

Cannabis and Health

Module 11: Neurocognitive/Brain Disorders Part I

Lecture 1: Multiple Sclerosis, Epilepsy, Traumatic
Brain Injury

Why MS, Epilepsy and TBI?

- Multiple Sclerosis (MS) is the condition/indication first targeted by GW Pharma with Sativex
 - Sativex approved in Canada and Europe for MS
- Much of what we know about cannabinoids and pain and muscle spasticity comes from these studies
- Epilepsy (or specific forms of it) was the first FDA approved indication for cannabinoids (CBD) in the U.S.
- TBI is a serious injury with chronic implications
 - Though it has not been studied as much with cannabis, we are likely to see significant interest in this area
 - Especially from active military and veteran groups

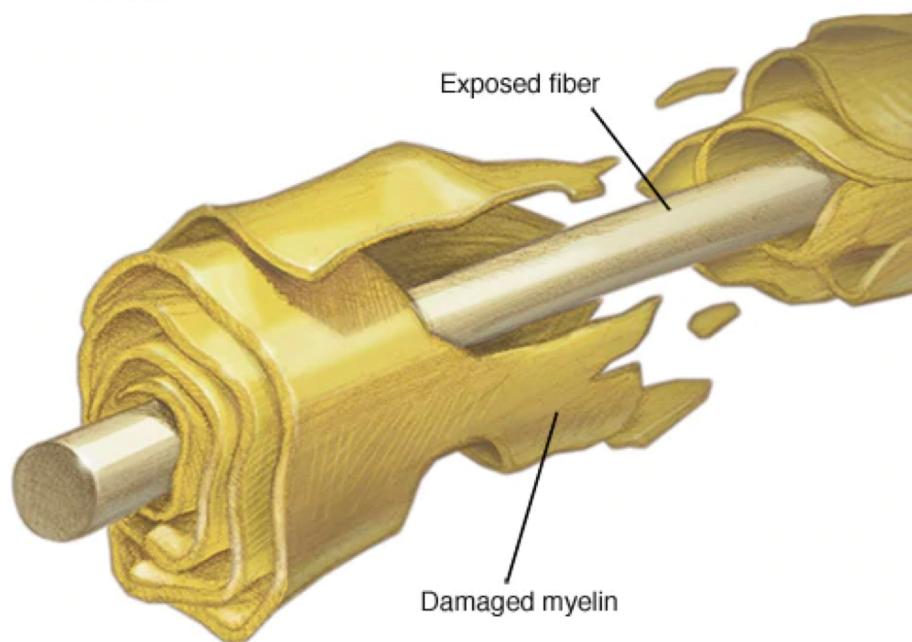
What is MS?

- Multiple sclerosis (MS) involves an abnormal response of the immune system which attacks the CNS
- Inflammation damages nerve fibers and the myelin that surrounds the nerves which interferes with normal functioning of the CNS
- Damage produces a variety of neurological symptoms that varies widely from person to person
- People with MS typically experience one of four disease courses (types of MS)
- There are over a dozen treatments to help modify the MS disease process

Normal nerve



Nerve affected
by MS



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The protective coating on nerve fibers (myelin) and exposed fiber are damaged. Depending on where the nerve damage occurs, MS can affect vision, sensation, coordination, movement, and bladder and bowel control.

What are the signs and symptoms of MS?

- Symptoms often involve movement
 - Numbness or weakness in one or more limbs
 - Electric-shock sensations that occur with certain neck movements
 - Tremor, lack of coordination or unsteady gait
- Vision problems
 - Partial or complete loss of vision, usually in one eye at a time, often with pain during eye movement
 - Prolonged double vision
 - Blurry vision
- Other symptoms include
 - Slurred speech
 - Fatigue
 - Dizziness
 - Tingling or pain in parts of your body
 - Problems with sexual, bowel and bladder function
- Pain, muscle spasms/spasticity, and problems with sleep are common (may be secondary to anxiety)

What is the clinical course of MS?

- Most people with MS have intermittent relapses with potentially long periods of remission
- About 60 to 70 percent of people with relapsing-remitting MS eventually develop a steady progression of symptoms, with or without periods of remission, known as secondary-progressive MS
- The worsening of symptoms usually includes problems with mobility and gait
- The rate of disease progression varies greatly among people with secondary-progressive MS
- Some people with MS experience a gradual onset and steady progression of signs and symptoms without any relapses. This is known as primary-progressive MS

What is Epilepsy?

- Epilepsy is a central nervous system (neurological) disorder in which brain activity becomes abnormal, causing seizures
- Seizure symptoms can vary widely
 - Some people with epilepsy stare blankly for a few seconds during a seizure
 - others repeatedly twitch their arms or legs
- Having a single seizure doesn't necessarily mean someone has epilepsy

What is Epilepsy?

- Epilepsy is not one single condition but a variety of disorders
- All reflect underlying brain dysfunction that may result from many different causes
- Not all seizures are epileptic seizures
 - An epileptic seizure has a clear start and finish
 - An epileptic seizure has a clinical manifestations (e.g., sensory, motor, and autonomic function; consciousness; emotional state; memory; cognition; or behavior)
 - Epileptic seizures have *abnormal enhanced synchrony* of neuronal activity

Symptoms of Epilepsy

Epilepsy is caused by abnormal activity in the brain, so seizures can affect any process the brain coordinates

Seizure signs and symptoms:

- Temporary confusion
- A staring spell
- Uncontrollable jerking movements of the arms and legs
- Loss of consciousness or awareness
- Psychiatric symptoms such as fear, anxiety or déjà vu
- Symptoms vary depending on the type of seizure
 - a person with epilepsy will tend to have the same type of seizure each time
 - symptoms similar episode to episode

Types of Epilepsy

- Hundreds of different types of epilepsy
- Dravet Syndrome
 - rare genetic dysfunction of the brain
 - begins in the first year of life in an otherwise healthy infant and is lifelong
- Frontal Lobe Epilepsy
 - produces brief seizures, start in frontal lobes
 - second most common type of focal epilepsy
 - may run in families
- Temporal Lobe Epilepsy
 - most common type of focal epilepsy
 - high risk for memory and mood difficulties
 - usually begins at the end of a first or second decade of life



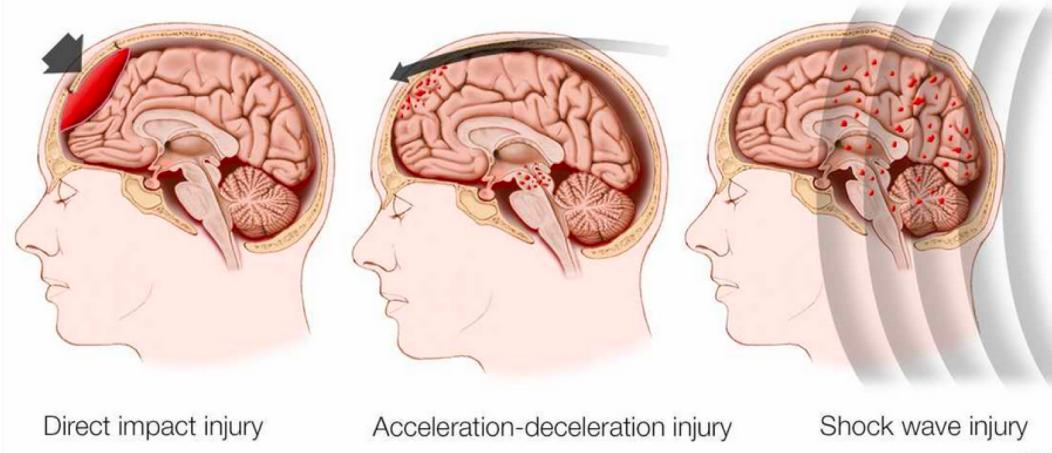
What is Traumatic Brain Injury?

- TBI is defined as an alteration in brain function manifest as confusion, altered level of consciousness, seizure, coma, or focal sensory or motor neurologic deficit resulting from blunt or penetrating force to the head
- In mild TBI, subtle behavioral and neuropsychological changes may be the only symptom(s)
- Has considerable morbidity and mortality and is a major cause of epilepsy

Types of Traumatic Brain Injury

Closed head injuries

Types of traumatic brain injury



Direct impact injury

Acceleration-deceleration injury

Shock wave injury

Direct impact injury = a blow to the head

Acceleration-deceleration injury = a car accident

Shock wave injury = an explosion

Symptoms of Mild TBI

Physical symptoms

- Loss of consciousness for a few seconds to a few minutes
- No loss of consciousness, but a state of being dazed, confused or disoriented
- Headache
- Nausea or vomiting
- Fatigue or drowsiness
- Problems with speech
- Difficulty sleeping
- Sleeping more than usual
- Dizziness or loss of balance

Sensory symptoms

- Sensory problems, such as blurred vision, ringing in the ears, a bad taste in the mouth or changes in the ability to smell
- Sensitivity to light or sound

Cognitive or mental symptoms

- Memory or concentration problems
- Mood changes or mood swings
- Feeling depressed or anxious

Symptoms of Moderate to Severe TBI

Physical symptoms

- Loss of consciousness from several minutes to hours
- Persistent headache or headache that worsens
- Repeated vomiting or nausea
- Convulsions or seizures
- Dilation of one or both pupils of the eyes
- Clear fluids draining from the nose or ears
- Inability to awaken from sleep
- Weakness or numbness in fingers and toes
- Loss of coordination
- Any symptoms of mild TBI

Cognitive or mental symptoms

- Profound confusion
- Agitation, combativeness or other unusual behavior
- Slurred speech
- Coma and other disorders of consciousness
- Any symptoms of mild TBI



TBI, Chronic Pain, and Sleep Disturbance

- Chronic pain is reported by approximately 50-70% of individuals with a TBI
- Headaches are the highest reported, followed by neck, shoulders, back and upper limb pain
- In veterans, TBI and chronic pain are also likely to co-occur with PTSD and depression
- Sleep disturbance is common in TBI patients
 - Insomnia (50%), poor sleep (49–50%), delayed sleep onset (36%)

Nampiaparampil, 2008, *JAMA*; Mathias et al., 2012, *Sleep Medicine*

Conclusions

- MS is chronic disease state that involves damage to the protective layer over nerve fibers, pain, and muscle spasticity
- Epilepsy is a term that refers to a variety of disorders with different causes that result in brain dysfunction and seizures
- TBI is common, especially among veterans, and often involves comorbid chronic pain (e.g., headaches) and sleep disturbance