CONCUSSIONS AND RETURN TO PLAY: PROTECTING OUR YOUNG PEOPLE

Paediatric Traumatic Brain Injury
Protecting our Kids.

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April 18, 2016

What Every Health Care Professional Should Know about Concussions.

CANADIAN CONCUSSION CENTRE

MY AFFILIATIONS

- Professor of Neurosurgery, University of Toronto
- DIRECTOR, CANADIAN CONCUSSION CENTRE, Krembil Research Institute, Toronto Western Hospital
- Founder, ThinkFirst Canada
- Board Member, Parachute Canada: Canada's National Injury Prevention Charity

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THE CONCUSSION SPECTRUM OF DISORDERS- FROM ACUTE CONCUSSION TO CTE

Charles Tator

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CONCUSSION TOPICS FOR TODAY

1. Definition of Concussion and the Concussion Spectrum of Disorders
2. Mechanisms of Concussion
3. The Problems of Recognition and Diagnosis of Concussions
4. Return to Play, Work or School: Guidelines
5. The Major Consequences of Concussion: Second Impact Syndrome, Post Concussion Syndrome, Mood Disorders and Brain Degeneration
6. Prevention of Concussions

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WHERE DOES CONCUSSION FIT IN THE OVERALL PICTURE OF BRAIN INJURIES?

- Concussion is the most frequent brain injury. In North America, there are 200,000 per year in Canada.
- 25% of players on a Junior B hockey team, average age 18, are concussed each season *Echlin et al 2010 Neurosurgery Focus*
- In football, probably 50% of players each season

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QUESTIONS:

- How many here have had a Brain Injury?
- How many here have had a Concussion?

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TYPES OF BRAIN INJURIES

- Concussion is THE MOST COMMON Brain Injury
- Bruising or Contusion of the brain
- Tearing or Laceration of the brain
- Bleeding and Blood Clots in the brain or around the brain

  (Intracerebral, subdural and extradural haematomas)

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THE CONCUSSION SPECTRUM OF DISORDERS

- Acute Concussion
- Second Impact Syndrome
- Post Concussion Syndrome
- Psychological Consequences – Mood Disorders: Depression/Anxiety
- Brain Degeneration - Chronic Traumatic Encephalopathy (CTE), Movement Disorders, Etc.

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WHAT ABOUT MILD TRAUMATIC BRAIN INJURY?

- Similar to Concussion. Concussion is a better term.
- mTBI- includes a mixture of more severe injuries and focal injuries such as bruises, haemorrhages and contusions of the brain.
- There is nothing “mild” about concussions which can produce permanent consequences.
- Many members of the public now understand what a concussion is, and not even health care professionals agree on what mTBI is except that it is an oxymoron.

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CONCUSSION IS THE MOST COMMON TYPE OF BRAIN INJURY. CONCUSSION IS A BETTER TERM THAN MTBI.

1. Concussion is now widely recognized by the public
2. The consequences of concussions are often not mild
3. More Homogeneous- no admixture of clots and bruises

in mTBI, GCS=13-15

EYE RESPONSE (E)	Open Spontaneously	4
	Open to verbal command	3
	Open in response to pain	2
	No response	1
VERBAL RESPONSE (V)	Talking / Orientated	5
	Confused speech / Disorientated	4
	Inappropriate Words	3
	Incomprehensible sounds	2
	No response	1
MOTOR RESPONSE (M)	Obeys commands	6
	Localizes to pain	5
	Flexion / withdrawal	4
	Abnormal flexion	3
	Extension	2
	No response	1
	TOTAL	3-15

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DEFINITION OF CONCUSSION

- Immediate and temporary alteration of mental functioning due to trauma
- The trauma does not have to be directly to the head, and can be due to a whiplash effect on the brain from a blow elsewhere on the body

(OLD Terms: "Bell Ringer", "Ding", "Seeing stars" were all concussions)

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WHAT IS THE MECHANISM OF CONCUSSION?

- Exact mechanism unknown
- **Rotational acceleration** more important than linear acceleration–the "jiggle" of the brain within the skull causes concussion
- Axonal injury may occur
- Probably, the first concussion is a biochemical injury
- NOT DUE TO Bleeding
- NOT DUE TO Tearing or Bruising of the brain

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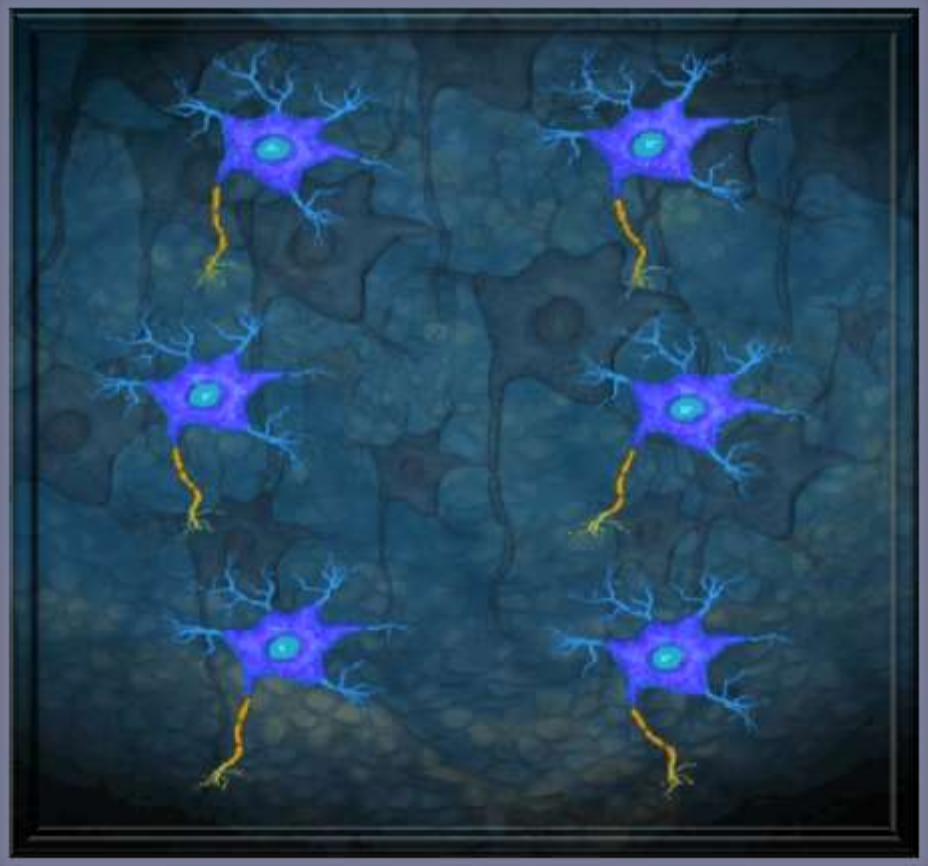
BRAIN MOVES WITHIN SKULL



Concussion may be a biochemical injury. **Mouse cursor** on centre of diagram to start movie.

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SCIENTIFIC EXPLANATION OF CONCUSSION

UNKNOWN

- A **genetic predisposition is** suspected, but is unproven. If there is a genetic predisposition, then screening might be feasible and would be desirable

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CAUSES OF CONCUSSION

- Motor vehicle crashes
- Falls at home
- Work related injuries
- Sports and recreation – e.g. football, hockey, rugby, soccer, lacrosse, etc.
- Military action
- Spousal abuse

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CONCUSSION IN SPORTS ARE IMPORTANT

- Concussions in sports are especially common in collision sports such as hockey and football
- Players often have repetitive concussions
- Repetitive concussions can have major consequences, including brain degeneration

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FEATURES OF CONCUSSIONS

1. Mild injury - usually, especially the first concussion, complete recovery in about 90%
2. Diffuse injury. No focal neurological deficits in cranial nerves, motor or sensory exams
3. Subtle deficits- eg dizziness, nausea, photophobia
4. Major cumulative effects from repetitive injury
5. There is no evidence-based grading system.

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FACTORS AFFECTING THE INCIDENCE OF CONCUSSION

Activity- hockey, football, occupation

Age-especially adolescents (sports) and older people (falls)

Gender-women have higher % e.g. hockey

Number of Previous Concussions

Genetic Effects- runs in some families

Pre-Existing Conditions: migraine, ADD, ADHD, Depression

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INCIDENCE OF CONCUSSIONS IN ONTARIO CHILDREN AND YOUTH AGES 3-10 IN 2003-2010

TABLE 1
Total annual number of visits for paediatric concussions to an emergency department and physician office in Ontario, 2003 to 2010

Year	Emergency department	Physician office	Total number of visits	Rate per 100,000
2003	4180	4556	8736	340.5
2004	4791	4893	9684	378.5
2005	4701	4979	9680	379.8
2006	4847	4945	9792	386.1
2007	5252	5439	10,691	423.3
2008	5583	5968	11,551	460.0
2009	6443	7235	13,678	548.8
2010	6495	8391	14,886	601.3
Total	42,292	46,406	88,698	–

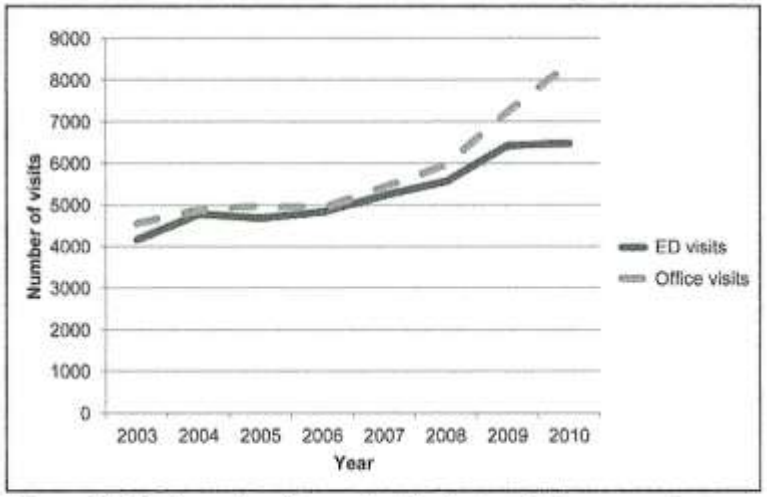

Figure 1) *Total number of annual visits for paediatric concussion to an emergency department (ED) and physician office in Ontario, 2003 to 2010*

(Macpherson et al, 2014)

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AGES OF CONCUSSED ONTARIO CHILDREN AND YOUTH

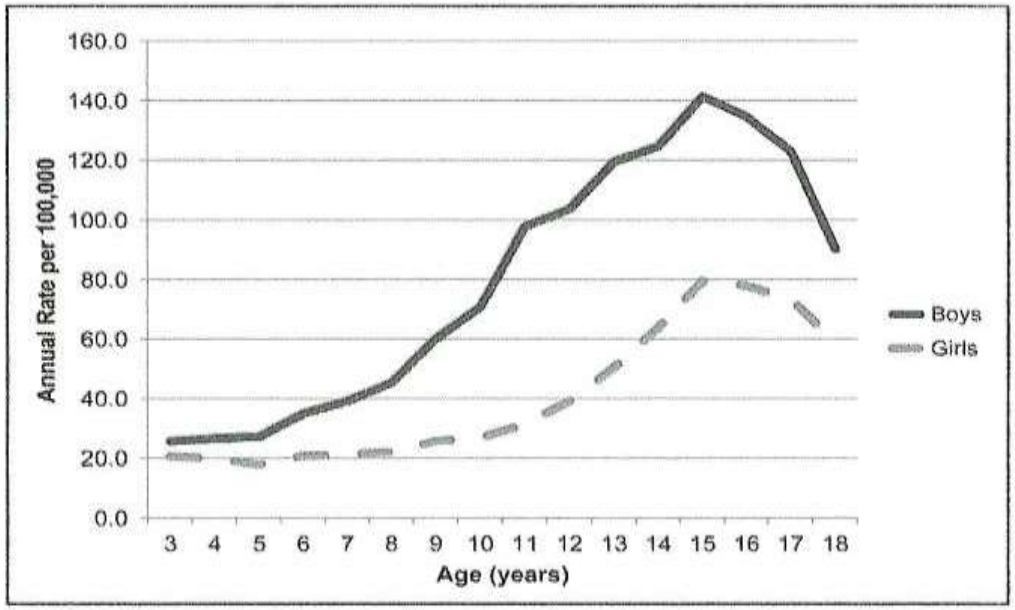

Figure 2) *Paediatric emergency department and physician office visit annual concussion rate among boys and girls per 100,000 population according to age, 2003 to 2010*

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CAUSES OF CONCUSSIONS IN ONTARIO CHILDREN AND YOUTH

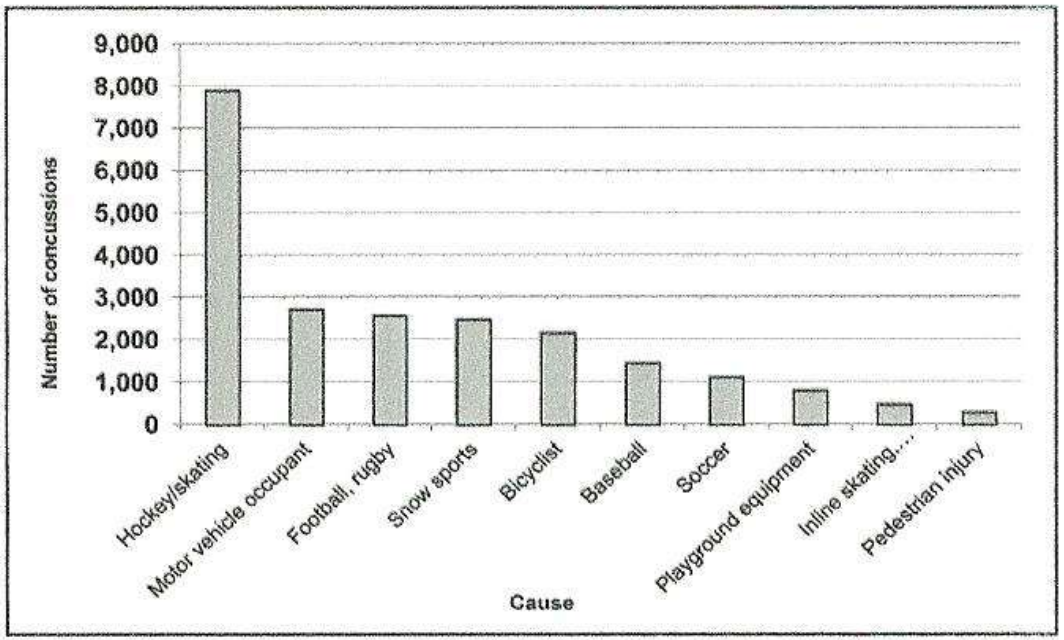

Figure 3) *Emergency department visits for paediatric concussion according to selected causes in Ontario, 2003 to 2010*

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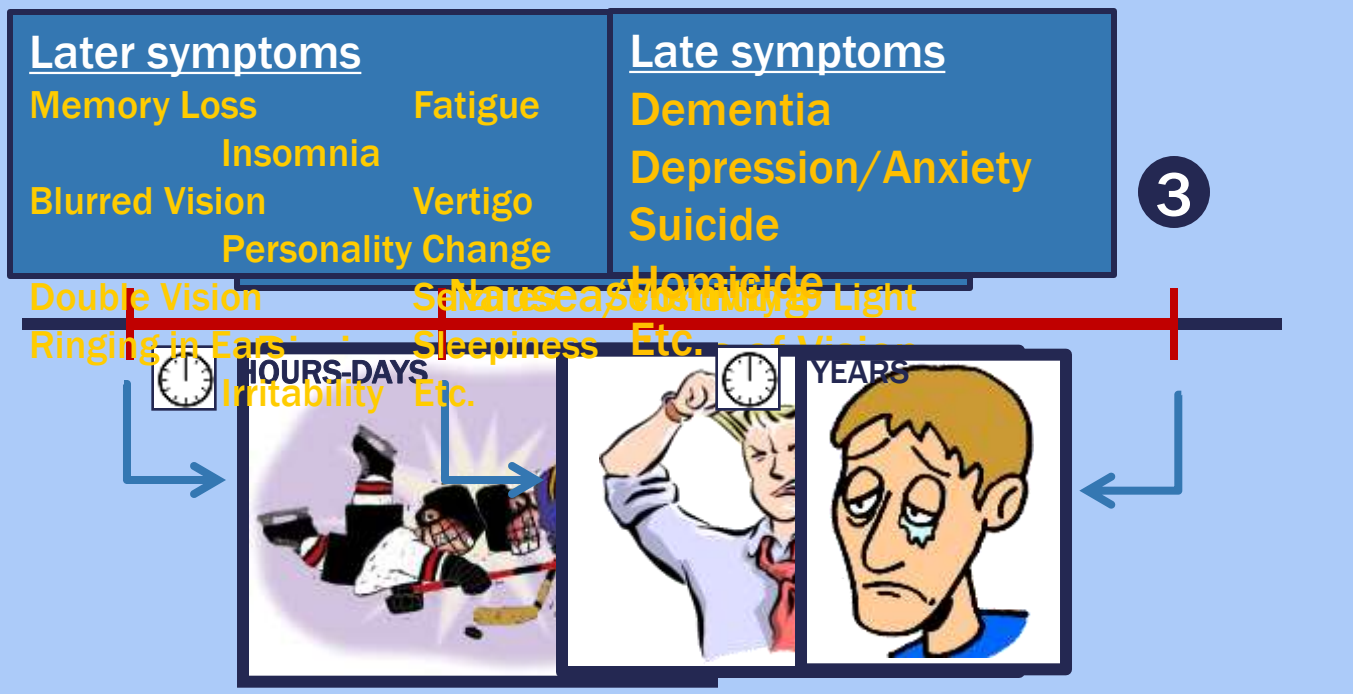
SYMPTOMS AFTER CONCUSSION

NOTE – SYMPTOMS VARY AMONG PATIENTS



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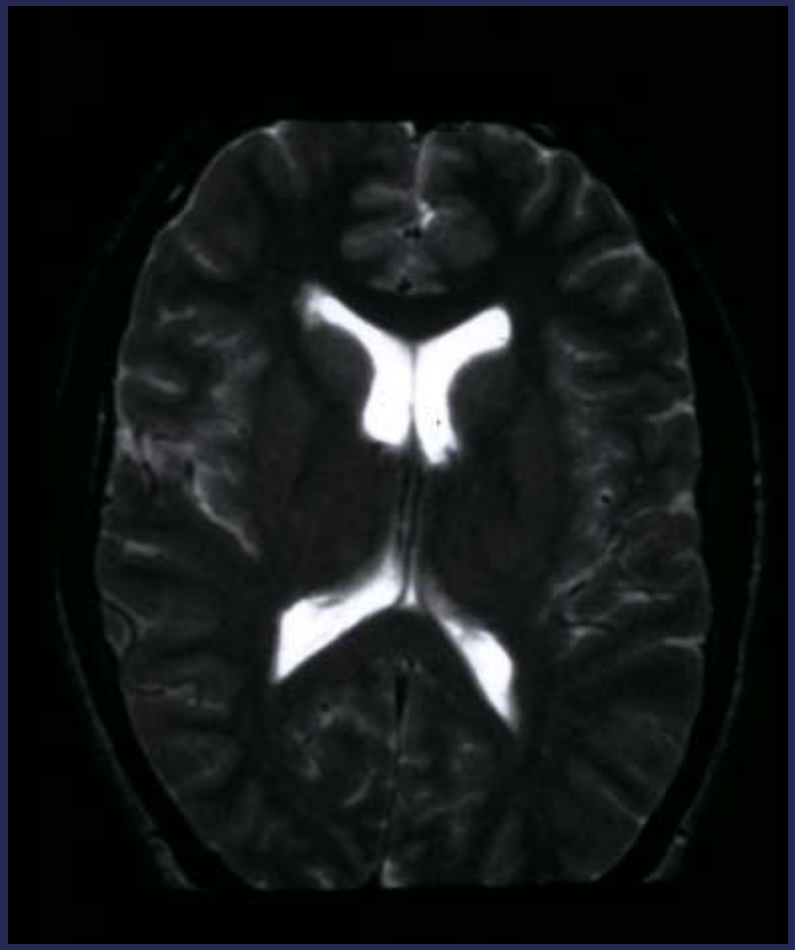
Can You Diagnose a Concussion on a CT Scan or MRI?

NO!

Click to continue!



Routine CT and MRI are always normal after concussion

If there is a lesion identified, it is more than a concussion

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CONCUSSION DIAGNOSIS

- The diagnosis of concussion is made **CLINICALLY**
- The diagnosis depends on a knowledgeable doctor and a compliant patient
- Therefore, **BIG PROBLEMS!!!!** because of uninformed docs and non-compliant patients

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INTERNATIONAL CONSENSUS STATEMENTS ON CONCUSSION IN SPORT

Consensus Statements based on International Sport Concussion Conferences among Leading Concussion Experts.

Last conference in Zurich in 2012 and statement was published in 2013

Sport concussion guidelines are relevant for concussions from all other causes-work, MVC, falls in elderly, etc.

Stay tuned-next conference in Berlin in October, 2016, and there will be changes: we are on a learning curve!

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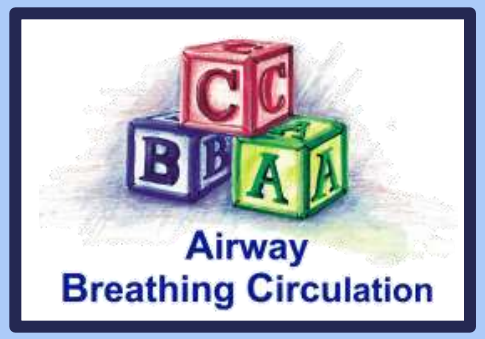
CONSENSUS STATEMENTS - MANAGEMENT

A. First Steps

- If there is loss of consciousness – Initiate Emergency Action Plan. Call 911 to get an ambulance. Assume possible neck injury.
- Assess ABCs: Airway, Breathing and Circulation
- Important acute management principles (next slide)



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CONSENSUS STATEMENTS – MANAGEMENT (CONT'D)

1. Remove the person from the current game, practice or work environment
2. Do not leave the person alone; monitor signs and symptoms
3. Do not administer medication
4. Inform parent or guardian if applicable
5. The person should be evaluated by a medical doctor
6. The player must not return to the current game or practice or work environment

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CONSENSUS STATEMENTS – MANAGEMENT (CONT'D)

B. Later Management for Athletes

- ***The 6-step Graduated Return to Play Protocol***
- **Step 1** - physical and mental rest.
  - → No return to activity until all symptoms have resolved, and do not recur even after provocative exercise during Steps 2-5.
  - → If any Symptoms or Signs Return, Stop the Process, and Return to Previous Step

Never return to play if symptoms persist or recur with exercise!

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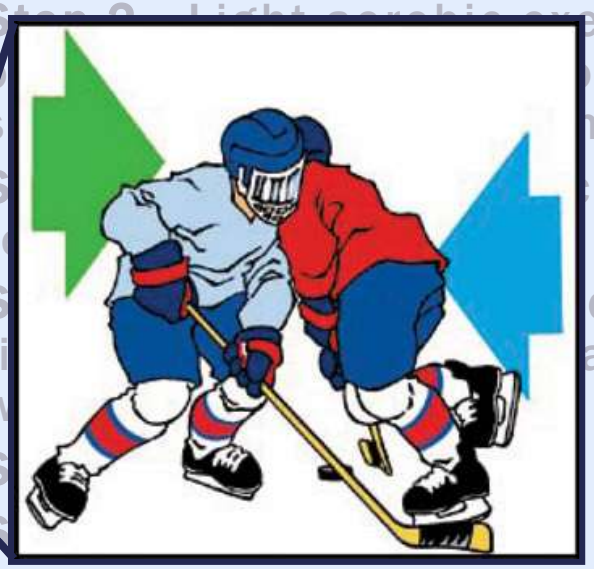
CONSENSUS STATEMENTS – MANAGEMENT (CONT'D)



The time needed to progress from non-contact to contact exercise (4→5) will vary with the severity of the concussion and the player. Only go to step 5 after medical clearance. Again, go back to Step 1 if symptoms recur.

Click for next slide!

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MANAGEMENT – CLINICAL SUMMARY

- Return to play, learn or work is gradual.
- If severe symptoms return during this process, the person must be re-evaluated by a physician. No return to play if any symptoms or signs persist. Graduated return to school or work even if symptoms persist in low-risk environment.
- Remember, symptoms may return later that day or the next, not necessarily when exercising!

In sports each step should take at least one day. Therefore, the minimum time for return to play is one week, and double that for children

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For Non-Docs coaches, trainers, teachers, etc

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

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 so do.
- 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

Download from parachutecanada.org

INDICATIONS FOR CONCERN

Permanent Termination "Modifiers"

- Continuing neurological symptoms and signs, especially cognitive deficits
- Multiple concussions over short period of time
- Long duration to recover e.g. months
- Lesions seen on imaging-CT or MRI

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RETURN TO PLAY/WORK GUIDELINES

- Two aspects:

1. When to Return
2. When to Never Return or Terminate?

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CRITERIA AND GUIDELINES FOR RETURN OR NEVER RETURN TO PLAY

Criteria	Can Return To Play	Never Return to Play
1. *Neurological Examination*	No neurological deficits	Presence of any neurological deficits or significant symptoms
2. *Number, pattern and severity of previous concussions*	Small number, dispersed in time, low severity and complete recovery	Multiple, over a short period of time, high severity
3. *Length of time to achieve recovery*	Short duration (days)	Long duration (several months or years)
4. *Neuropsychological evaluation- detailed*	No cognitive deficits	Presence of cognitive deficits
5. *MR/CT findings*	No abnormalities	Presence of lesions

RETURN TO LEARN AND RETURN TO WORK GUIDELINES

- Much More Complex than Return To Play Guidelines
- Needs to be Individualized
- “Accomodations” are Usually Necessary
- Team Interaction/Communication and feedback to schools/employers
- Based On Clinical Evaluation
- NO HELP FROM ANY IMAGING OR OTHER BIOMARKER!!!

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CONCUSSION LEGISLATION AND REGULATION

- Concussion Legislation was enacted in all 50 states in USA by 2014. Involves mandatory education about concussion and mandatory management principles for concussion.
- In Ontario, Bill 39 legislation introduced in 2012, but it died.
- PPM 158 on Concussions announced March 31, 2014 and in force Jan. 31, 2015 in all 72 Ontario School Boards.
- School Board responsibility to implement
- Requires **Education** of teachers, students and parents about concussion
- Regulates **Management** of concussion such as removal from play and principles of return
- What about other provinces?

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THE CONCUSSION SPECTRUM - SUBSEQUENT AND LATE EFFECTS

- Second Impact Syndrome
- Post concussion Syndrome
- Psychosocial problems – Depression, Anxiety, Behaviour Change, Suicide
- Epilepsy
- Cognitive Deficits and Dementia
  - →Chronic Traumatic Encephalopathy (CTE)

SECOND IMPACT SYNDROME OR MALIGNANT BRAIN SWELLING

- Results from a second head hit a few days later when there has not been full recovery from the first head hit
- Can be catastrophic, and even fatal.
- Exact mechanism unknown (?loss of autoregulation leading to cerebrovascular congestion, brain swelling, increased intracranial pressure, herniation of the brain).
- Is completely preventable by preventing the second hit.
- Treatment is poor.
- Can also occur without an identifiable first injury.

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Evidence Table for Second Impact Syndrome
(all are class III evidence)

Article	Case Report	Result
Fekete	16 y/o male hockey player	Death
Saunders & Harbaugh	19 y/o male football player	Death
McQuillen et al	18 y/o male downhill skier	PVS
Kelly et al	17 y/o male football player	Death
Cantu & Voy	16 y/o hockey player	Death
	17 y/o boxer	Death
	19 y/o boxer	Death
	17 y/o boxer	Death
	21 y/o boxer	Death
	24 y/o boxer	Death

Fekete, JF in CMAJ, 1968

Hemorrhages in brainstem due to herniation of the brain

Death of a young hockey player due to second impact syndrome

Click for next slide!

ROWAN STRINGER, AGE 17, OTTAWA HIGH SCHOOL, RUGBY, 2013. INQUEST, MAY, 2015

Recent Case of Second Impact Syndrome

- Friday - concussion in rugby game
- Monday - concussion in rugby game
- Wednesday another head injury in rugby game caused malignant brain swelling, herniation of brain, emergency neurosurgical decompression did not help.
- Declared brain dead a few days later and was an organ donor
- Accurately texted her history to friends, but told no adults

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WILL ROWAN'S LAW LEAD TO CONCUSSION LEGISLATION IN ONTARIO?

- Rowan's parents, Gordon and Kathleen Stringer, and Lisa McLeod MPP in Ottawa and others including me are lobbying to prevent further deaths and disability from concussion by passing concussion legislation.
- Did the killing of Bill 39 in 2012 and the failure to reintroduce it lead to the killing of Rowan Stringer in 2013?
- The Stringer inquest in 2015 found that none of the adults with whom Robin came in contact during the last week of her life had received any concussion education: her coaches, teachers, referees and parents.
- The inquest found that Robin and her peers had received no education about concussion in school or out of school

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POSTCONCUSSION SYNDROME

1. Debilitating condition affecting a large number of people, difficult to diagnose, with **no clear pathophysiology** and with only symptomatic **treatment** available.

2. **Does PCS lead to CTE??**

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PATIENT CHARACTERISTICS IN OUR SERIES OF 221 PATIENTS WITH PCS

- Mean age: 27.0 years
  - Range 10-74 years
  - 123 (55.7%) of all patients were ages 10-22
- Sex ratio: 127 (57.5%)male: 94 (42.5%) female
- Can occur after any cause of concussion: sports, work, MVC, etc

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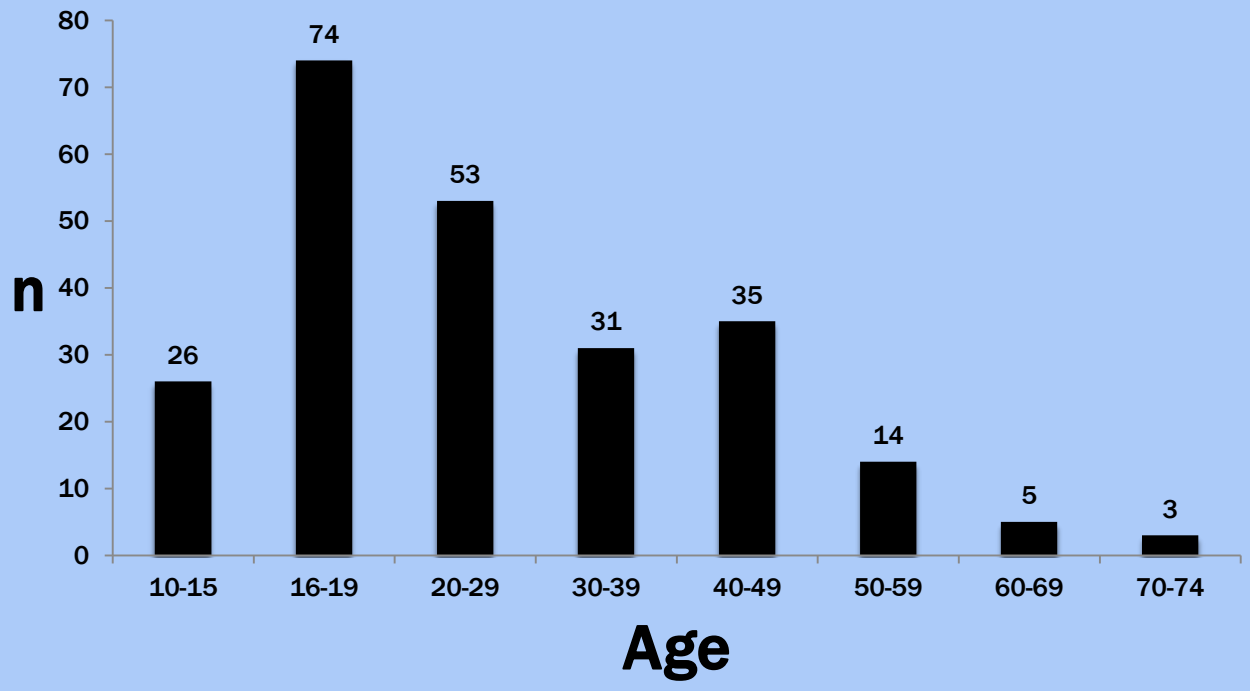
AGE OF PATIENTS WITH PCS (AT LAST CONCUSSION). (N=221) M=27.0



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PERSISTENT SYMPTOMS

- **Mean number**: 8.1
  - Range of 3-23 symptoms
- **Most common** symptoms:
  1. Headaches (89.1%)
  2. Memory Problems (61.5%)
  3. Concentration Problems (54.8%)
  4. Balance problems (52.0%)
  5. Dizziness (51.6)
  6. Fatigue (45.7%)
  7. Nausea (43.0%)
  8. Sensitivity to light (38.9%)
  9. Irritability (31.7%)
  10. Depression (30.8%)

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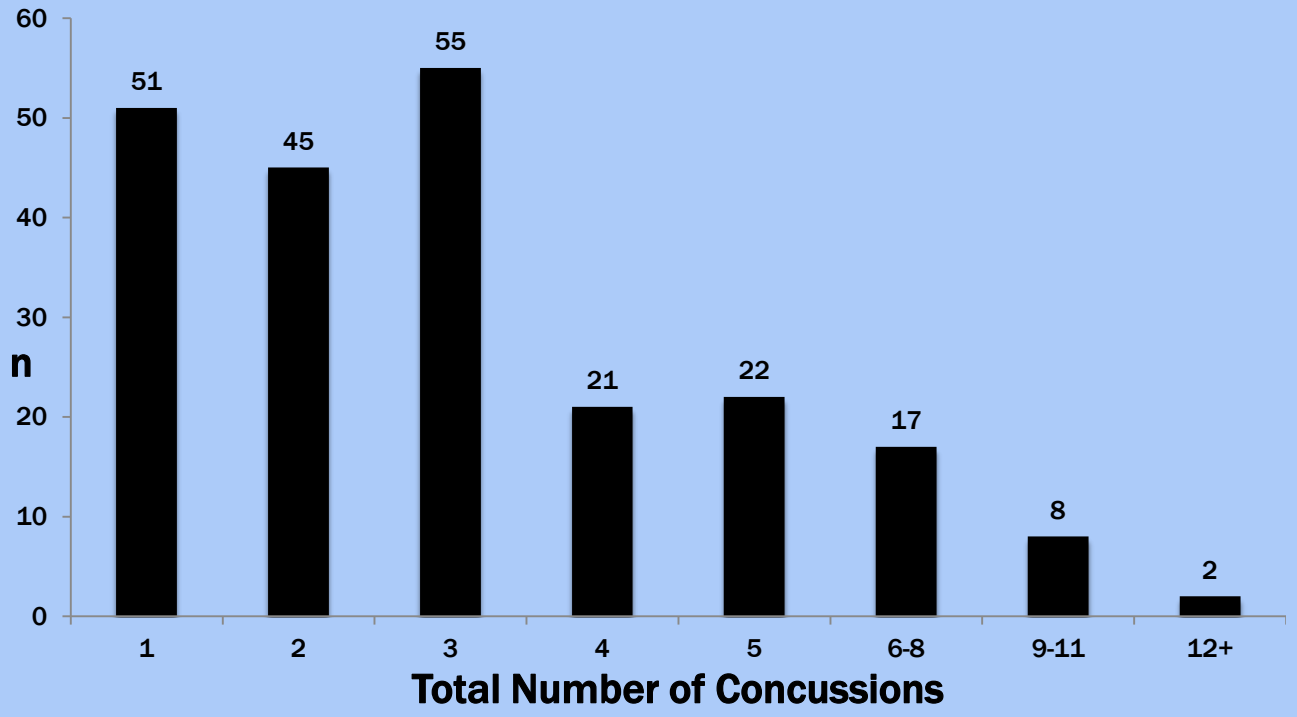
OF CONCUSSIONS PER PATIENT (INCLUDING MOST RECENT). (N=221) M= 3.3



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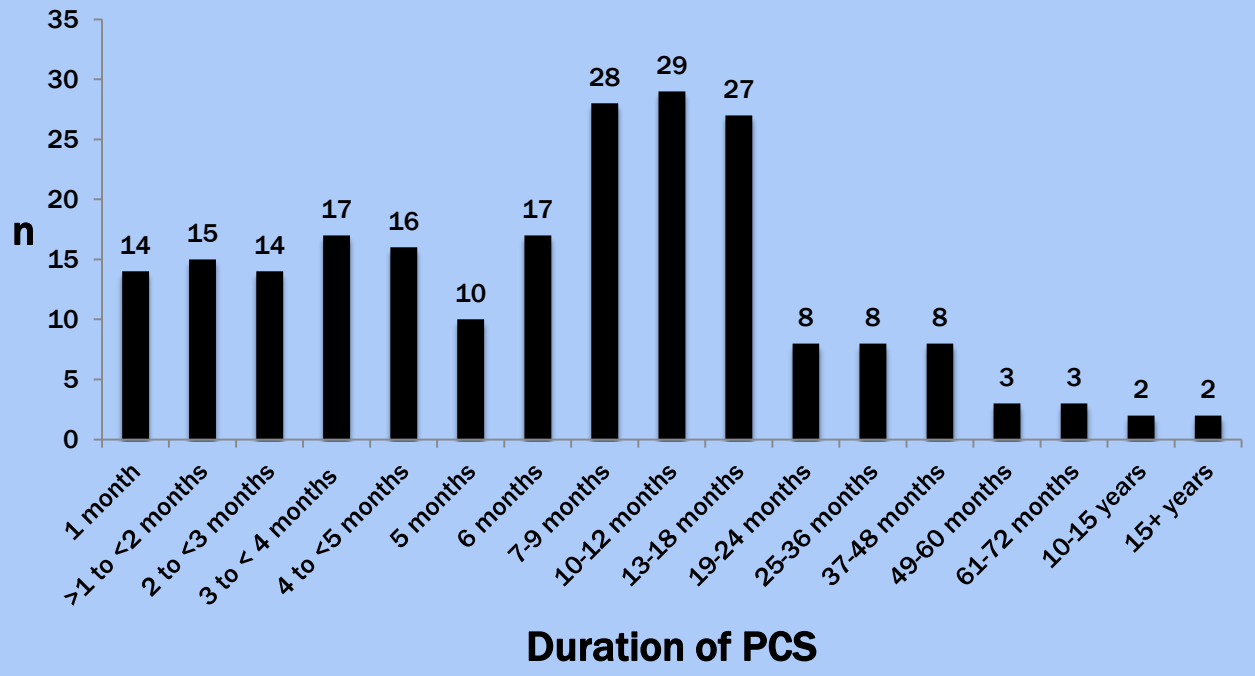
DURATION OF PCS. (N=221) M=7 MONTHS, RANGE: 1 MONTH TO 26 YEARS



(In most patients, the actual duration is longer as PCS had not resolved at time of last examination.)

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FOLLOW-UP STUDY OF RECOVERY IN 110 PCS CASES (BY QUESTIONNAIRE). WHO RECOVERS? WHO DOES NOT RECOVER?

RESULTS:

- Good chance of recovery in 1st year
- Less chance during years 2-3
- No recovery after 3 Years

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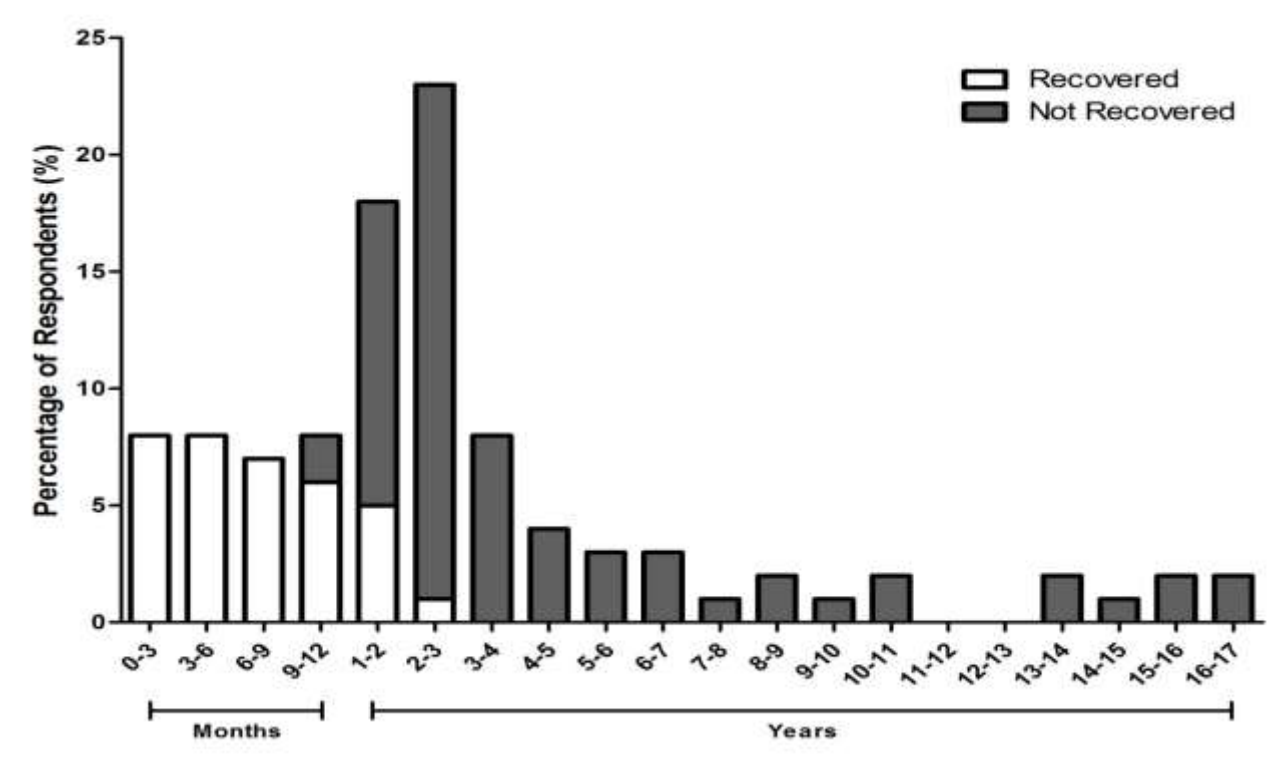
TIME TO RECOVER FROM POSTCONCUSSION SYNDROME (PCS), AND FAILURE TO RECOVER.



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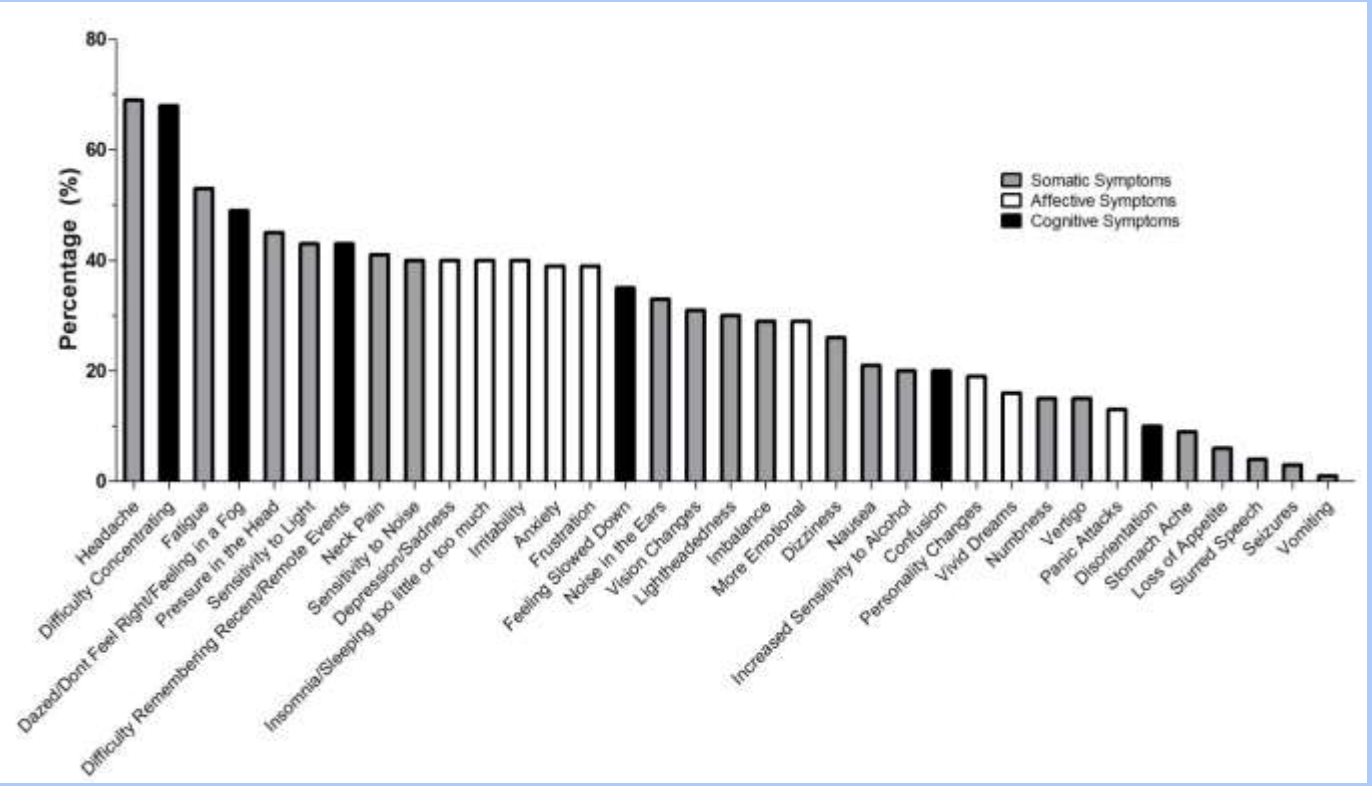
POSTCONCUSSION SYNDROME (PCS). % OF NON-RECOVERED GROUP (N=80) WITH CONTINUING SOMATIC, AFFECTIVE, AND COGNITIVE SYMPTOMS



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We examined 334 patients with postconcussion syndrome (PCS) and compared two age groups:

- Age 10-19 n=150 patients
- Age 20-74 n=184 patients

The following variables were studied:

- Post Concussion Symptoms – males vs. females
- Mechanism of Injury
- Loss of Consciousness & Amnesia
- Type of postconcussion symptoms
- Main neurological symptoms
- Main psychological symptoms

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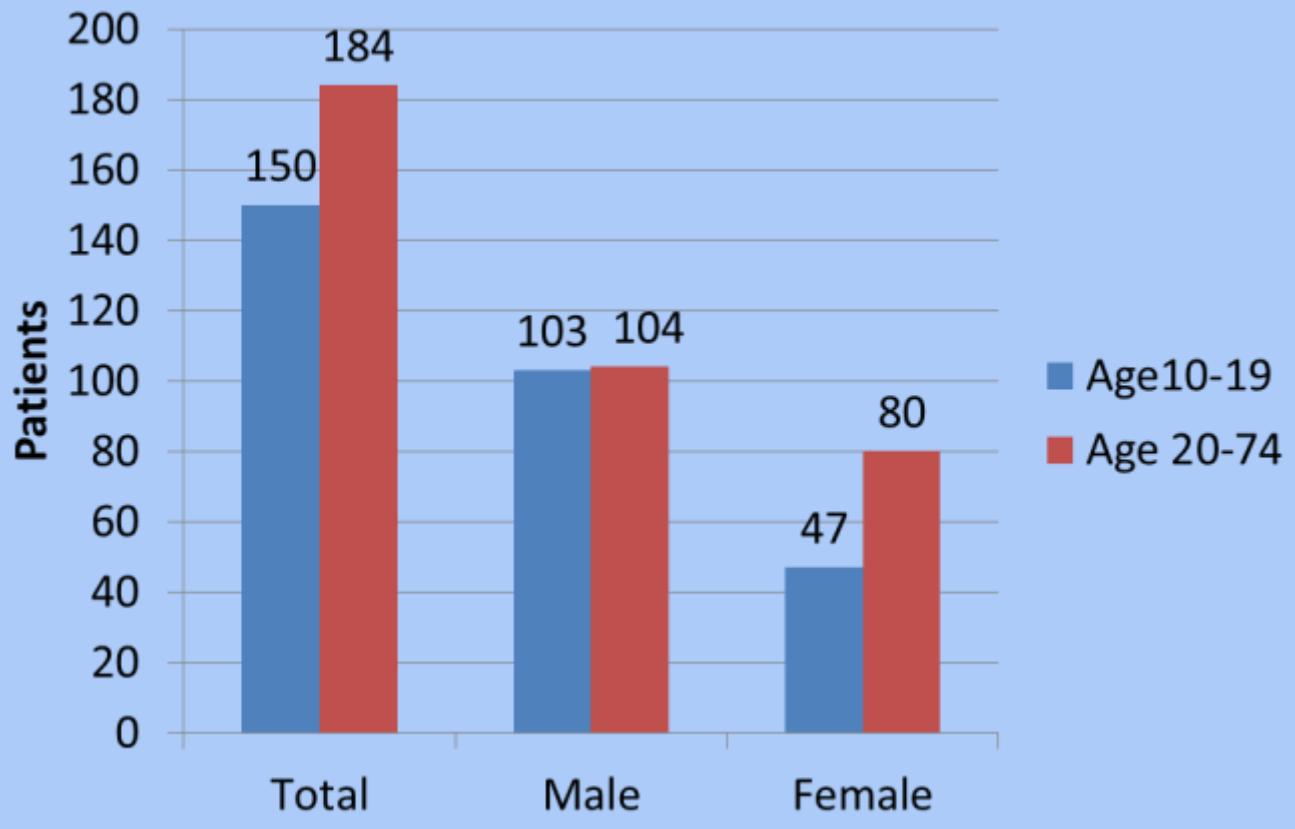
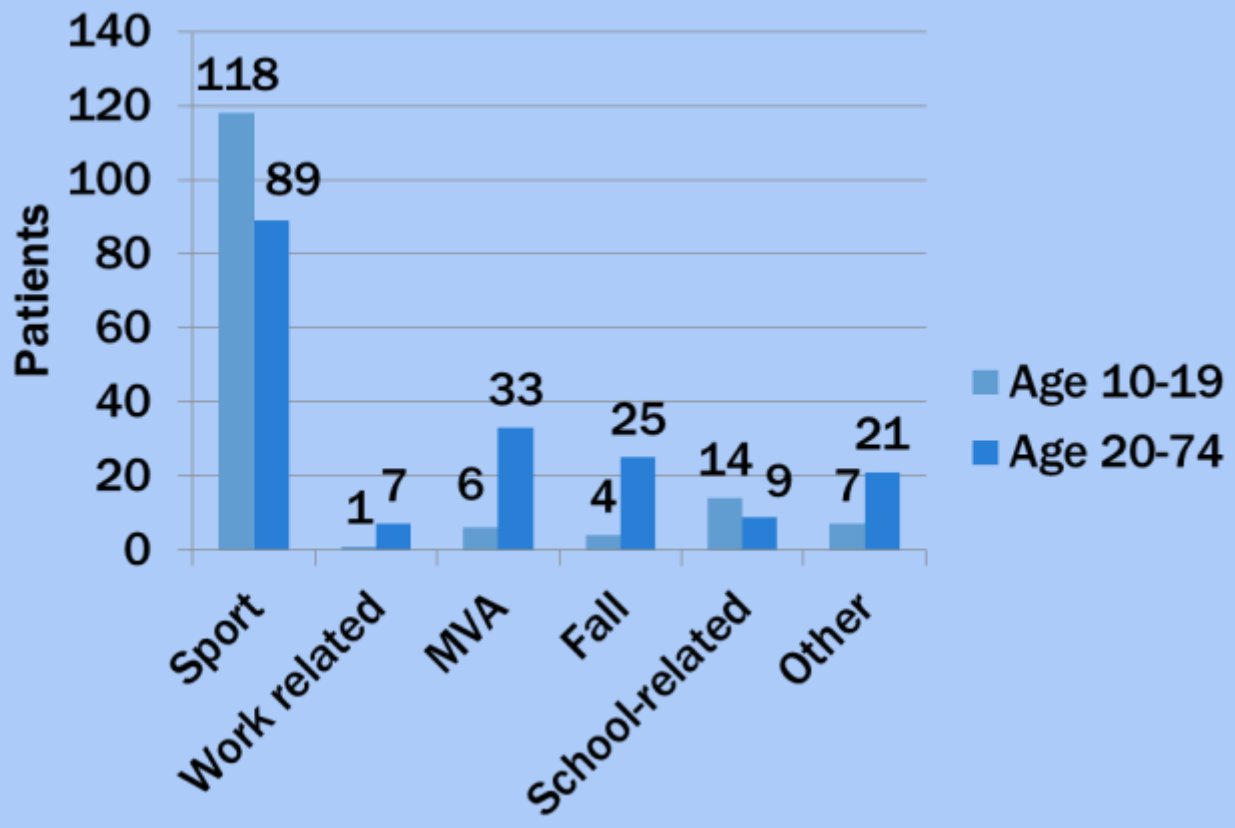
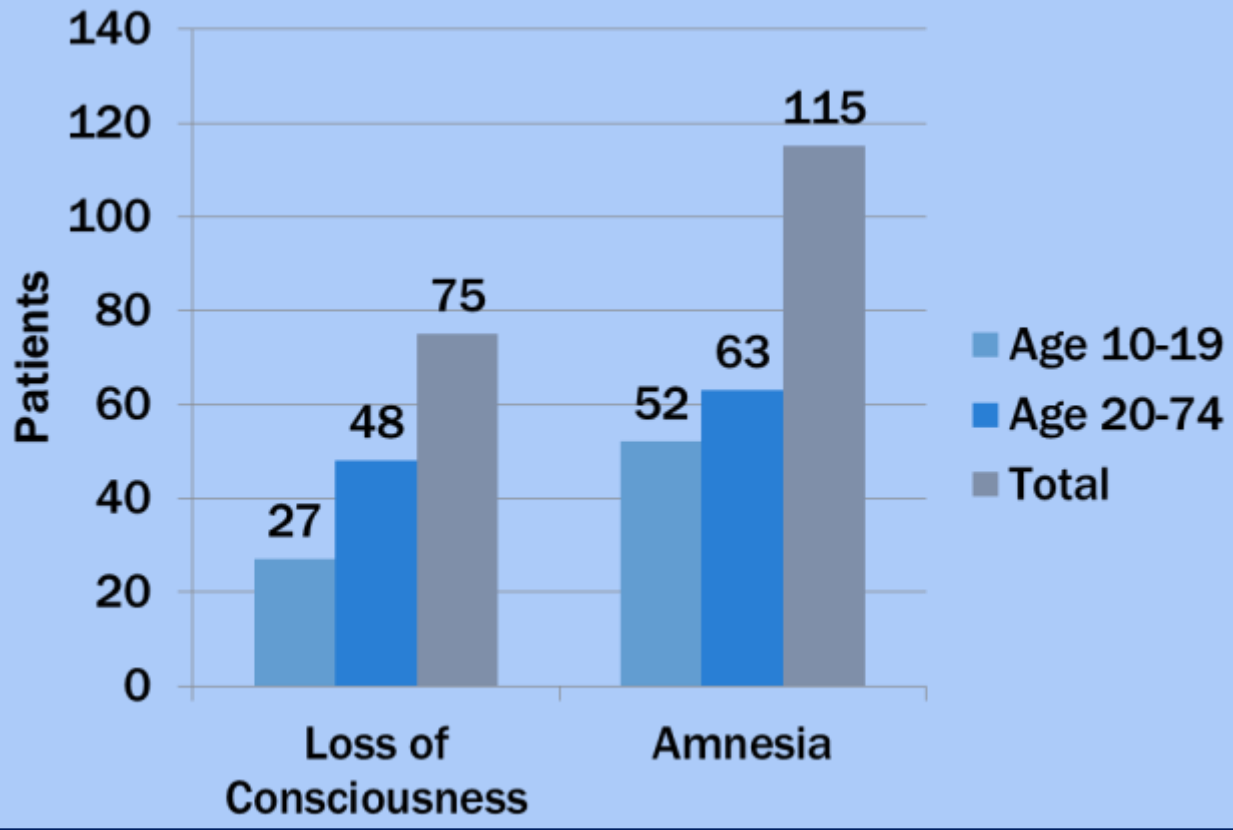
SIMILAR PFROPORTIONS OF MALES AND FEMALES-PCS



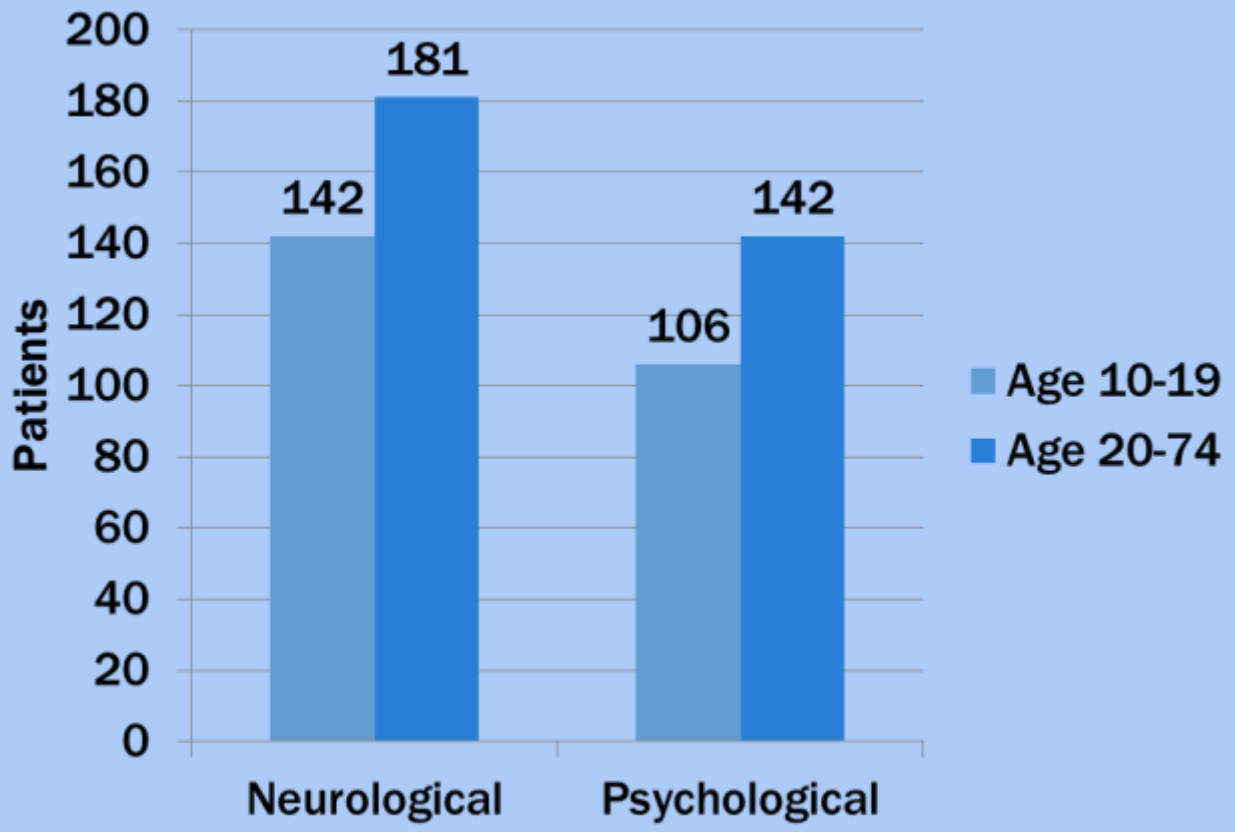
MSIMILAR CAUSES OF INJURY N=334 FOR YOUNG VERSUS OLDER CASES



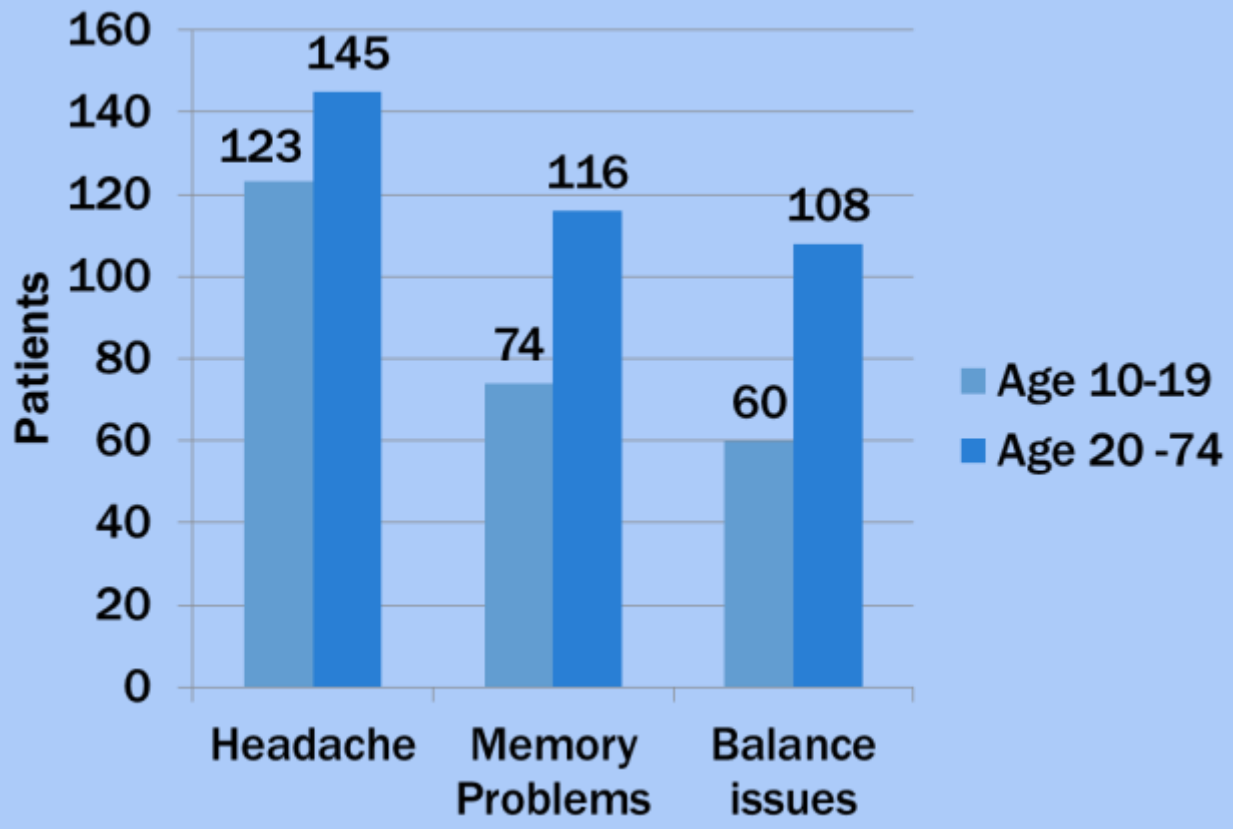
SIMILAR INCIDENCE OF LOSS OF CONSCIOUSNESS &AMNESIA N=334



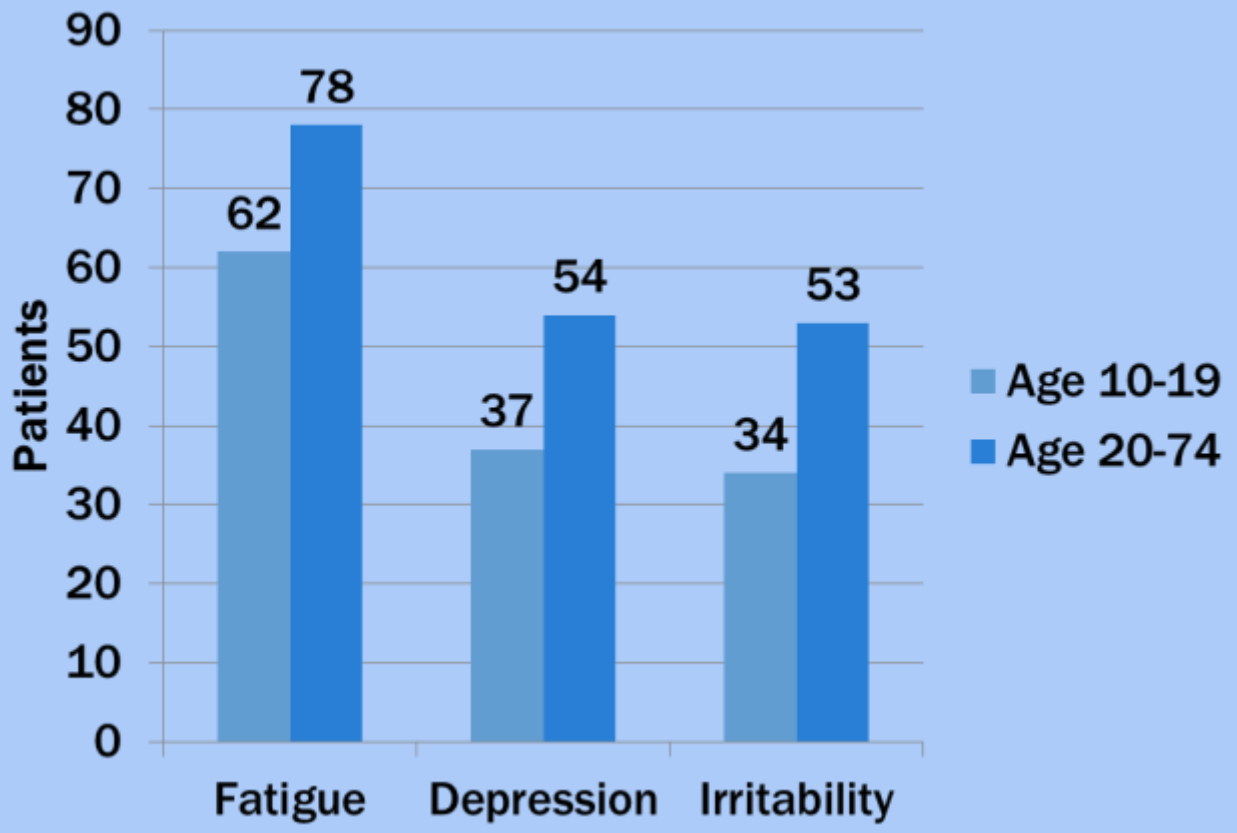
SIMILAR TYPES OF CONCUSSION SYMPTOMS



YOUNGER PEOPLE HAVE SIMILAR BALANCE AND COGNITIVE SYMPTOMS



SIMILAR PSYCHOLOGICAL SYMPTOMS



SUMMARY OF AGE AND GENDER DIFFERENCES

- **Gender contrast**

There were no major differences among adolescent boys and girls, but in adults, there was a greater number of females.

- **Mechanism of Injury**

Sport was the main cause of concussion in both age groups, and MVA and Falls were the second and third causes of injury in adults. Sport was especially common in young people

- **Postconcusion Symptoms**

PCS patients in both age groups experienced more neurological symptoms than psychological symptoms.

Headache, memory problem and balance impairment were the main neurological symptoms.
Depression, irritability and fatigue were the main psychological symptoms.

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TREATMENT OF PCS

- Vestibular therapy-repositioning
- Physiotherapy for accompanying whiplash
- Acupuncture
- Analgesics for non-specific headaches
- Specific anti-migraine meds for migraine
- Psychotherapy or meds for depression and anxiety

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PSYCHOLOGICAL MANIFESTATIONS OF THE NEUROLOGICAL INJURIES IN PCS

- Depression
- Anxiety
- Anxiety plus Depression

Affects a large number of concussed people, usually with other aspects of PCS. **Treatment is often effective:** psychotherapy, medication or both

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TREATMENT OF PCS (CONT'D)

- No proven therapy for most symptoms.
- No proven therapy for accelerating recovery.
- Graduated return to school, play, work can be helpful.
- Thus, prevention is essential.

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DOES PCS PROGRESS TO CHRONIC TRAUMATIC ENCEPHALOPATHY (CTE)?

- Was called Dementia Pugilistica because first described in boxers by Martland, HS (JAMA, 1928)
- Also known as the “punch drunk syndrome” because of intellectual decline, balance impairment, slurred speech, tremor
- Variable latency after repetitive concussions. Our youngest case is Steve Montador, age 35, NHLer
- Too many “dings”, cumulative effects of “mild concussions”

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CHRONIC TRAUMATIC ENCEPHALOPATHY (CTE)

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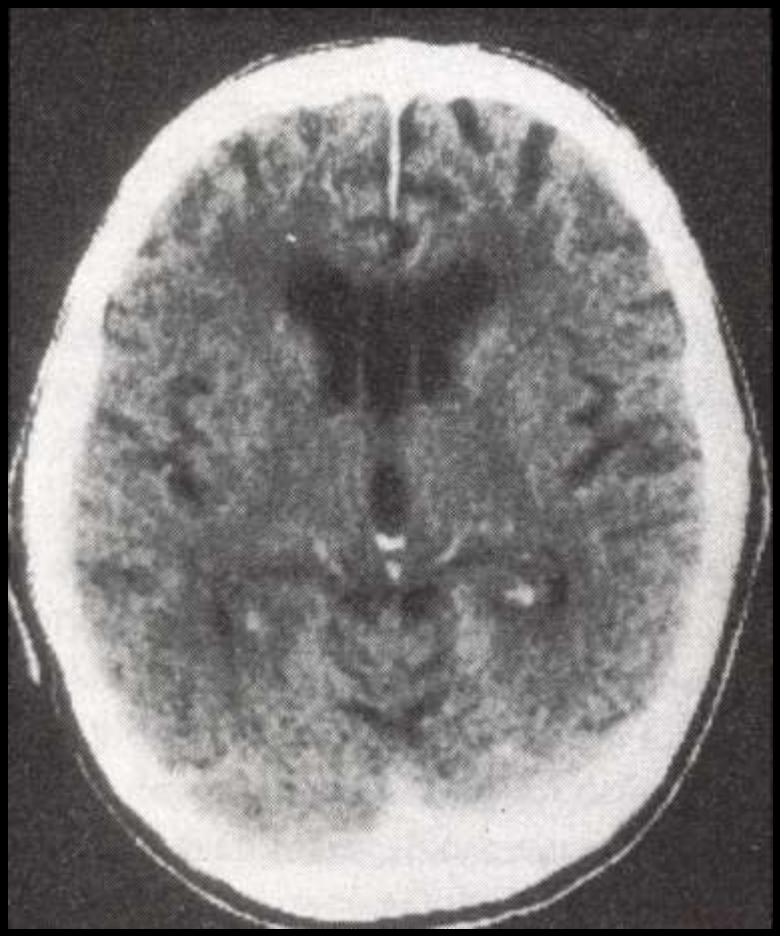

CT Scan shows atrophy of the brain.

Brain of boxer with Dementia Pugilistica

thinkfirst pensezd'abord

CTE PATHOPHYSIOLOGY

- CTE Is a tauopathy due to repeated blows to the brain
- Accumulation of tau protein in neuronal cell bodies.
- Tau is normally present in axons and functions to stabilize microtubules
- In CTE, deposition of tau damages neurons
- CTE has been seen in boxers and football, soccer and hockey players
- Research needed to determine its prevalence

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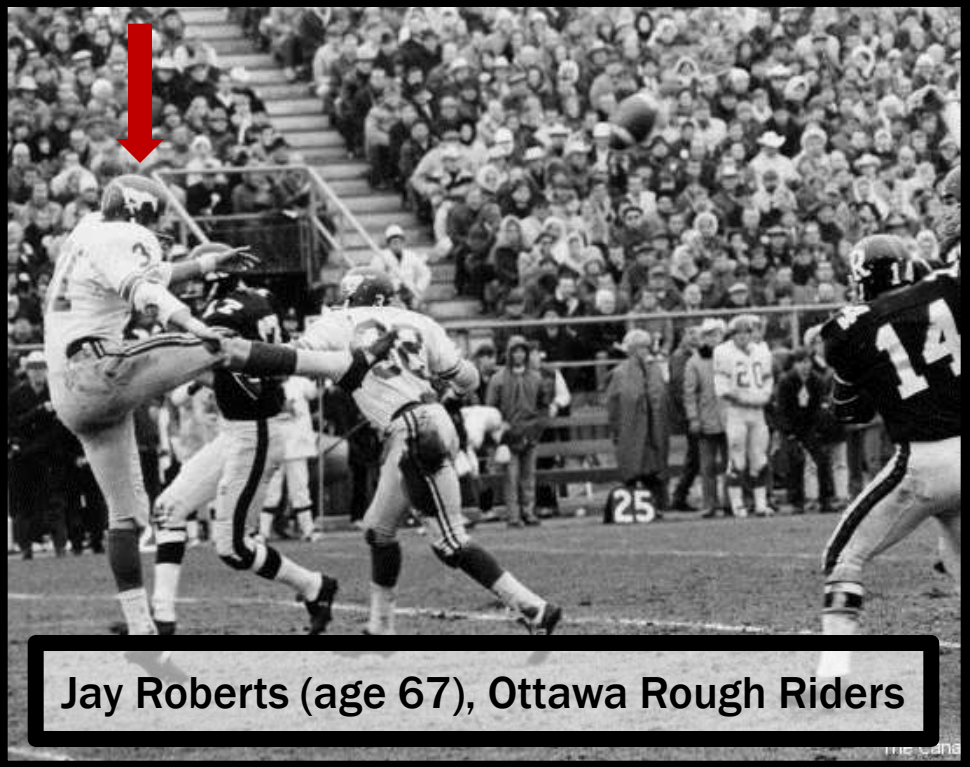
First CFL Brain Donation to the Canadian Sports Concussion Project

Krembil Neuroscience Centre, Toronto Western Hospital

Krembil Neuroscience Centre

Normal Nerve Cells



Jay Roberts (age 67), Ottawa Rough Riders

Abnormal Nerve Cells

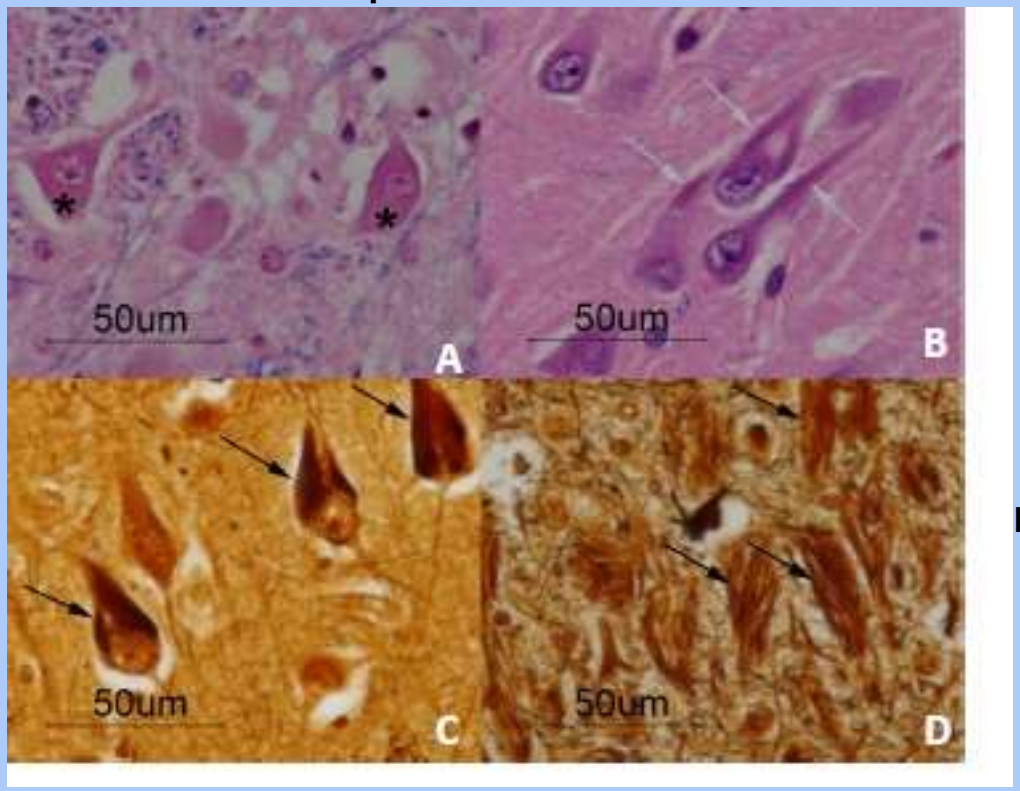
CTE Pathophysiology (continued)

Click for next slide!

First CFL Brain Donation
To The Canadian Sports Concussion Project,
Krembil Neuroscience Centre.
Toronto Western Hospital

Jay Roberts,
Ottawa Rough Riders
Age 67

Normal Nerve Cells



Abnormal Nerve Cells

Nerve Cells Filled with Tau Protein

DIAGNOSIS: C.T.E.

POTENTIAL BIOMARKERS FOR CONCUSSION INDUCED BRAIN DEGENERATION SUCH AS CTE

- Clinical Exam Non-Specific
- Routine CT and MRI Non-Specific Atrophy
- Functional MRI ??
- DTI MRI ??
- BOLD MRI ??
- MRS ??
- Maxi-Neuropsych Tests Non-Specific
- PET ??
- Event Related Potentials (ERP) ??
- Electrical Connectivity ??
- MEG ??
- Blood Biomarkers ??
- CSF Biomarkers Tau
- Mechanical Tests ??
- **AUTOPSY-TAUOPATHY-the only proven Biomarker!!!!!!!!**

THE YOUNG BRAIN - IS IT MORE VULNERABLE TO INJURY?

- Modern Research Says, YES!
- Therefore, the emphasis must be on prevention

  →To prevent long-term deficits such as permanent memory loss

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GLOBE AND MAIL APRIL 2, 2016

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HEALTH CARE PROFESSIONALS CAN PREVENT FURTHER BRAIN DAMAGE AFTER CONCUSSION

1. Suspect that a Concussion may have occurred. Do You Know the Current Criteria for Concussion?
2. Take the person to a medical doctor
3. Follow Advice about Return. Do You Know When it is Safe to Return to Play, Work or Learn after a Concussion?

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CONCUSSION PREVENTION STRATEGIES

- Concussions are serious injuries - can cause lasting symptoms and permanent brain injury
- Follow the established guidelines for management
- Promote safer play and respect – get rid of fights, elbows to the head, and illegal play.
- Reduce head contact in football practices, raise the age of bodychecking in hockey to age 16
- No heading in soccer until age 14
- Know that helmets do not prevent concussion

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CONCUSSION EDUCATION RESOURCES ON PARACHUTECANADA.ORG

a) Concussion Management Guidelines: for **Physicians**
b) Concussion Management for **Teachers**.
c) Questions and Answers for **Athletes/Coaches**
d) Concussion Cards for the **General Public**.
e) Concussion Information for **Parents**
f) SCAT3 Tools
g) Smart Hockey videos
h) Guidelines for Return to Play and Termination
i) Helmet Fitting Guide/Video

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PARACHUTE INJURY PREVENTION PROGRAMS FOR SCHOOLS-ALL FREE

- Grades JK-8 - TD ThinkFirst for Kids
- Grades 4 5, or 6 - BRAIN DAY – has concussion module
- High Schools - Concussion Presentations
- Specific Sports and Recreation Programs, such as Smart Hockey video

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PARACHUTE/THINKFIRST BRAIN WAVES

- For Grades 4, 5 or 6
- Half-Day Program
- Four 25-minute modules focusing on anatomy, vision, smell and taste and motor function.
- Concussion module
- An injury prevention message is included in each module.
- Taught by university students.
- Please sign up!

CONCUSSION MYTHOLOGY

- Concussions can be prevented by helmets
- Concussions can be diagnosed by CT and MRI
- There is a proven treatment for concussions
- Resume your activities as soon as possible, and you will get better quickly
- It's just a concussion, and everybody gets better
- Baseline testing prevents concussion
- Baseline testing is good treatment for concussion
- Postconcussion syndrome is what malingerers get and only occurs when liability is an issue
- Depression and anxiety after a concussion are psychogenic, and due to sadness

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CONCLUSIONS

- The term “Mild Traumatic Brain Injury” or mTBI is an oxymoron
- Concussions can produce lasting symptoms, especially repetitive concussions (in 10-15%)
- Prevention is the only cure. There is no drug or other therapy to accelerate recovery from concussion or to prevent the next concussion, or to prevent the long term consequences of concussion.
- Good concussion management facilitates recovery, and keeps kids playing!
- Important to treat anxiety and depression
- More concussion research is necessary

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THANK YOU

Parachute

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