

*"Patient management in the golden hour: from injury to primary care"*

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**About this talk**

- I want to outline some brain pathology post traumatic brain injury (TBI).
- I'll present information on managing TBI.
- I'll present information on TBI diagnostic methods.
- We'll talk about acute treatment strategies.
- We'll talk about why time = brain post acute TBI.

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**Why Am I Giving This Talk?**

- I'm a certified Athletic Trainer, a retired EMT and ambulance book author.
- I'm part of the concussion management center in the University of Cincinnati.
- I see the college football players with mTBI.
- My research involves what happens when the brain is injured including bleeding events in the brain.

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### A little background on Concussion

- A concussion = a Mild Traumatic Brain Injury (mTBI). An injury has in fact occurred to the brain.
- The definition of a concussion is poorly defined. We tend to use, trauma induced alteration in mental status and or activity.
- The CDC says, "A concussion is a type of traumatic brain injury, or TBI, caused by a bump, blow, or jolt to the head that can change the way your brain normally works."
- TBI is trauma induced injury to the brain or brain's function: mild, moderate and severe TBI.

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### Frequency of occurrence of postconcussion symptoms (Rivermead Postconcussion Symptoms Questionnaire).

	All patients (n=86) (%)	Women (n=59) (%)	Men (n=27) (%)
Headache	73.5	51.0	40.72
Dizziness	61.7	40.0	34.9
Nausea/vomiting	29.1	30.0	16.3
Sleep disturbance	84.9	42.0	45.3
Fatigue	90.7	57.0	53.5
Irritability	66.3	54.0	50.0
Feeling depressed	55.8	41.0	40.7
Feeling frustrated	55.8	40.0	44.5
Poor memory	67.1	51.0	53.5
Poor concentration	88.2	50.0	52.3
Noise sensitivity	59.5	45.0	34.9
Blurred vision	55.8	31.0	32.6
Sensitivity to light	51.2	41.0	44.2
Double vision	26.2	13.0	16.3
Restlessness	69.0	35.0	48.8
Taking longer to think	74.1	41.0	48.8

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### Why do people Vomit during a Neuro Event?

- Increased intracranial pressure (ICP) leads to vomiting.
- This is a reflex to decrease blood volume.
- The vomiting is profound.
- It can also be associated with diarrhea.
- Projectile Vomiting.
  - You can't miss it, but when it happens you want it to miss you.

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### Is denial part of brain pathology?

- You have a possible TBI patient; the patient is hemiplegic, agitated and combative.
- If the patient is hemiplegic do they acknowledge the weakness on one side?
- "Alien hand" is where patients do not recognize their own plegic extremities.
- Hold the patient's hand in front of their face and ask them, "whose hand is this?" and they will say "yours" or "I don't know."
- This may be a true medical emergency.

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### Denial and brain pathology cont.

- It is all too common to see a suspected mTBI patient in relatively little distress, but just not right. They will say things are fine.
- Sadly people (especially non medically trained people) believe them.
- They are believable because they calmly say, "I'm fine, and do not want to go to the hospital."
- If you suddenly lost feeling in your arm would you think that fine? Not likely.
- **Is this person normal to you?**
- <http://www.josephfclark.com/blog/?p=690>

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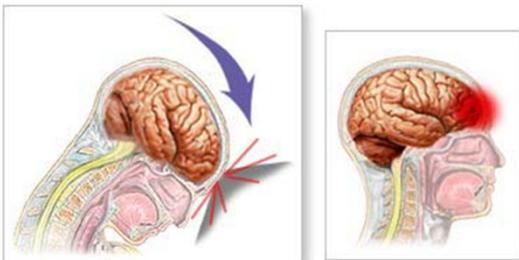
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### Concussion: a violent jarring of shaking that disturbs brain function



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### TBI is high in the public consciousness

- So lets talk about TBI for a moment.
- Car accident, IED, sports, slip and fall etc can all cause a TBI.
- There are 3.6 million TBIs in the USA annually.
- Why is the “golden hour” called that?
- Lets talk about Natasha Richardson. Remember her?




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### EMS was called but turned away

British actress Natasha Richardson dies after a skiing accident in Canada

by Nick Riv 6258 Views 5 Comments




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### A Quick 1-on-1 Evaluation

- Tongue – Stick tongue out and make the shape of a circle and X
- Eye tracking – keep head still and have eyes follow your finger.
- Manual dexterity – finger to thumb one hand at a time and both hands at the same time.
- Pupil reflexes – note pupil size and responses to exposure to light.
- Balance, Gait – observe the subject walking. Have subject put feet together, hands to side and close eyes. Look up. Stand on one leg, and the other.

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**Football and Concussion.  
Concussion = TBI**



Football Players are at risk for concussion and second impact syndrome. Teams average 5 to 10 per season.

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**Sports / Football Fact**



- In 1905, President Theodore Roosevelt threatened to outlaw football
  - 18 college football players were killed
  - 159 seriously injured (including paralysis)
- Ultimately contributed to the development of the forward pass.
- The football helmet was developed to stop SKULL FRACTURE. It does that very well.
  - It was NOT designed to prevent concussion.
  - It does prevent a lot of TBI's by preventing fracture.

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**Coup Contrecoup**

Brain Injuries  
Initial impact

Brain Injuries  
Contrecoup effect



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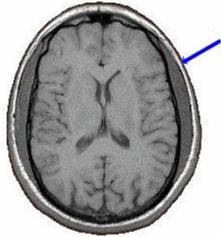
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### Contrecoup

- “contrecoup injuries occur at areas distant from the point of impact as a result of shock waves travelling across the brain causing stress/cavitation effects.”



<http://www.ijntonline.com/Dec09/abstracts/04.PDF>

[http://www.neurostaff.org/disc\\_en.htm](http://www.neurostaff.org/disc_en.htm)

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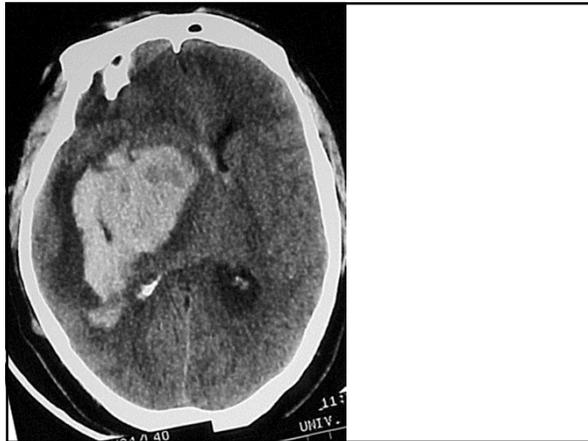
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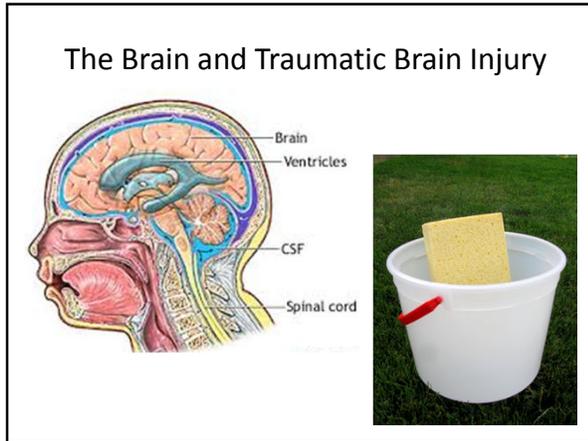
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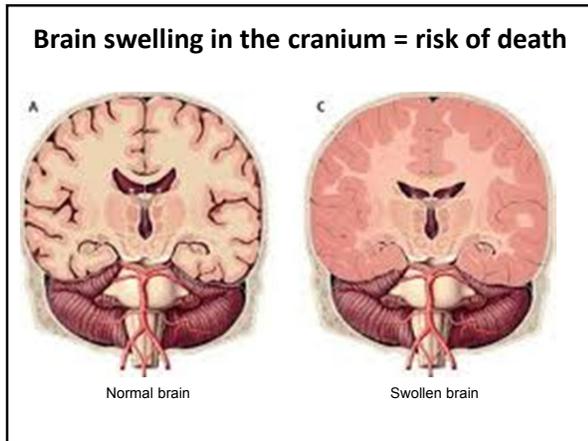
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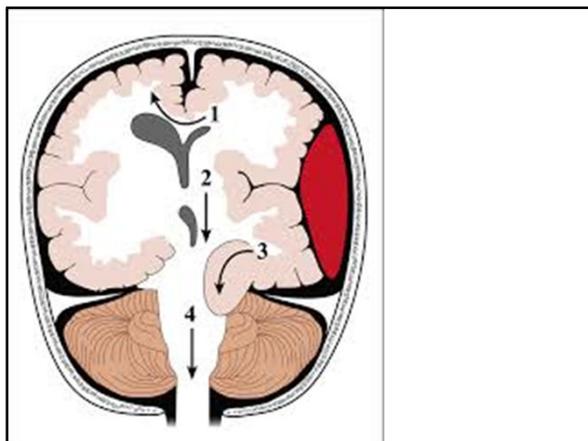
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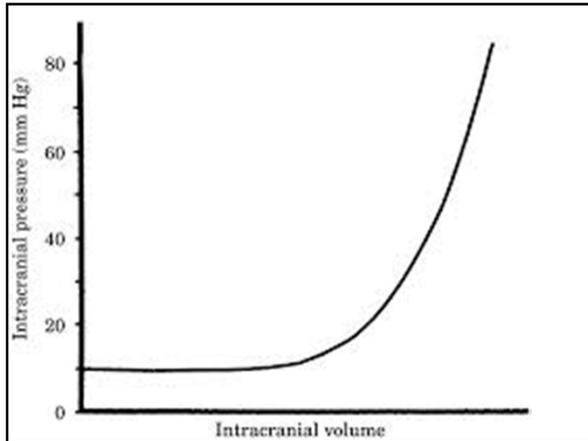
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### Diagnostic Tests for Concussion Symptoms

- Questions – Q&A
- Balance
- Executive Function
- Coordination
- Cranial Nerves
- Visual tests
- Vestibular
- Others
- A full neuro exam, neuropsych exam takes 2 plus hours

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Baseline OCT

N T

Post-TBI OCT

N T

Figure Legend. This is one representative image from a subject with baseline and post TBI ganglion cell layer changes. The image on the left was obtained as a baseline of the left eye, the image on the right is of the left eye 6 weeks post TBI. The same region also has diminished color visual fields. The concordance of functional and anatomical changes is very strong support of our thesis that optical coherence tomography can be used to monitor and manage patients post TBI. What is lacking is the temporal relationship of the changes in OCT post TBI and if and to what extent it returns to normal post TBI, which is a component of the study proposed herein.

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**The good the bad the ugly of neuro diagnostics**

- The good; there are multiple options, increased awareness and new ones coming out.
- The bad; some tests are quantitative, some are not. You need clinical experience to make assessments. Know your athlete.
- The ugly; many tests being put forth as diagnostic are NOT FDA approved or cleared. Which means; you are on your own (YOYO).

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**Some Diagnostic Technologies**

- Transcranial Sensors to Detect Brain Injury
  - EEG
  - RF Pulsed Detectors
  - Blood Biomarkers
  - Transcranial IR
  - Improved CT, MR other imagers
  - Others

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**Conclusion**

- A traumatic brain injury is an injury to the brain.
- We can diagnose it and provide an environment to promote healing and recovery.
- More work, research and understanding, is needed to keep people safe and get them better faster.

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### Acknowledgements

- Everybody.
- UC athletics, athletes, sports medicine, nova care, department of orthopedics, neurology, neurosurgery, CCHMC.
- Questions:

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### Some Resources

- <http://www.cdc.gov/concussion/sports/recognize.html>
- [http://www.legislature.state.oh.us/bills.cfm?ID=129\\_HB\\_143](http://www.legislature.state.oh.us/bills.cfm?ID=129_HB_143)
- <http://www.youtube.com/watch?v=jjgXd1-PKWk>
- [http://stroke.nih.gov/documents/NIH\\_Stroke\\_Scale.pdf](http://stroke.nih.gov/documents/NIH_Stroke_Scale.pdf)
- <http://www.hindawi.com/journals/rerp/2012/528265/>
- <http://www.sportsconcussion.com/pdf/management/BESSProtocolNATA09.pdf>

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### Acknowledgements

Clovis



Libby



Winston



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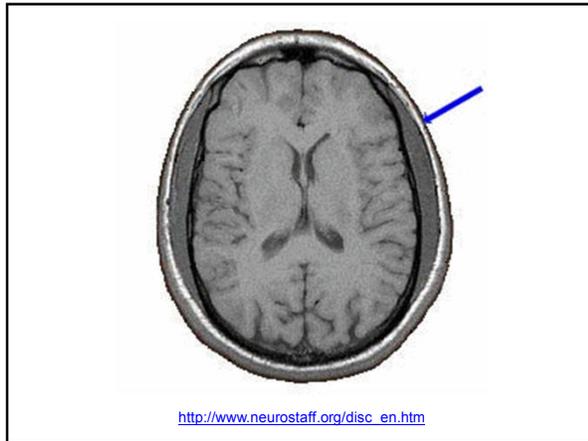
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