

CDC defines a **traumatic brain injury (TBI)** as a disruption in the normal function of the brain that can be caused by a bump, blow, or jolt to the head, or penetrating head injury.

Causes of a TBI



Fall



Motor Vehicle Accident



Struck by object



Sports

Traumatic brain injuries (TBI) in **ELDERLY** patients are most frequently due to:

- | | |
|--------------------------------|-----------------------------------|
| A. Falls | B. Motor vehicle accidents |
| C. Alcohol (ETOH) abuse | D. Assault |

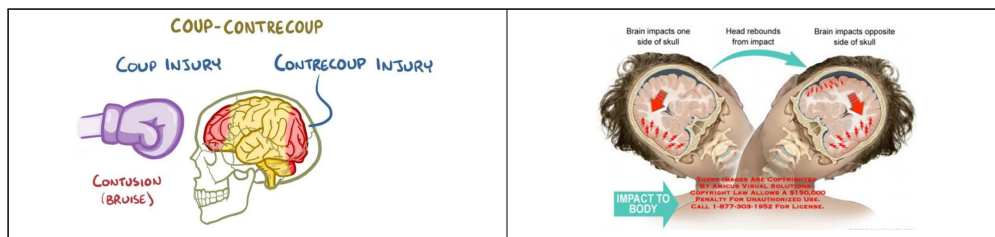
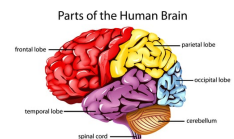
- In the elderly population, gait and visual disturbances lead to falls, which cause most of the TBIs in the elderly.
- Over half of all reported traumatic brain injuries are the result of an automobile accident. A traumatic brain injury can occur as a result of any force that penetrates or fractures the skull; areas which are susceptible during an auto accident.

- Trauma is the leading cause of death in people ages 1 to 44, and more than one-half of these deaths are due to brain trauma. Traumatic brain injury (TBI) is arguably the primary cause of neurologic mortality and morbidity in the United States.
- Data from 2013 epidemiologic study by the Centers for Disease Control and Prevention and the National Center for Injury Prevention and Control:
 - Approximately 2.8 million TBIs occur in the United States annually.
 - Of the 2.5 million, 81% were ED visits, 16.3% were hospitalizations, and 3% were deaths (Faul et al., 2010).
- Age distribution is bimodal.
 - Peak ages: 0 to 5 years, with second peak in the elderly (age 65 and older); older group has a higher mortality rate.
- Male to female ratio → 2.5:1.
 - Mortality in males is three to four times higher than in females.
- The single most common cause of death and injury in automobile accidents is ejection of the occupant from the vehicle (Spitz and Fisher, 1991).

Which are the most commonly injured areas of the brain after a traumatic brain injury (TBI)?

- | | |
|---------------------------------|----------------------------------|
| A. Occipital and frontal | B. Frontal and temporal |
| C. Parietal and frontal | D. Occipital and temporal |

- Regardless of site of impact, the orbitofrontal and anterior temporal lobes are the most commonly injured sites of the brain because of the close relation of the lobes to the bones.






Coup-contrecoup injuries in traumatic brain injuries (TBI) are typically concentrated in:

- | | |
|--------------------------------------|--|
| A. Frontal and parietal lobes | B. Occipital and parietal lobes |
| C. Frontal and temporal lobes | D. Subcortical structures |

- In head injury, a coup injury occurs under the site of impact with an object, and a contrecoup injury occurs on the side opposite the area that was hit. Coup and contrecoup injuries are associated with cerebral contusions, a type of traumatic brain injury in which the brain is bruised.
- The frontal lobe is often affected directly in TBI, and the temporal lobes are affected due to the bony protuberances surrounding the temporal region; the coup is the contusion directly beneath the impact; the contre coup is the side opposite the impact.

GLASGOW COMA SCALE

- The Glasgow Coma Scale (GCS) is the most common scoring system used to describe the level of consciousness in a person following a traumatic brain injury. Basically, it is used to help gauge the severity of an acute brain injury. The test is simple, reliable, and correlates well with outcome following severe brain injury.
- The GCS is the summation of scores for eye, verbal, and motor responses. The minimum score is a 3 which indicates deep coma or a brain-dead state. The maximum is 15 which indicates a fully awake patient
- The GCS is a simple scale for assessing the depth of coma.
- Lower GCS scores are associated with worse outcomes based on the best GCS within the first 24 hours.

4 eyes		Jackson 5		V6 engine	
EYE OPENING		VERBAL RESPONSE		MOTOR RESPONSE	
					
Spontaneous	> 4	Orientated	> 5	Obey commands	> 6
To sound	> 3	Confused	> 4	Localising	> 5
To pressure	> 2	Words	> 3	Normal flexion	> 4
None	> 1	Sounds	> 2	Abnormal flexion	> 3
		None	> 1	Extension	> 2
				None	> 1

- Total GCS score is obtained from adding the scores of all three categories.
- GCS score <8: Patient is said to be comatose. The lower the score, the deeper the coma.

Lowest score	Highest score
3	15

	Severe TBI (coma)	Moderate TBI	Mild TBI
GCS Score	3 - 8	9 - 12	13 - 15

According to the Glasgow Coma Scale (GCS), a severe brain injury would be:

- A. 13 to 15
- B. 9 to 12
- C. 3 to 8
- D. 0 to 2

- The Glasgow Coma Scale is from 3 to 15. A score of < 8 indicates a severe brain injury. A score of 9 to 12 indicates moderate brain injury, and a score of 13 or over indicates mild injury.

Which of the following is true about Glasgow Coma Scale (GCS) in traumatic brain injury (TBI)?

- A. A GCS of 12 is a mild injury
- B. A GCS of 10 is a moderate injury
- C. A GCS of 8 is a moderate injury
- D. A GCS of 2 is a severe injury

- A mild injury is a GCS of 13 to 15, a moderate injury is a GCS of 9 to 12, and a severe injury is a GCS of 3 to 8.
- The lowest score is a 3 on the GCS.

	Severe TBI	Moderate TBI	Mild TBI
GCS Score			

A Glasgow Coma Scale (GCS) score of 13 to 15 would indicate:

- A. Death
 B. Severe traumatic brain injury (TBI)
 C. Moderate TBI
 D. Mild TBI

GCS score 3 to 8	GCS score of 9 to 12	GCS score of 13 to 15

What is the Glasgow Coma Scale (GCS) for someone who withdraws from pain, is confused, and opens eyes to pain?

- A. 6
 B. 8
 C. 10
 D. 12

Eye opening	Best verbal response	Best motor response	=	

Eye opening	Best verbal response	Best motor response
4 = spontaneous	5 = normal conversation	6 = follows commands
3 = to voice	4 = disoriented conversation	5 = localizes to pain
2 = to pain	3 = words, but no coherent	4 = withdraws to pain
1 = none	2 = no words, only sounds	3 = decorticate posture
	1 = none	2 = decerebrate posture
		1 = none

A 25-year-old is brought to the emergency department following a motor vehicle collision. On examination, she can open her eyes when spoken to and is able to follow commands. Although disoriented, she is able to converse with you. What is her Glasgow Coma Score (GCS)?

- A. 12
 B. 13
 C. 14
 D. 15

Eye opening	Best verbal response	Best motor response	=	

- Of the three items in GCS, *best motor response*, particularly 2 weeks postinjury, is the best acute predictor of outcome. The verbal response was the second-best acute predictor of outcome.

What is the best acute predictor of outcome after a traumatic brain injury (TBI)?

- A. Best motor response of the Glasgow Coma Scale (GCS)
 B. Best verbal response on the GCS
 C. Best eye opening response on the GCS
 D. Initial GCS score



- The best motor GCS and the best overall GCS within the first 24 hours is considered to be the best acute predictor of outcome in TBI.

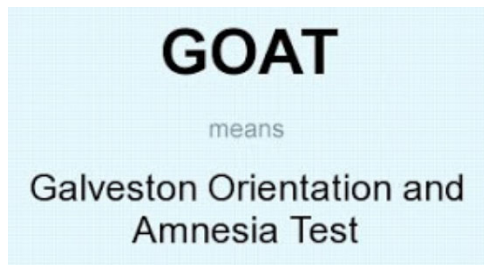
- Posttraumatic amnesia (PTA) is one of the most commonly used predictors of outcome.
- A longer duration of PTA is associated with worse outcomes.
- Resolution of PTA clinically corresponds to the period when incorporation of ongoing daily events occurs in the working memory.

PTA lasts <2 months	PTA lasts >3 months
Severe disability is unlikely	Good recovery is unlikely

What does NOT describe post-traumatic amnesia (PTA)?

- A. It is a predictor of recovery and outcome in traumatic brain injury (TBI)
- B. It can be assessed using the Galveston Orientation and Amnesia Test (GOAT)
- C. Assesses orientation to person, place, time; recall of the circumstances of the hospitalization
- D. The GOAT score of 75 or greater for one time is considered the end of PTA.

-  **Galveston Orientation and Amnesia Test (GOAT)**—developed by Harvey Levin and colleagues, it is a standard technique for assessing PTA. It is a brief, structured interview that quantifies the patient's orientation and recall of recent events.
 - Assesses orientation to person, place, time; recall of the circumstances of the hospitalization; and the last preinjury and first postinjury memories
 -  The end of PTA can be defined as the date when the patient scores 75 or higher in the GOAT for 2 consecutive days. The period of PTA is defined as the number of days beginning at the end of the coma to the time the patient attains the first of two successive GOAT scores ≥ 75 (Ellenberg et al., 1996).



- The **Galveston Orientation and Amnesia Test (GOAT)** is an instrument originally created by Levin, O'Donnell, and Grossman and first published in 1979. It was developed to evaluate cognition serially during the subacute stage of recovery from a closed head injury (CHI).
- This practical scale measures orientation to person, place, and time, and memory for events preceding and following the injury. The GOAT assesses post-traumatic amnesia (PTA) in patients who have had a severe traumatic brain injury (TBI).
- The GOAT is designed to be a practical, reliable scale that can be used at the bedside or in the emergency room by health service providers of various disciplines. It is important in determining the outcome and prognosis

The Galveston Orientation and Amnesia Test (GOAT)

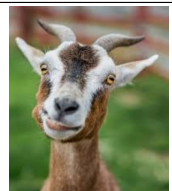
Question	Error score	Notes
What is your name?	/ 2	Must give both first name and surname.
When were you born?	/ 4	Must give day, month, and year.
Where do you live?	/ 4	Town is sufficient.
Where are you now?		
(a) City	/ 5	Must give actual town.
(b) Building	/ 5	Usually in hospital or rehab center. Actual name necessary.
When were you admitted to this hospital?	/ 5	Date.
How did you get here?	/ 5	Mode of transport.
What is the first event you can remember after the injury?	/ 5	Any plausible event is sufficient (record answer)
Can you give some detail?	/ 5	Must give relevant detail.
Can you describe the last event you can recall before the accident?	/ 5	Any plausible event is sufficient (record answer)
What time is it now?	/ 5	1 for each half-hour error, etc.
What day of the week is it?	/ 3	1 for each day error, etc.
What day of the month is it? (i.e. the date)	/ 5	1 for each day error, etc.
What is the month?	/ 15	5 for each month error, etc.
What is the year?	/ 30	10 for each year error.
Total Error:		
100 - total error		Can be a negative number.

76-100 = Normal
66-75 = Borderline
< 66 = Impaired

Which of the following tests is most useful for evaluation of memory loss after traumatic brain injury?

- A. Mini Mental Status Examination (MMSE)
- B. Galveston Orientation and Amnesia Test (GOAT)
- C. Ranchos Los Amigos Scale
- D. Glasgow Coma Scale (GCS)

- The GOAT is out of 100 points and is useful for assessing severity of post-traumatic amnesia. The end of PTA can be defined as the date when the patient scores 75 or higher in the GOAT for 2 consecutive days. The period of PTA is defined as the number of days beginning at the end of the coma to the time the patient attains the first of two successive GOAT scores ≥ 75 .
- The MMSE is a cognitive screener. The Ranchos Los Amigos Scale stages recovery from traumatic brain injury. The GCS measures coma and severity of TBI.



MILD TBI (CONCUSSION)

- Mild TBI constitutes 80% to 90% of TBI cases in the United States (approximately 2.3 million cases).
- Multiple terms, definitions, and diagnostic criteria are available for mild TBI.
- The American Congress of Rehabilitation (Giacino et al., 1995) defined mild TBI as a traumatically induced physiologic disruption of brain function with at least one of four manifestations.
 - Any loss of consciousness (LOC)
 - Any loss of memory for events immediately before or after the injury
 - Any alteration in mental status at the time of the accident
 - Focal neurologic deficits that may or may not be transient
- The injury does not exceed the following severity criteria:

LOC (loss of consciousness)	PTA (post-traumatic amnesia)	Initial GCS
30 minutes	24 hours	13

SYMPTOMS OF TBI

MODERATE TO SEVERE TBI	MILD TBI
Accounts for 10% of all cases	Accounts for 90% of all cases (based on WHO information)
SYMPTOMS:	SYMPTOMS:
<ul style="list-style-type: none"> slurred speech profound confusion seizures persistent headaches coma 	<ul style="list-style-type: none"> headaches dizziness & fatigue sleeping difficulties memory & concentration problems blurred vision

Criteria	Mild	Moderate	Severe
Structural imaging	Normal	Normal or abnormal	Normal or abnormal
Loss of consciousness	0-30 min	>30 min and <24 h	>24 h
Alteration of consciousness or mental state*	Momentary to 24 h	>24 h	>24 h
Post-traumatic amnesia	0-1 d	>1 and <7 d	>7 d
Glasgow Coma Scale score	13-15	9-12	<9

Which of the following criteria is incorrect regarding the concussion (mild TBI)?

- Loss of consciousness < 30 minutes
- Post-traumatic amnesia < 24 hours
- Initial Glasgow Coma Scale of 13-15
- The brain is bruised with possible surface hemorrhage

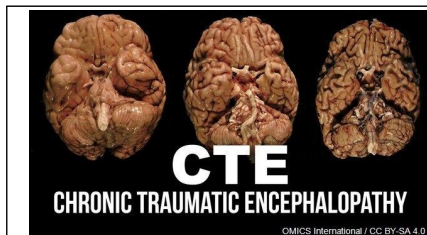
- Temporary loss of consciousness (LOC): A partial or complete loss of consciousness with interruption of awareness of oneself and ones surroundings. When the loss of consciousness is temporary and there is spontaneous recovery, it is referred to as syncope or, in nonmedical quarters, fainting.
- Post-traumatic amnesia (PTA) is a state of confusion that occurs immediately following a traumatic brain injury (TBI) in which the injured person is disoriented and unable to remember events that occur after the injury. The person may be unable to state their name, where they are, and what time it is.
- The Glasgow Coma Scale (GCS) is often used to help define the severity of TBI. Mild head injuries are generally defined as those associated with a GCS score of 13-15, and moderate head injuries are those associated with a GCS score of 9-12. A GCS score of 8 or less defines a severe head injury.

CONCUSSION	CONTUSION		
<ul style="list-style-type: none"> Temporary loss of neurologic function with no apparent structural damage lasting for a few seconds to few minutes Jarring of the brain that caused it to stop functioning momentarily 	<ul style="list-style-type: none"> More severe injury in which the brain is bruised, with possible surface hemorrhage Unconscious for more than a few seconds or minutes Picture is somewhat similar to that of shock 	<ul style="list-style-type: none"> Cerebral concussion: <ul style="list-style-type: none"> Temporary brain dysfunction after injury Usually clears within 24 hours Cerebral contusion: <ul style="list-style-type: none"> Bruising of brain tissue through direct trauma to head Neurological deficits persist longer than 24 hours 	<ul style="list-style-type: none"> Concussion: <ul style="list-style-type: none"> No visible bleed, microscopic diffuse/widespread neuronal stress/damage. Contusion: <ul style="list-style-type: none"> Localized, Visible Injury with bleeding (Bruise) Laceration: <ul style="list-style-type: none"> Visible linear tear in brain tissue.

Which of the following is the characteristic of Concussion vs. Contusion?

- Temporary loss of neurologic function with no apparent structural damage
- Bruising of brain tissue through direct trauma to head
- Post traumatic amnesia persist longer than 24 hours
- Appears as a hemorrhagic lesion on CT scan

- Usually, Concussion (mild TBI) has no findings of structural injury on routine neuroimaging (CT/MRI).
- Contusions are more serious than concussions because they involve damage to brain structure and pose more severe risks.



Chronic traumatic encephalopathy (CTE) is a brain condition associated with repeated blows to the head. It is also associated with the development of dementia. Potential signs of CTE are problems with thinking and memory, personality changes, and behavioral changes including aggression and depression.

Repeated concussions may result in:

- A. Parkinson-like symptoms
- B. Alzheimer-like neuropathology
- C. Second impact syndrome
- D. All of the above

- Chronic traumatic encephalopathy (CTE), or dementia pugilistica, results in extrapyramidal symptoms and Alzheimer pathology.
- Second impact syndrome results from inability to autoregulate blood pressure after repeat concussion; this hypertensive emergency has resulted in death (in those younger than 18).

Second-Impact Syndrome

Swelling on **both** sides of the brain Swelling on **one** side of the brain

Second Impact Syndrome

- Results from a person (usually an athlete) sustaining a second brain injury (that may be minor in severity) before symptoms of a prior concussion have cleared. Immediately following the second head injury, patients become dazed, and within 15 seconds to several minutes can rapidly decompensate—collapse, pupil dilation, loss of eye tracking, respiratory failure, semicomatose state.
- Current research suggests an impairment in the brain's vascular autoregulation, leading to engorgement and increased ICP that results in herniation (either of the medial temporal lobe through the tentorium or the cerebellar tonsils through the foramen magnum).

_____ happens when the brain swells rapidly shortly after a person suffers a second concussion before symptoms from an earlier concussion have subsided. This event is rare, but when it does happen, it is most often fatal.

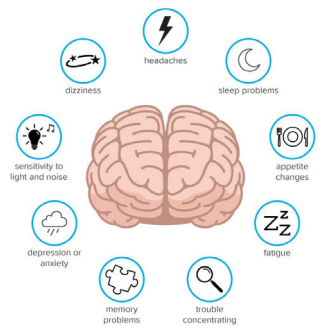
- A. Concussion
- B. Contusion
- C. Second Impact Syndrome
- D. Post-traumatic stress disorder

- Incidence of second impact syndrome is unknown and likely underreported, but studies suggest morbidity and mortality rates close to 100% and 50% respectively. More common in adolescent-aged athletes.

_____ is a mental health condition that's triggered by a terrifying event — either experiencing it or witnessing it. Symptoms may include flashbacks, nightmares and severe anxiety, as well as uncontrollable thoughts about the event

- A. Traumatic brain injury
- B. Specific phobias
- C. Second Impact Syndrome
- D. Post-traumatic stress disorder

- Post-traumatic stress disorder (PTSD): may last months or years, with triggers that can bring back memories of the trauma accompanied by intense emotional and physical reactions.
- Specific phobia: an intense, persistent, irrational fear of a specific object, situation, or activity, or person. Usually, the fear is proportionally greater than the actual danger or threat. Examples include the fear of dogs, snakes, insects, or mice.



- Signs and symptoms after mild TBI include:
 - Headache (most common)
 - Dizziness
 - Tinnitus
 - Impaired balance
 - Hearing loss
 - Blurred vision
 - Altered taste and smell
 - Sleep disturbances/insomnia
 - Fatigue
 - Sensory impairments
 - Attention and concentration deficits
 - Slowed mental processing (slowed reaction and information processing time)
 - Memory impairment (mostly recent memory)
 - Lability
 - Irritability
 - Depression
 - Anxiety
- Most mild TBI patients have a good recovery with symptoms clearing within the first few weeks or months postinjury (usually within 1–3 months).
- Pharmacologic intervention may be used including antidepressants and psychostimulants.

What is the most common symptom described after a concussion?

- A. Dizziness
- B. Poor sleep
- C. Headache
- D. Fatigue

- Headaches are the most common symptom experienced after a concussion. The others can also occur, but are not as frequent as headaches.

How is the severity of a concussion graded?

- A. Severity of ongoing symptoms
- B. Brain MRI every three months
- C. Presence of loss of conscious (LOC)
- D. Presence of post-traumatic amnesia (PTA)

- A concussion is a mild traumatic brain injury and should never be graded with grading scales.
- The majority of concussions do not have LOC and therefore should not be used as an indication of severity.
- Concussion severity is determined by the number, severity, and length of symptoms present.

SCAT (Sport Concussion Assessment Tool)

a standardized tool for evaluating concussions designed for use by physicians and licensed healthcare professionals.

How do you feel? You should score yourself on the following symptoms, based on how you feel now.

Post Concussion Symptom Scale									
	None		Moderate		Severe				
Headache	0	1	2	3	4	5	6		
"Pressure in head"	0	1	2	3	4	5	6		
Neck Pain	0	1	2	3	4	5	6		
Balance problems or dizzy	0	1	2	3	4	5	6		
Nausea or vomiting	0	1	2	3	4	5	6		
Vision problems	0	1	2	3	4	5	6		
Hearing problems / ringing	0	1	2	3	4	5	6		
"Don't feel right"	0	1	2	3	4	5	6		
Feeling "dinged" or "dazed"	0	1	2	3	4	5	6		
Confusion	0	1	2	3	4	5	6		
Feeling slowed down	0	1	2	3	4	5	6		
Feeling like "in a fog"	0	1	2	3	4	5	6		
Drowsiness	0	1	2	3	4	5	6		
Fatigue or low energy	0	1	2	3	4	5	6		
More emotional than usual	0	1	2	3	4	5	6		
Irritability	0	1	2	3	4	5	6		
Difficulty concentrating	0	1	2	3	4	5	6		
Difficulty remembering	0	1	2	3	4	5	6		
(follow up symptoms only)									
Sadness	0	1	2	3	4	5	6		
Nervous or Anxious	0	1	2	3	4	5	6		
Trouble falling asleep	0	1	2	3	4	5	6		
Sleeping more than usual	0	1	2	3	4	5	6		
Sensitivity to light	0	1	2	3	4	5	6		
Sensitivity to noise	0	1	2	3	4	5	6		
Other:	0	1	2	3	4	5	6		

	none	mild	moderate	severe			
Headache	0	1	2	3	4	5	6
"Pressure in head"	0	1	2	3	4	5	6
Neck Pain	0	1	2	3	4	5	6
Nausea or vomiting	0	1	2	3	4	5	6
Dizziness	0	1	2	3	4	5	6
Blurred vision	0	1	2	3	4	5	6
Balance problems	0	1	2	3	4	5	6
Sensitivity to light	0	1	2	3	4	5	6
Sensitivity to noise	0	1	2	3	4	5	6
Feeling slowed down	0	1	2	3	4	5	6
Feeling like "in a fog"	0	1	2	3	4	5	6
"Don't feel right"	0	1	2	3	4	5	6
Difficulty concentrating	0	1	2	3	4	5	6
Difficulty remembering	0	1	2	3	4	5	6
Fatigue or low energy	0	1	2	3	4	5	6
Confusion	0	1	2	3	4	5	6
Drowsiness	0	1	2	3	4	5	6
More emotional	0	1	2	3	4	5	6
Irritability	0	1	2	3	4	5	6
Sadness	0	1	2	3	4	5	6
Nervous or Anxious	0	1	2	3	4	5	6
Trouble falling asleep (if applicable)	0	1	2	3	4	5	6
Total number of symptoms:					of 22		
Symptom severity score:					of 132		
Do your symptoms get worse with physical activity?					Y N		
Do your symptoms get worse with mental activity?					Y N		
If 100% is feeling perfectly normal, what percent of normal do you feel?							

Return to Play Protocol

Step 1	Athlete has received written medical clearance from a licensed health care provider to begin the return-to-play process, AND the athlete is back to regular activities, including school, without experiencing any concussion signs, symptoms, or behaviors for a minimum of 24 hours.
Step 2	Low impact, light aerobic exercise. Walking or stationary cycling at slow to medium pace. No resistance/weight training.
Step 3	Basic exercise, such as running in the gym or on the field. No helmet or other equipment.
Step 4	Noncontact, sport-specific training drills (dribbling, ball handling, batting, fielding, running drills) in full equipment. Resistance/weight training may begin.
Step 5	Full contact practice and participation in normal training activities.
Step 6	Contest participation.

What is the best recommendation for return to play (RTP) in an adolescent who has sustained a concussion?

- A. If the athlete has no symptoms after 24 hours, can RTP the next day
- B. If the athlete has no symptoms at rest for 24 hours, can begin light aerobic activities
- C. If the athlete has had loss of consciousness (LOC), RTP is delayed for a week
- D. If the athlete has no symptoms at rest for 7 days, can RTP the next day

- RTP is a very important decision to maintain safety of athletes. RTP should be based on the graduated **RTP protocol**.
- There are **six stages**, and to progress through each stage, the athlete must be asymptomatic for 24 hours.
- If the athlete experiences any post-concussive symptoms at any stage, he or she must return to the previous stage of activity.
- Symptoms in relation to physical activity must be assessed, and no player should RTP if he or she has only been asymptomatic at rest.
- LOC is not relevant for deciding whether a patient should RTP.

Significant amounts of pain are reported by 95% of _____ traumatic brain injury (TBI) patients, but by only 22% of _____ TBI patients.

- A. Severe; mild
- B. Moderate; mild
- C. Mild; severe
- D. All of the above

- The most pain is actually reported by patients with mild brain injury; post-concussive syndrome is thought to involve psychiatric as well as cognitive symptoms.

Seizure Prophylaxis

- Greater risk of development of PTS in the first 2 years postinjury
- Prophylactic use of antiepileptic drugs (AEDs) has not been proven effective in prospective, randomized, controlled studies.
- Phenytoin and valproic acid have been proven effective only during the first week postinjury at decreasing the incidence of early PTS. No benefit seen with prophylaxis for more than 1 week.
- There is also no proof of change in overall outcome with prophylactic use of phenytoin (Temkin et al., 1990) and evidence it may delay recovery.

How long should phenytoin be administered for seizure prophylaxis after a traumatic brain injury (TBI)?

- A. 1 week
- B. 6 months
- C. 1 year
- D. Indefinitely

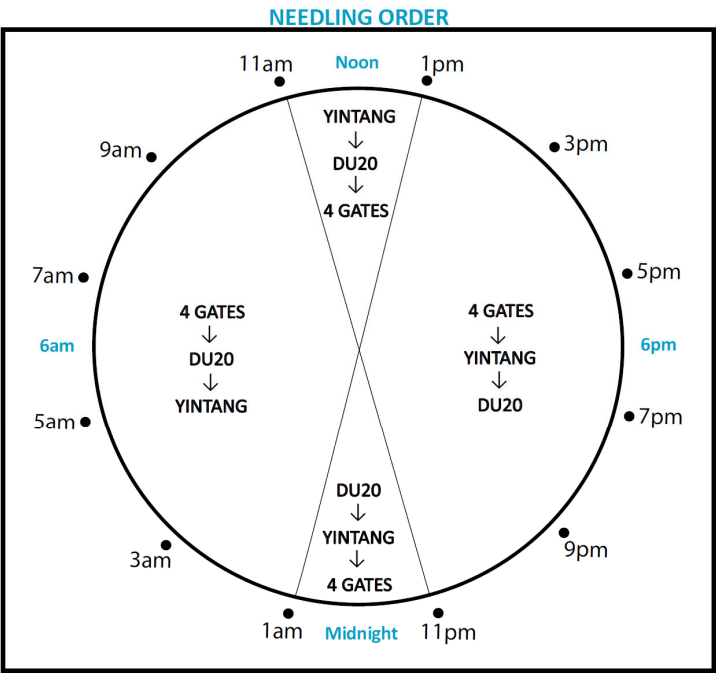
- A study by Temkin et al. determined that phenytoin has been shown to be effective for prophylaxis of seizures when administered for 1 week.
- Beyond 1 week, treatment conferred no benefit to seizure prevention. Long-term use of phenytoin has been associated with impaired neurologic recovery.

1

GATE OPENING

Tong Gi Chim

24 GATE OPENINGS			
EARTH	LU9	H	UB64
		M	GB40
	LI4	H	KD3
		M	LV3
HEAVEN	ST42	H	HT7
		M	PC7
	SP3	H	SI4
		M	SJ4
HUMAN	HT7	E	ST42
		M	GB40
	SI4	E	SP3
		M	LV3
	UB64	E	LU9
		M	PC7
	KD3	E	LI4
		M	SJ4
	PC7	E	ST42
		H	UB64
	SJ4	E	SP3
		H	KD3
	GB40	E	LU9
		H	HT7
	LV3	E	LI4
		H	SI4



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EARTH CIRCUIT				HEAVEN CIRCUIT				HUMAN CIRCUIT			
LU	LI	ST	SP	HT	SI	UB	KD	PC	SJ	GB	LV

