SNS COLLEGE OF ALLIED HEALTH SCIENCES

SNS Kalvi Nagar, Coimbatore - 35

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DEPARTMENT : PHYSICIAN ASSISTANT

COURSE NAME : NEUROLOGY

UNIT : NEUROPATHOLOGY

TOPIC : NEUROPATHOLOGY - TRAUMA

MECHANISM OF INJURY

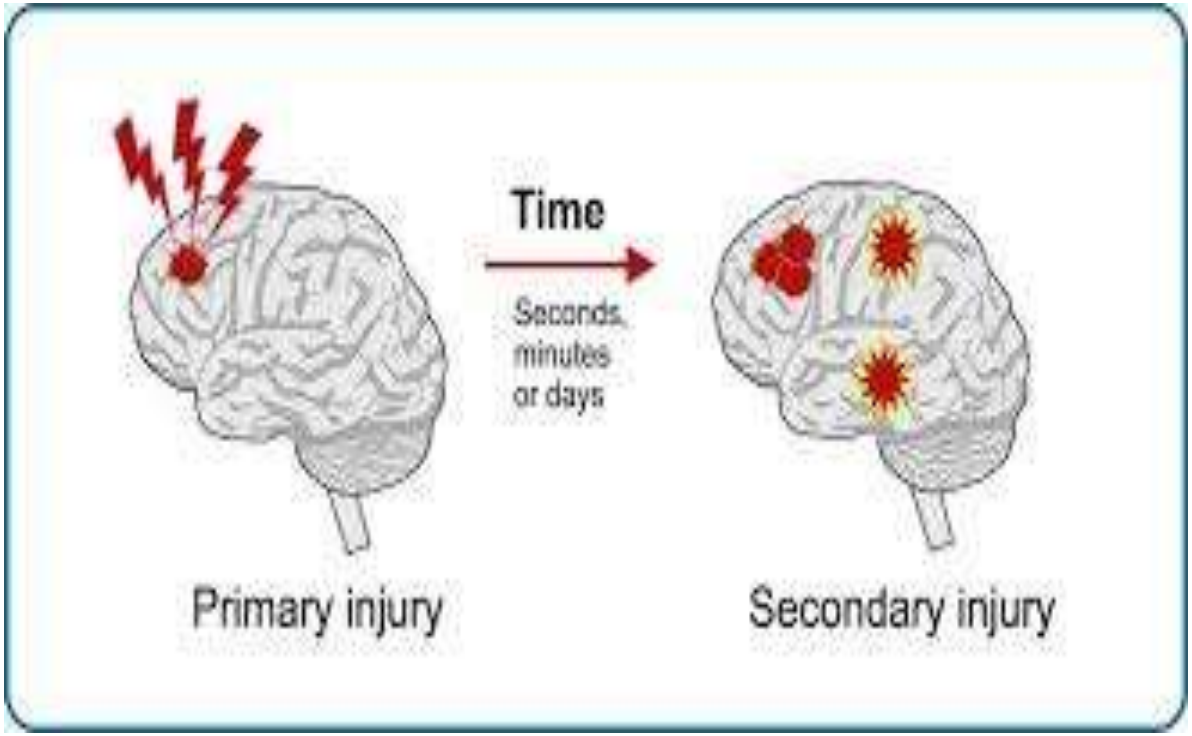
- Traumatic injuries to the nervous system can result from various mechanisms, including blunt force trauma, penetrating injuries (such as gunshot wounds or stab wounds), acceleration-deceleration forces (commonly seen in car accidents or falls), and blast injuries (often seen in combat or explosions).


Traumatic Brain Injury
Cerebral edema
Cerebral hypoxia and ischemia
Cerebral metabolic impairment
Cerebral vasospasm
Increased intracerebral pressure
Complement activation
Inflammation &
ROS generation
Cell death
Excitotoxicity
Increased Glutamate
BBB damage
Mitochondrial dysfunction
Impairment of Glucose metabolism

PRIMARY INJURY

- This refers to the initial damage caused by the traumatic event. In the case of head trauma, it can include skull fractures, contusions (bruises), lacerations (tears), and diffuse axonal injury (shearing forces causing damage to nerve fibers).

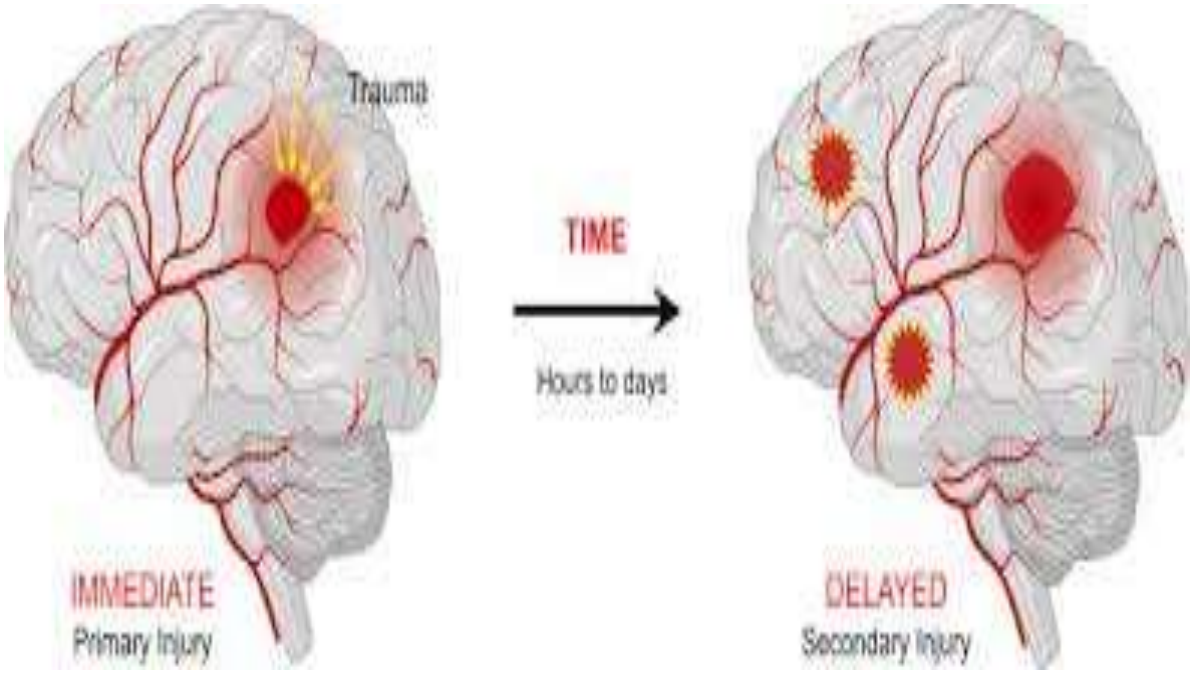
- In spinal cord trauma, primary injury often involves compression, laceration, or contusion of the spinal cord itself.


Time
Seconds
minutes
or days
Primary injury
Secondary injury

SECONDARY INJURY

- Following the primary injury, a cascade of secondary pathological processes can occur, exacerbating tissue damage.

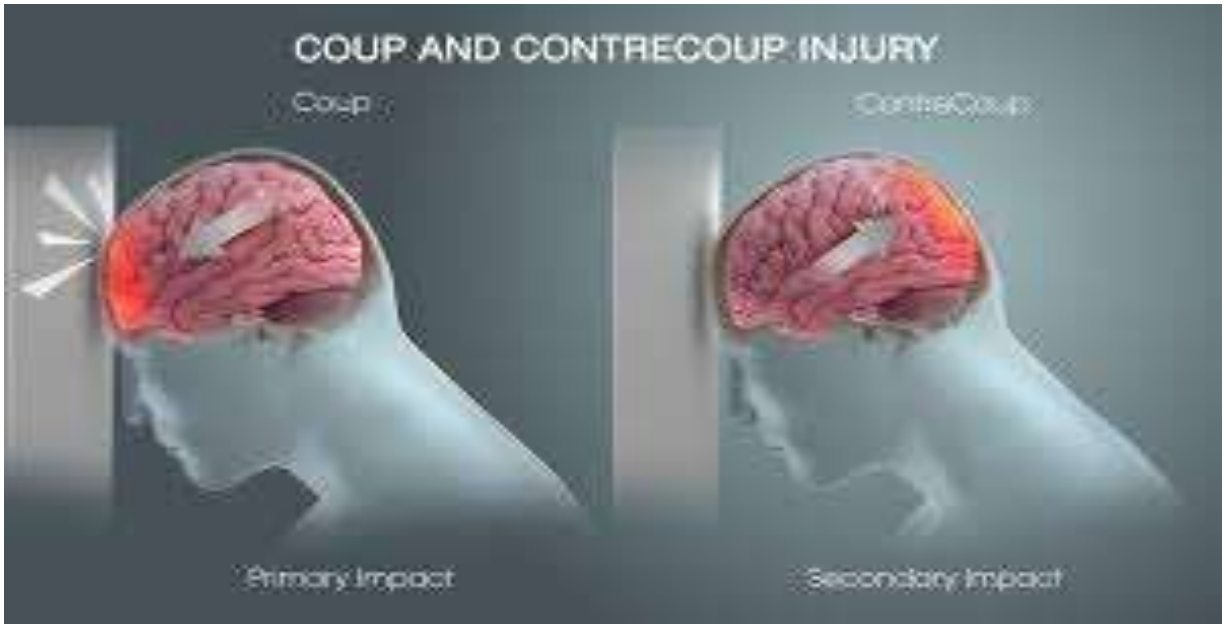
- These processes include inflammation, ischemia (restriction of blood supply), excitotoxicity (excessive stimulation of nerve cells leading to cell death), oxidative stress, and edema (fluid buildup).


Trauma
TIME
Hours to days
IMMEDIATE
Primary Injury
DELAYED
Secondary Injury

COUP - CONTRECOUP INJURY

- This refers to injuries occurring at the site of impact (coup injury) as well as on the opposite side due to the rebound of the brain within the skull (contrecoup injury).

- This can lead to double the damage in the brain due to the impact and the secondary forces.


COUP AND CONTRECOUP INJURY
Coup
Primary Impact
Secondary Impact

HEMORRHAGE

- Trauma can cause various types of bleeding in the brain, including epidural hematoma (bleeding between the skull and the outer layer of the brain), subdural hematoma (bleeding between the outer and inner layers of the brain's covering), subarachnoid hemorrhage (bleeding in the space between the brain and the arachnoid membrane), and intracerebral hemorrhage (bleeding within the brain tissue itself).

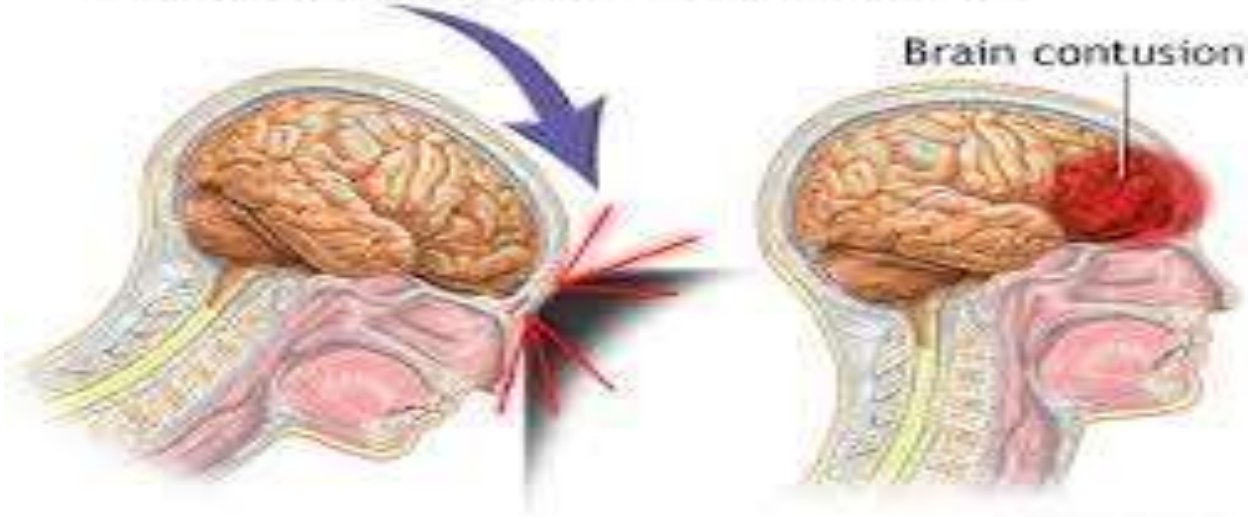

Human Brain Hemorrhage

CONCUSSION

- Concussion is a form of mild traumatic brain injury characterized by temporary loss of normal brain function. It can result from a blow or jolt to the head or body, causing the brain to move rapidly within the skull.

- While there may not be visible structural damage on imaging, concussion can still have significant effects on brain function.

A concussion is a violent jarring or shaking that results in a disturbance of brain function



CHRONIC TRAUMATIC ENCEPHALOPATHY (CTE)

- CTE is a neurodegenerative disease believed to result from repetitive head injuries, such as those experienced in contact sports or military combat.

- It is characterized by the buildup of abnormal tau protein in the brain, leading to symptoms such as memory loss, confusion, personality changes, and eventually dementia.

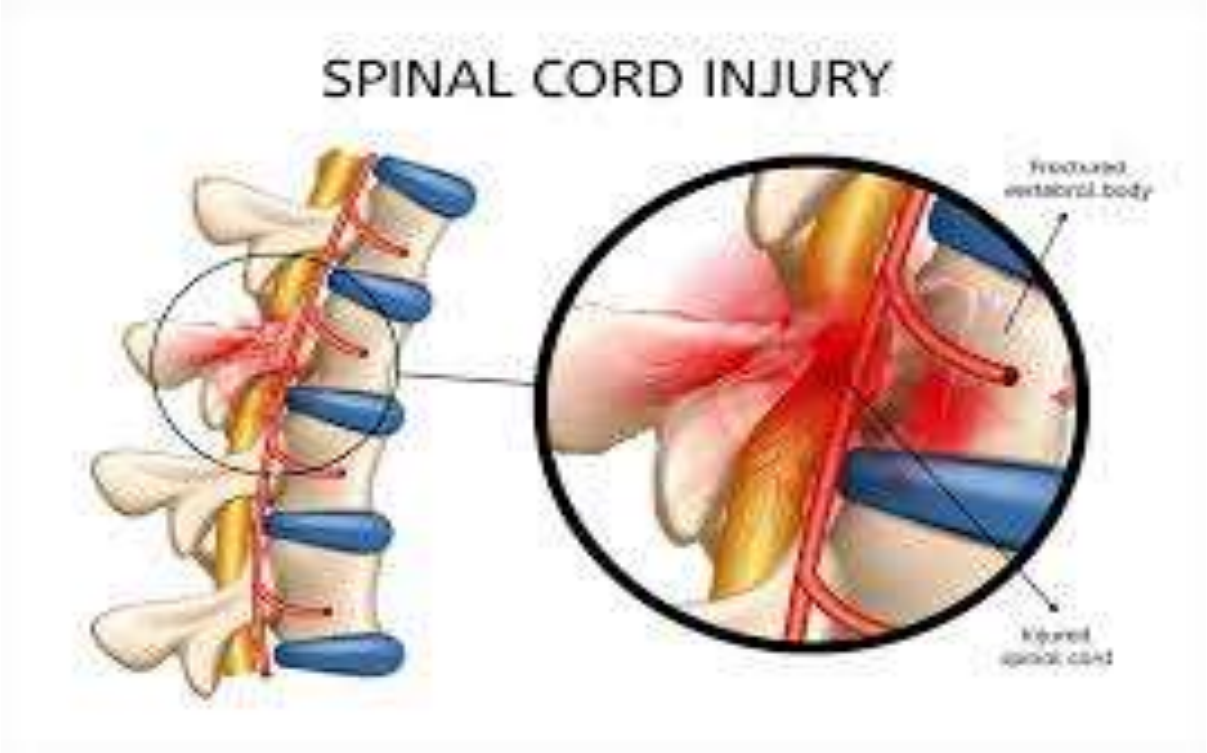

Normal Brain
Advanced CTE

SPINAL CORD INJURY(SCI)

- Trauma to the spinal cord can result in various degrees of paralysis and sensory loss depending on the location and severity of the injury.

- Injuries can be classified as complete (resulting in total loss of function below the level of injury) or incomplete (some function remains below the level of injury).

SPINAL CORD INJURY



REGENERATION AND REPAIR

- Unlike other tissues in the body, the nervous system has limited capacity for regeneration.

- While some degree of recovery may occur following injury, particularly in peripheral nerves, the central nervous system (brain and spinal cord) has limited ability to regenerate damaged tissue.

ASSESSMENT

- What is the Primary injury ?
- What is Regeneration and repair ?