Traumatic Brain Injury

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Objectives

- A teenager with a bad case of *mild* Traumatic Brain Injury
- What does concussion do to the brain, inner ear, and spinal cord? Treatment options?
- Post-Concussion Syndrome
 Causes
 Treatment
- Link between TBIs in football and Alzheimer's disease

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Michelle's Story







Michelle's Story

- For weeks, she was sensitive to sounds, lights, and people
- Constant headaches, almost daily
- Felt dizzy and was sensitive to moving her head
- Difficulty performing simple tasks, even crossing the street
- Unable to go to school
- Stopped many of her extra-curricular activities such as music
- Depressed, hopeless
- In one year, she had seen 15 different specialists and received different tests, eye movement therapy, massage, acupuncture, and tried different medication
- Nothing had worked; she and her family were frustrated
 - WHAT HAPPENED TO HER BRAIN?
 - WHY WAS SHE NOT GETTING BETTER ONE YEAR LATER?

There is nothing *mild* about Mild Traumatic Brain Injury (mTBI)

Four main categories of symptoms

Migraine & Sensitivity to Light and Sound

Mood & Sleep Disorder

Dizziness & Vertigo Memory & Attention Deficits

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Traumatic Brain Injury



- Stage 1:
 - Neurochemical changes
 - Torn fiber bundles
- Stage 2:
 - Inflammation
 - Energy crisis
- Stage 3:
 - Healing
 - Production of BDNF

Torn neuronal connections: diffuse axonal injury



Normal



Trauma to cervical spinal cord, inner ears, and vestibular nerve



Inner Ears: Dizziness & Vertigo

Vestibular

Labyrinthine & Migraine VN injury

Meniere's Disease

BPPV

Medication Side-Effects

mTBI Treatment

Migraine

- Reduce exposure to stimuli
- Improve sleep hygiene
- Medications
- Improve diet
- Exercise

Mood & Sleep

- Meditation
- Biofeedback
- Improve Sleep
 Hygiene
- Medications
- Improve diet
- Exercise

Dizziness & Vertigo

- Vestibular rehab (constant symptoms)
- No vestibular rehab (episodic symptoms)

Cognitive Deficits

- Cog. skills training
- Organizational skills
- Assist with life challenges
- Improve diet
- Exercise

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1. Multiple expert opinions, multiple therapies



https://pbs.twimg.com/media/CYe6ut2WcAE5Dm4.jpg

2. Many symptoms exacerbate each other

Migraine & Sensitivity to Light and Sound

Mood & Sleep Disorder

Dizziness & Vertigo Memory & Attention Deficits

3. Fragmented care in different facilities



4. No universally accepted treatment protocols or outcome measures



5. False recovery: Return to study or work too soon



Thompson, J. et al (2005). EEG and postural correlates of mild traumatic brain injury in athletes. Neuroscience Letters. 377. p. 158-163. Montelpare, W. (2015). Establishing baseline measures for concussion and providing evidence for return to work or play decisions. On-going research.

NeuroGrow Concussion Recovery Program



Concussion Recovery Program: Twice-weekly for 12 weeks

Neurofeedback

Cognitive Training

Brain Coaching & Meditation







Diet Counseling

Exercise Training

Weekly Monitoring







Michelle's improvements in cognitive scores



Michelle's improvements in brain fitness



89% of patients experienced some improvement in their cognitive scores



Significant improvement in common TBI-related cognitive domains



Significant reduction in sleep, cognitive, and behavioral symptoms



nces changes are significant.

Error bars represent SEM.

Summary diagram: Pathophysiology of Mild Traumatic Brain Injury



Summary Diagram: NeuroGrow Concussion Recovery Program



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Professional football is bad for your brain



Repeated trauma to the brain causes the formation of Alzheimer's-type tangles



- 65 YO normal subject
- No plaques or tangles

43 YO NFL player
Alzheimer's-type changes

73 YO boxer
Alzheimer's-type changes

More football and concussions, smaller hippocampus



Retired NFL players have a 5-fold increased risk for cognitive decline



Association between Recurrent Concussion and Late-Life Cognitive Impairment in Retired Professional Football Players

Kevin M. Guskiewicz, Ph.D., A.T.C. ➡, Stephen W. Marshall, Ph.D., Julian Bailes, M.D., Michael McCrea, Ph.D., Robert C. Cantu, M.D., Christopher Randolph, Ph.D., Barry D. Jordan, M.D., M.P.H.

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Thank You

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