

# Trauma MedEd

## Concussion Testing: There's An App For That!

Smart phone programmers are becoming more and more creative! The newest trauma app is geared toward helping the user identify individuals who have suffered a concussion. It can be used by parents, coaches or physicians to help identify a concussion at sporting events.

The app is a portable and convenient system for identifying concussions based on established sports medicine research. It queries the user for common signs of concussion, tallies the results of a simple balance test, and looks for other symptoms that suggest the injury. The exam can also be administered serially to detect changes from baseline.

To get the most from this free app, the user must purchase an optional module for \$4.99 that does a more in-depth physiologic and cognitive evaluation. A report can be emailed automatically to your physician, and he or she can then respond and send a message to your team to approve or deny continuing play.

The app is provided by SportSafety Labs LLC. The basic app is free, and the add-on is \$4.99. It is published for the iPhone and iPad.

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### TRAUMA CALENDAR OF EVENTS

#### AMERICAN ASSOCIATION FOR THE SURGERY OF TRAUMA

LOCATION: PHILADELPHIA, PENNSYLVANIA

DATE: SEPTEMBER 10-13, 2014

#### ORTHOPEDIC TRAUMA ASSOCIATION

LOCATION: TAMPA, FLORIDA

DATE: OCTOBER 15-18, 2014

**Bottom line: Expect more trauma-oriented apps geared toward a variety of problems in the near future!** *I have no financial interest in this app.*



## Diffuse Axonal Injury

Trauma professionals tend to focus on the two extremes of TBI: mild concussive injury because we see so much of it, and very severe injury that we have to work so hard to keep the patient alive. Today I'll write about the one in the middle, diffuse axonal injury (DAI). People don't talk about it nearly as much, and it seems kind of mysterious.

DAI is also known as a shear injury, because that's what we think happens to the brain at the time of injury. Officially, it is diagnosed when a patient remains in a coma for more than 6 hours without a demonstrable mass lesion from bleeding seen on CT. It is seen in about 15% of trauma ICU patients with head injury. Essentially the substance of the brain moves around enough to disrupt a critical mass of axonal connections that results in prolonged unconsciousness. It then takes time to try to rebuild those connections and restore consciousness and some degree of cognition. Mechanisms which result in sudden acceleration or deceleration of the brain may cause this condition, and rotational forces which spin the head suddenly seem to be even worse.

CT scan of the head frequently shows no unusual findings. On occasion, small punctate hemorrhages may be seen. These are generally bad prognostic signs, because CT is so much less sensitive in showing these compared to MRI. Here are some key points about DAI:

- If the head CT is negative, and all recreational drugs have worn off and the patient still doesn't wake up, DAI is likely.
- MRI can confirm the diagnosis, but is not good for giving a prognosis
- Slow recovery of consciousness or failure to recover correlates with death
- Hyperglycemia and the presence of a subdural also are highly correlated with mortality

**Bottom line: The diagnosis of DAI can generally be made clinically with the assistance of head CT. MRI is not very useful, unless it is needed to confirm the diagnosis. It does not predict speed or degree of recovery so is otherwise not very**

**useful. Supportive care, avoidance of complications and early therapy and rehab are the best treatments we have to offer.**

*Reference: Diffuse axonal injury in patients with head injuries: an epidemiologic and prognosis study of 124 cases. J Trauma 71(4):838-846, 2011.*

## (In)appropriate Neurosurgical Consultation

Emergency physicians and trauma surgeons routinely assess patients with potential neurotrauma and decide whether to obtain CT scans and/or neurosurgical consultations. The criteria they use to make these decisions are not always clear.

The neurosurgery department at the University of California - Davis performed a prospective study that looked at the appropriateness of consults they received and of CTs of the head ordered by other physicians in trauma and non-trauma patients. A total of 99 patients entered the study (32 head trauma, 29 spine trauma, 34 other disease, 4 not documented).

**After reviewing the consultations, they found that 69 were appropriate, 32 were not appropriate, and 7 could not be classified. Additionally, they felt that 10 of the head CTs in injured patients (31%) were not indicated.**

"Appropriateness" was difficult to define well in this study, and there is certainly a great deal of subjectivity involved. The authors recommend using the Canadian CT Head Rule to fine-tune use of head CT in trauma patients.

*Reference: (In)appropriate neurosurgical consultation. Clinical Neurology and Neurosurgery 112(9):775-780, 2010.*

## What INR Is Safe For Ventriculostomy Placement?

Intracranial pressure monitoring has been shown to benefit patients with severe brain injuries.

Neurosurgeons are reluctant to place these invasive monitors in patients with abnormal coagulation studies, and many times expect the coagulation values to be completely normal. Is this reasonable? Brain injury itself can raise the INR. **When is it safe to place one of these monitors?**

Researchers at the University of Alabama - Birmingham performed a retrospective review of their experience with 71 patients who underwent ventriculostomy with a range of INR values. None of these patients were on warfarin. Eighty one ventriculostomies were performed after an average of 1.5 attempts. They looked at the incidence of new hemorrhage seen on CT after placement.

Here are the factoids:

- Patients with an INR < 1.2 had a 9% incidence
- Patients with an INR from 1.2 to 1.4 had a 4 % incidence
- Patients with an INR > 1.4 had an 8% incidence

If the neurosurgeon, is unwilling to place the ventriculostomy until the INR is normalized, there may be several additional sources of morbidity:

- Additional brain injury that is not known and treated due to the lack of an ICP monitor
- Potential infectious and other complications (transfusion reaction, TRALI) from plasma administration
- Cost for the transfusion products

The patients who did have hemorrhage generally had a small focal area. The one significant hemorrhage occurred in a patient on clopidigrel (Plavix).

**Bottom line: The numbers are small, and this is retrospective work. Based on their study, the authors are comfortable placing a ventriculostomy in patients not on Coumadin with an INR up to 1.6 without plasma administration beforehand. Clopidigrel should be considered as a separate risk factor.**

*Reference: The relationship between INR and development of hemorrhage with placement of ventriculostomy. J Trauma, 70(5):1112-1117, 2011.*

## Nail Discoloration After Severe TBI

Occasionally, patients who have had a severe brain injury but recovered relatively quickly may present with complaints of odd nail discoloration. This may involve fingernails and/or toenails. What gives?

This is actually a byproduct of repeated exams to determine the Glasgow Coma Scale score. A common way to determine the motor component is to squeeze the fingertip or toetip. I've seen some neurosurgeons use a pen to apply a great deal of force to the nail.

The discoloration is a resolving subungual hematoma. You may see different colors under different nails, depending on the age of the hematoma. Amaze your colleagues with your knowledge on this one!



## Quick And Dirty TBI Screening

Traumatic brain injury (TBI) is an extremely common diagnosis in trauma patients. The majority are minor concussions that show no evidence of injury on head CT. Despite normal findings, however, a short conversation with the patient frequently demonstrates that they really do have a TBI.

Scoring systems can help quantitate how significant the head injury is. The Glasgow Coma Scale (GCS) score is frequently used. This scoring system is not sensitive enough for minor head injuries, since a patient may be perseverating even with a GCS of 15.

The Short Blessed Test (SBT) is a 30 year old scoring system for minor TBI that has been well-validated. It takes only a few minutes to administer, and is very easy to score.

The most important part of the administration process is choosing a threshold for further evaluation and testing. At Regions Hospital, we administer this test to all trauma patients with a suspected TBI (defined as known or suspected loss of consciousness, or amnesia for the traumatic event). If the final score is >7, we refer the patient for more extensive evaluation

by physical and occupational therapy. If the score is 7 or less but not zero, consideration should be given to offering routine followup in a minor neurotrauma clinic as an outpatient. In all cases, patients should be advised to avoid situations that would lead to a repeat concussion in the next month. Use the information to the right to download this file.



To download the full pdf file, scan the QR code, or enter this into your browser:  
<http://bit.ly/YOAEoM>

Patient: \_\_\_\_\_  
 Age: \_\_\_\_\_

DATE: \_\_\_\_\_

**Short Blessed Test (SBT)<sup>1</sup>**

"Now I would like to ask you some questions to check your memory and concentration. Some of them may be easy and some of them may be hard."

- |                                |                |                  |
|--------------------------------|----------------|------------------|
| 1. What year is it now? _____  | Correct<br>(0) | Incorrect<br>(1) |
| 2. What month is it now? _____ | Correct<br>(0) | Incorrect<br>(1) |

Please repeat this name and address after me:

John Brown, 42 Market Street, Chicago  
 John Brown, 42 Market Street, Chicago  
 John Brown, 42 Market Street, Chicago

(underline words repeated correctly in each trial)  
 Trials to learning \_\_\_\_\_ (can't do in 3 trials = C)

Good, now remember that name and address for a few minutes.

- |  |                |                  |
|--|----------------|------------------|
| 3. Without looking at your watch or clock, tell me about what time it is.<br>(If response is vague, prompt for specific response)<br>(within 1 hour) _____<br>Actual time: _____ | Correct<br>(0) | Incorrect<br>(1) |
|--|----------------|------------------|

- |   |              |
|---|--------------|
| 4. Count aloud backwards from 20 to 1<br>(Mark correctly sequenced numerals)<br>If subject starts counting forward or forgets the task, repeat instructions and score one error | 0 1 2 Errors |
|---|--------------|

20 19 18 17 16 15 14 13 12 11  
 10 9 8 7 6 5 4 3 2 1

- |   |              |
|---|--------------|
| 5. Say the months of the year in reverse order.<br>If the tester needs to prompt with the last name of the month of the year, one error should be scored<br>(Mark correctly sequenced months) | 0 1 2 Errors |
|---|--------------|

D N O S A J L J N M Y A P M R F J

- |  |                    |
|--|--------------------|
| 6. Repeat the name and address I asked you to remember.<br>(The thoroughfare term (Street) is not required)<br>(John Brown, 42 Market Street, Chicago) | 0 1 2 3 4 5 Errors |
|--|--------------------|

\_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_

**Check correct items**

**USE ATTACHED SCORING GRID & NORMS**

<sup>1</sup> Katzman R, Brown T, Fuld P, Peck A, Schechter R, Schimmel, H. Validation of a short orientation-memory concentration test of cognitive impairment. Am J Psychiatry 140:734-739, 1983.

			
<a href="http://www.TheTraumaPro.com">www.TheTraumaPro.com</a>	<a href="https://twitter.com/@regionstrauma">@regionstrauma</a>	<a href="http://www.Linkedin.com/in/MichaelMcGonigal">www.Linkedin.com/in/MichaelMcGonigal</a>	<a href="https://skype.com/Michael.D.McGonigal">Michael.D.McGonigal</a>