Typical resolution over days to weeks, sometimes a few months
- ▶ Good evidence from sports medicine literature that for sports injury's, most symptoms typically have resolved by approx 3 weeks
- ▶ Reported 10-15% persistent symptoms at 1 year, over estimation, but this number is still significant
- ▶ “Miserable minority”

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What are confounding factors

- ▶ 10-15 % with mtbi - persistent symptoms even after 1 year
- ▶ Significant overlap between other diagnosis - eg depression , anxiety , and PTSD, chronic pain
- ▶ These all have a significant effect on functional ability - rtw , school , daily activity

Consider 3 stages pre- injury / peri -injury and post injury factors

- ▶ Pre injury
- ▶ Symmonds - sx picture not only depends on the kind of injury but upon the kind of brain
- ▶ 2 most researched area - prev tbi , personality /psychological fx
- ▶ Multiple concussion effects memory but 2 had little effect ..but no definite answer on severity /freq / interval etc
- ▶ Personality characteristics influence how people to stressors /illness /injury

- 
- ▶ Low self esteem /life coping skills - most likely to be depressed then experience mtbi -
 - ▶ Narcistic traits / compulsive / dependency / histrionic/ negative affect/ social inhibition over represented in group with persistent sx
 - ▶ Resilience - confer protection
 - ▶ Positive coping style/ high self- efficacy /hardiness / optimism are all resilient factors

Peri injury

- ▶ Retrograde amnesia up to 10x more predictive of outcome than LOC, PTA 4x more predictive (Collins et al., Clinical Journal of Sport Medicine, July 2003)
- ▶ Migraine often triggered in susceptible individ (Mihalik, Collins, Lovell et al, J Neurosurgery, 2006)

However poor correlation between loc and pta to predict mtbi outcomes

- ▶ mild low risk TBI was defined as: GCS score of 15,
- ▶ with no skull fracture, neurological deficits, clinical findings (eg., vomiting, headache), or risk factors (eg., drug/alcohol consumption); medium risk mild was
- ▶ GCS score of 15, no skull fracture, neurological deficits, or risk factors, but 1
- ▶ clinical finding; high risk mild TBI had GCS scores of 15 with/without clinical
- ▶ findings and either neurological deficits or skull fracture or risk factors; or GCS of 14
- ▶ with/without clinical or radiological findings.

- ▶ The findings suggest CT scan indices share a linear relationship with injury severity
- ▶ when five severity groupings are used.
- ▶ THE NEW ZEALAND
- ▶ MEDICAL JOURNAL
- ▶ Journal of the New Zealand Medical Association
- ▶ NZMJ 24 August 2012, Vol 125 No 1360; ISSN 1175 8716 Page 92
- ▶ URL: <http://www.nzma.org.nz/journal/125-1360/5319/> ©NZMA
- ▶ **Computerised tomography indices of raised intracranial**
- ▶ **pressure and traumatic brain injury severity in a New**
- ▶ **Zealand sample** Suzanne Lyn Barker-Collo, Nicola Starkey, Michael Kahan, Alice Theadom,
- ▶ Valery Feigin



Case study

- ▶ 28 year old primary school teacher
- ▶ 5-months post TBI - hit on head by ball
- ▶ Previous minor TBI - approx 6 months ago hit head against falling statue - not knocked out and headache for 2 days
- ▶ Can work half days and feels tired
- ▶ Difficulty sleeping at nights and on-going headaches

Case study

- ▶ How would you deal with her headaches?
- ▶ What about the issue of sleep difficulties?
- ▶ Work plan for her fatigue?

Medications

- ▶ Nortriptyline - short course , low dose 10mg useful for sleep disturbance
- ▶ Methylphenidate - mechanism not fully clear - increased dopamine in frontal cortex and increased noradrenalin and serotonin levels
- ▶ Studies showing improved performance in attention , concentration and motor memory at 1month this did not persist at 3month - ie did not change morbidity