

“A Pain in the Head”

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Learning Objectives

1. Identify **anatomical** structures underpinning “headache”
2. Recognise clinical “**red flags**” warranting urgent referral of a headache patient
3. Understand the mechanism and possible consequences of **repeat sports concussions**
4. Appreciate the need for **return-to-play** guidelines in concussed patients

Headache – Anatomical Structures

Aka cephalgia

A pain in any ANY part of the head

Many tissues / structures can generate this

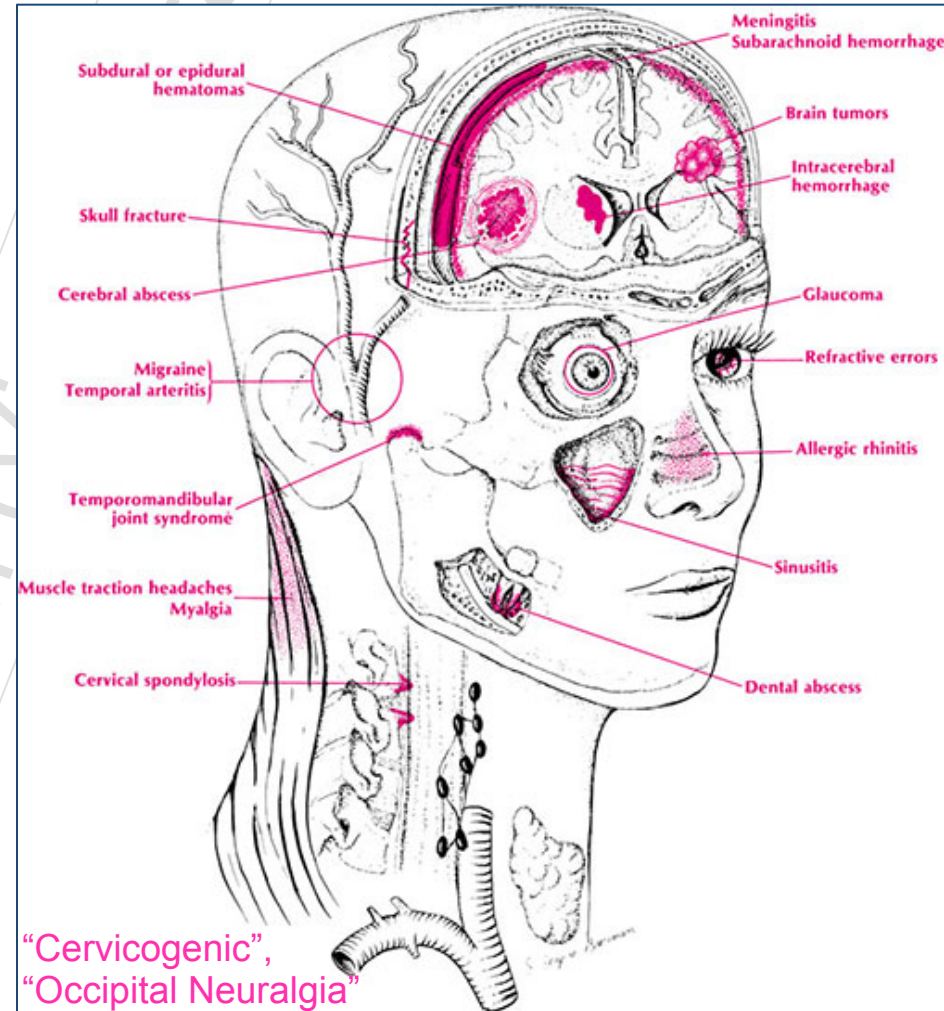
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Headache – Anatomical Structures

Aka *cephalgia*

A pain in any ANY part of the head

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Headache – Pain History

Presentation different between patients

Pain history....



Headache – Pain History

Presentation different between patients

Pain history....

1. How long? Where? What kind of pain?
2. Is it different to previous headaches?
3. Time and timing?
4. Is it the worst headache ever?
5. Timing of onset?
6. Associated symptoms?



Headache – Key Investigations

Which investigations?

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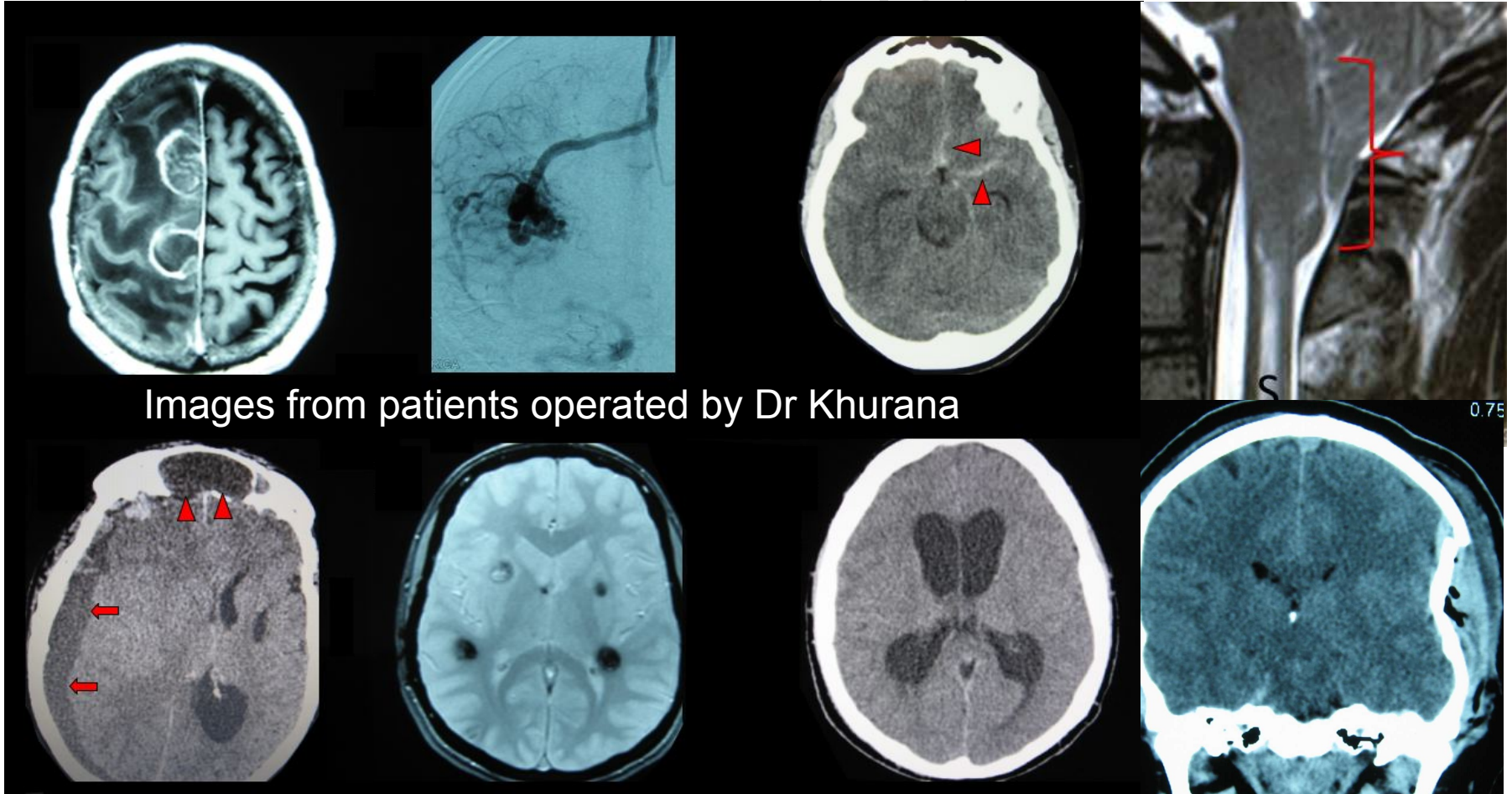
Headache – Key Investigations

Which investigations?

1. CT Brain (contrast preferable)
2. MRI (contrast preferable)
3. MRA “Circle of Willis”
4. Digital subtraction angiography (DSA)

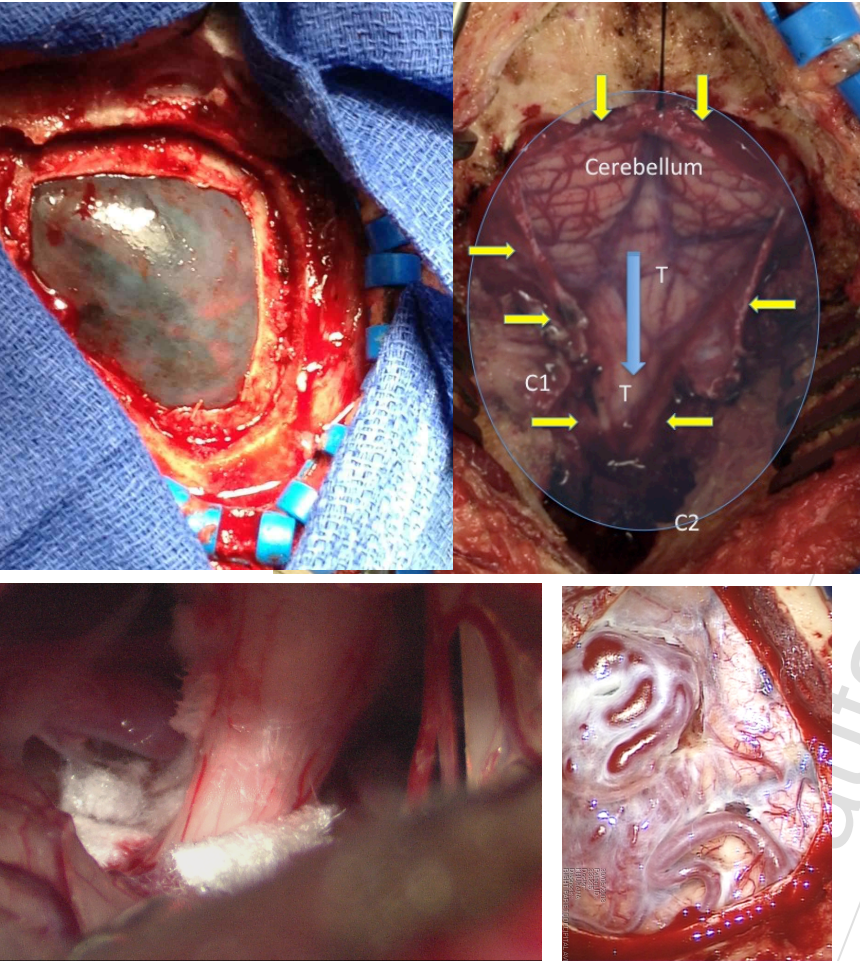
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Headache – Operative Pathology



Dr

Headache – Operative Pathology



Images from patients operated by Dr. Khurana

Dr. Khurana
Patient ID: 353631
Doctor: KHURANA
Diagnosis: PETROUS MENINGIOMA

Young lady, chronic headaches, petrous meningioma

Headache – Clinical Red Flags

Clinical “red flags” warranting referral to a neurosurgeon:

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Headache – Clinical Red Flags

Clinical “red flags” warranting referral to a neurosurgeon:

- “Morning”, “worsening”, “new-onset”, “severest”, and/or “persistent” headache
 - Associated w unexplained nausea and vomiting
 - Associated w fever, neck stiffness, unusual/unexpected visual symptoms
 - Associated w weakness or paralysis, speech changes, gait imbalance, vertigo
 - Associated w events that may be motor or sensory seizures
 - Associated w mental status or personality change

Concussion



Sports Concussion – Review Article



Review

An overview of concussion in sport

Vini G. Khurana, Andrew H. Kaye*

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ABSTRACT

Concussion is a sudden-onset, transient alteration of consciousness due to a combination of functional and structural brain disturbances following a physical impact transmitted to the brain. It is a common, although likely underreported, condition encountered in a wide range of sports. In the Australian Football League, concussion is estimated to occur at a rate of approximately seven injuries per team per season. While many instances of concussion are clinically mild, there is emerging evidence that a player's full recovery from a concussive injury may be more delayed and the sequelae of repeated concussions more severe than previously thought. In this light, a more conservative and rigorous approach to managing players with concussive injuries may be warranted, with the guiding principle being the player's immediate and long-term welfare. The current paper reviews the sports concussion literature. The definition, epidemiology, aetiology, pathophysiology, structural pathology, clinical features, assessment and investigation, treatment principles, and short-term and potential long-term complications of concussion are discussed. Special considerations in paediatric sports concussion, and the return-to-play implications of immediate, evolving and repetitive brain injury are also considered, as are the emerging concept and possible implications of subconcussive injury.

Download article and SCAT 3 PDFs at www.cnsneurosurgery.com.au/more_info.html

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Concussion - Definition

Concussion: What is it?



Concussion - Definition

- Sudden transient **alteration in consciousness** induced by traumatic (especially rotational) biomechanical forces transmitted directly or indirectly to the brain
- Latin *concutere* – “to shake violently”
- *NOT* interchangeable with terms “mild TBI” and “post-concussion syndrome”
- Concussion *does* involve some period of transient amnesia
(especially antegrade)
- “Knock”, “ding”,trivialising a significant cerebral event
- How common? VERY COMMON



(AUS: AFL 6-7 cc/team/season; USA: approx. 4m sports cc's/yr)

Concussion – Clinical Features



Concussion – Clinical Features

- Most common **symptoms** are headache, 'dizziness' and confusion
- Common **signs** include a dazed appearance, disorientation to game details, and impairment of balance and coordination (LOC in 10%)
- For most concussed individuals, symptomatic recovery occurs within 2-10 days of the injury
- Concussion can progress to a “post-concussion syndrome”



Concussion – Assessment – SCAT3

1. Timely, systematic, multifaceted approach
2. Initial on-field assessment (ABCDs, rest 15 mins, then SCAT 3)
3. Don't leave the side of a concussed player (evaluated over at least **a few hours**)
4. “**Red flags**”: GCS < 15; deteriorating mental state; neck pain; progressive, new S&S

SCAT3™

Sport Concussion Assessment Tool – 3rd Edition
For use by medical professionals only



FIFA®



FEI

Name

Date/Time of Injury:
Date of Assessment:

Examiner:

What is the SCAT3?¹

The SCAT3 is a standardized tool for evaluating injured athletes for concussion and can be used in athletes aged from 13 years and older. It supersedes the original SCAT and the SCAT2 published in 2005 and 2009, respectively². For younger persons, ages 12 and under, please use the Child SCAT3. The SCAT3 is designed for use by medical professionals. If you are not qualified, please use the Sport Concussion Recognition Tool¹. Preseason baseline testing with the SCAT3 can be helpful for interpreting post-injury test scores.

Specific instructions for use of the SCAT3 are provided on page 3. If you are not familiar with the SCAT3, please read through these instructions carefully. This tool may be freely copied in its current form for distribution to individuals, teams, groups and organizations. Any revision or any reproduction in a digital form requires approval by the Concussion in Sport Group.

NOTE: The diagnosis of a concussion is a clinical judgment, ideally made by a

1 Glasgow coma scale (GCS)

Best eye response (E)

No eye opening	1
Eye opening in response to pain	2
Eye opening to speech	3
Eyes opening spontaneously	4

Best verbal response (V)

No verbal response	1
Incomprehensible sounds	2
Inappropriate words	3
Confused	4

Pocket CONCUSSION RECOGNITION TOOL™

To help identify concussion in children, youth and adults



RECOGNIZE & REMOVE

Concussion should be suspected if **one or more** of the following visible clues, signs, symptoms or errors in memory questions are present.

1. Visible clues of suspected concussion

Any one or more of the following visual clues can indicate a possible concussion:

Loss of consciousness or responsiveness
Lying motionless on ground/Slow to get up
Unsteady on feet / Balance problems or falling over/Incoordination
Grabbing/Clutching of head
Dazed, blank or vacant look
Confused/Not aware of plays or events

2. Signs and symptoms of suspected concussion

Presence of any one or more of the following signs & symptoms may suggest a concussion:

- Loss of consciousness
- Seizure or convulsion
- Balance problems
- Nausea or vomiting
- Drowsiness
- More emotional
- Irritability
- Sadness
- Fatigue or low energy
- Nervous or anxious
- "Don't feel right"
- Difficulty remembering
- Headache
- Dizziness
- Confusion
- Feeling slowed down
- "Pressure in head"
- Blurred vision
- Sensitivity to light
- Amnesia
- Feeling like "in a fog"
- Neck Pain
- Sensitivity to noise
- Difficulty concentrating

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3. Memory function

Failure to answer any of these questions correctly may suggest a concussion.

- "What venue are we at today?"
- "Which half is it now?"
- "Who scored last in this game?"
- "What team did you play last week/game?"
- "Did your team win the last game?"

Any athlete with a suspected concussion should be IMMEDIATELY REMOVED FROM PLAY, and should not be returned to activity until they are assessed medically. Athletes with a suspected concussion should not be left alone and should not drive a motor vehicle.

It is recommended that, in all cases of suspected concussion, the player is referred to a medical professional for diagnosis and guidance as well as return to play decisions, even if the symptoms resolve.

RED FLAGS

If ANY of the following are reported then the player should be safely and immediately removed from the field. If no qualified medical professional is available, consider transporting by ambulance for urgent medical assessment:

- Athlete complains of neck pain
- Increasing confusion or irritability
- Repeated vomiting
- Seizure or convulsion
- Weakness or tingling/burning in arms or legs
- Deteriorating conscious state
- Severe or increasing headache
- Unusual behaviour change
- Double vision

Remember:

- In all cases, the basic principles of first aid (danger, response, airway, breathing, circulation) should be followed.
- Do not attempt to move the player (other than required for airway support) unless trained to do so
- Do not remove helmet (if present) unless trained to do so.

from McCrory et al, Consensus Statement on Concussion in Sport. Br J Sports Med 47 (5), 2013

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Post-Concussion Syndrome

- Development of symptoms in at least 3 categories within 4 weeks of concussion:
 1. Headache, dizziness, fatigue, noise intolerance
 2. Irritability, depression, anxiety, emotional lability
 3. Subjective concentration, memory or intellectual difficulties
 4. Insomnia
 5. Reduced tolerance to alcohol or stress
 6. Hypochondriacal concerns & adoption of A “sick” role
- PCS may persist for a few to several months



Concussion Treatment

- No specific medical therapies
- **Mainstay:**



Concussion Treatment

- No specific medical therapies
- **Mainstay:** Physical and cognitive rest until resolution of symptoms (usu 2-10 days)
- “REST” means no mobile phones, Xbox video games, iPADs, MP3s...!
- **Plus:** Good hydration, temporary mild analgesics for headache, anti-nausea medications as needed (but *avoid narcotics*)
- Education of players, parents and coaches regarding concussion, its associated risks, and principles of safe return-to-play (RTP)



Chronic Traumatic Encephalopathy

- Seminal work by Bennett Omalu (Pittsburgh Medical Examiner) & colleagues, *Am J Forensic Med Pathol* 2010
 - ✧ Clinical **prodrome before suicide** in five professional American contact sports athletes (4 NFL, 1 WWF) of ages 36 - 50 years

ORIGINAL ARTICLE

Chronic Traumatic Encephalopathy, Suicides and Parasuicides in Professional American Athletes

The Role of the Forensic Pathologist

Bennet I. Omalu, MD, MPH, Jultan Batles, MD, Jennifer Lynn Hammers, DO, and Robert P. Fitzsimmons, JD

Abstract: We present 5 cases of professional American contact sport athletes who committed parasuicides and suicides aged 50, 45, 44, 36, and 40 years old. Full forensic autopsies and immunohistochemical analyses of the brains revealed chronic traumatic encephalopathy (CTE). The brains appeared grossly normal at autopsy without gross evidence of remote traumatic injuries or neurodegenerative disease. Brain immunohistochemical analyses revealed widespread cerebral tauopathy in the form of neurofibrillary tangles and neuritic threads without neuritic amyloid plaques. CTE refers to chronic cognitive and neuropsychiatric symptoms of chronic neurodegeneration following a single episode of severe traumatic brain injury or repeated episodes of mild traumatic brain injury. CTE can only be definitively diagnosed by direct tissue examination. Without full autopsies and immunohistochemical brain analyses these cases would never have been identified. Forensic pathologists will play a vital and central role in the emerging disease surveillance of CTE in professional American athletes, in the identification of CTE cases, and in the establishment of the epidemiology of CTE, with the goal of eventually developing preventive and interventional therapeutic protocols for CTE outcomes.

Key Words: suicide, chronic traumatic encephalopathy, autopsy, forensic pathologist

(*Am J Forensic Med Pathol* 2010;31: 130–132)

immunohistochemistry, the diagnosis of CTE would have been missed in these cases. As a neurodegenerative disease, definitive diagnosis of CTE can only be made by direct postmortem brain tissue analyses.

The forensic pathologist plays a vital role in identifying cases of CTE who committed suicide. We recommend that full autopsies with neurodegenerative analyses of the brains be performed on professional contact sport athletes who die suddenly to identify CTE cases and further confirm the forensic significance of CTE as a valuable ancillary tool in the determination of cause and manner of death.

CASE SERIES

Case One

A 50-year-old white man, who was a professional American football player, and had played in the NFL for approximately 17 years. He died approximately 12 years after his retirement from the NFL, and had manifested progressive symptoms and signs of cognitive and neuropsychiatric impairments (Table 1) including several suicide attempts. He died as a result of myocardial infarction due to coronary atherosclerotic disease. A full autopsy was performed by a forensic pathologist and the whole brain was fixed in formalin for comprehensive neuropathologic examination and neurodegenerative

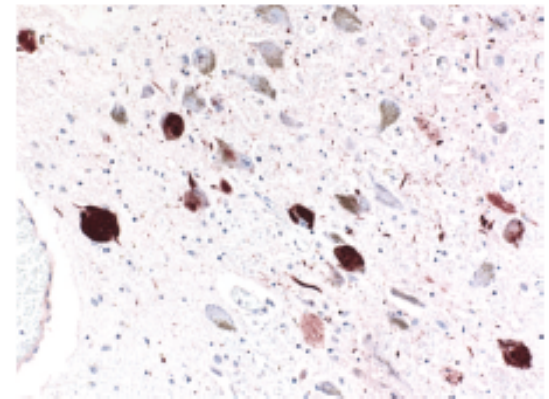


FIGURE 1. Photomicrograph of the polyclonal tau-immunostained section of the locus ceruleus of case two, showing neurofibrillary tangles and neuritic threads accompanied by loss of neurons (x400).

Tau. ApoE-ε4 allele

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CTE – From Repeat Concussions

Symptoms and signs

- Chronic headaches, generalized body aches & pain
- Insomnia, impaired memory
- Loss of executive function
- Breakdown in relationships
- Paranoia, hyperreligiosity
- Rampant mood fluctuations
- Alcohol and drug abuse
- Major depression with suicidal ideation, suicide attempts, completed suicide



Return-to-Play After Concussion

- RTP recommendations based on reported **symptom resolution** alone are *inadequate* (e.g., formal neuropsych testing, electrophysiology, fMRI findings)
- Repetitive concussions an emerging concern
- Detailed **past concussion history**
- Individually tailored recommendations
- Risk of recurrent concussion highest **within 7-10 days** of an acute concussive injury
 - biochemical and ultrastructural basis for this
- **DO NOT RETURN A CONCUSSED PLAYER TO THE FIELD OF PLAY ON THE SAME DAY**



Return-to-Play After Concussion

- 6-stage RTP protocol recommended by an international sports concussion consensus group
- Applies days *after* complete resolution of symptoms
- **Each stage 24 hours**, transitioning from no activity, to light aerobic exercise, sport-specific drills without head impact, more complex non-contact training drills, full contact practice then RTP
- Approx. **7 days AFTER** symptom resolution for adults; **14 days** for those < 18 y.o.
- *May be more applicable to a first, mild / self-limiting concussion in a given season*
- **Prolonged absence** if 2 or more concussions in a season or if severity of symptoms greater than severity of impact

TAKE-HOME MESSAGES

HEADACHE - “think laterally”; “history is (still) king”!

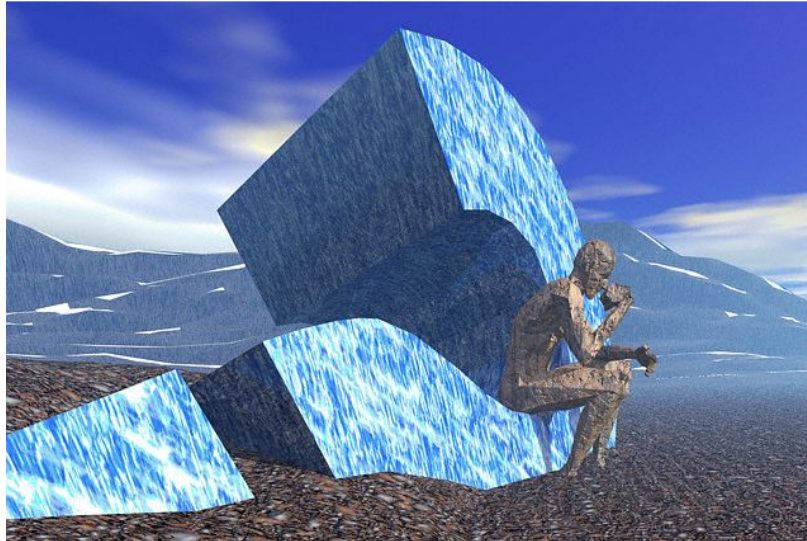
- Look for the “**red flags**”, Ix: CT with & without contrast
- Refer to a **neurosurgeon** if CT has positive finding, or if there are any concerning clinical features



CONCUSSION – It’s common. Needs a more **conservative** Rx approach

- RTP: **7 days** (adults) or **14 days** (< 18 yo) after all symptoms resolve
- Repeat concussions may have delayed neurodegenerative consequences

THANK YOU



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(more info tab – headache/TBI/concussion)

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