

# NEUROLOGICAL DISORDERS AND SPINAL CORD INJURIES

## OBJECTIVES

1. To review the signs, symptoms, and/or causes of neurological disorders and spinal cord injuries.
2. To be able to recognize these neurological disorders and spinal cord injuries in the pre-hospital setting.

## Topics to be discussed

- Stroke (CVA)
- Traumatic Brain Injury (TBI)
- Epileptic Seizures
- Multiple Sclerosis (MS)
- Alzheimer's Disease (AD)
- Parkinson's Disease (PD)
- Shaken Baby Syndrome
- Cerebral Palsy (CP)
- Spina Bifida

## **STROKE (CVA)**

- Cerebrovascular disease is one of the most devastating and misunderstood epidemics of our time.
- Over 700,000 Americans suffer a major cerebrovascular event, usually a stroke, each year.
- A stroke occurs when the blood flow to the brain is somehow disrupted and brain cells lose their supply of nutrients.
  - This happens when the brain receives too little or too much blood.
  - If the problem is not corrected in a short amount of time, usually hours, brain cells will die, leaving permanent brain damage.

### *Types of Stroke (CVA)*

- Ischemic- more common and occurs when blood flow to the brain is blocked.
- Hemorrhagic- less common, but more deadly, and occurs when there is bleeding into or around the brain itself.

### *Warning Signs of Stroke (CVA)*

- Prior stroke- suffering one stroke, regardless of the severity, increases your chance of a second stroke.
- TIA (Transient Ischemic Attack)- a temporary cerebrovascular disruption that leave no permanent damage. These are recognizable events and can be a predictor of a future, more devastating stroke.
- Headache- a severe and sudden unusual headache can be a sign of hemorrhagic stroke and requires immediate medical attention.

### *Risk Factors for Stroke (CVA)*

- Hypertension- high blood pressure is the cause of both ischemic and hemorrhagic stroke and requires immediate medical attention.
- Cigarettes-smoking doubles your chance of suffering a stroke
- Weight- obesity increases your chance of suffering from Hypertension. Even modest weight gain (24-43 lbs over 16 years) can almost double your chance of suffering a stroke.

### *Symptoms of Stroke (CVA)*

- Visual disturbances- blocked vision or loss of vision in one eye
- Weakness- numbness of clumsiness in one arm or hand
- Language problems- slurred speech
- Facial droop or weakness
- Dizziness
- Severe, sudden headache

## **Traumatic Brain Injury (TBI)**

(TBI is commonly referred to as a “head injury.” )

### *Most common causes of TBI*

- Motor vehicle accidents- most common mechanism in teenagers and young adults
- Falls- most common mechanism in pediatrics and geriatrics

## *Injuries to the Head*

- Concussion
- Hematoma
- Contusion
- Skull Fracture
- Subarachnoid Hemorrhage

### *Concussion*

- A concussion is an injury to the brain, usually caused by a blow to the head that results in temporary loss of normal brain function.
  - Most people assume that concussions involve a loss of consciousness; however, in most cases, the person with a concussion never loses consciousness.
- A concussion can affect:
  - Memory
  - Judgement
  - Reflexes
  - Muscle coordination
  - Speech
  - Balance

### *Symptoms of a Concussion*

- Headache
- Vision disturbance
- Dizziness
- Loss of balance
- Confusion
- Memory loss
- Ringing of the ears
- Nausea
- Difficulty in concentration

### *Hematoma*

- A hematoma is a blood clot that collects in or around the brain.
- There are 2 types of hematomas associated with TBI:
  - Epidural Hematoma- a blood clot between the dura mater and the inside of the skull
  - Intracerebral Hematoma- a blood clot within the brain

### *Contusion*

- A contusion is an area in which blood that has leaked out of the blood vessels is mixed with brain tissue.
- Contusions associated with TBI is often referred to as a “bruised brain.”

### *Skull Fracture*

- A skull fracture is a simple break or crack in the skull.
- A depressed skull fracture is a break in the bones of the head in which some bone is pushed inward, possibly pushing on or cutting into the brain.

### *Subarachnoid Hemorrhage*

- A Subarachnoid Hemorrhage is blood in, or bleeding into, the space under the arachnoid membrane, most commonly from trauma or rupture of an aneurysm.

### *Warning signs of a Serious Head/Brain Injury*

- Lengthy period of unconsciousness
- Altered LOC, such as persistent drowsiness
- Long-lasting confusion
- Convulsions

### **Epileptic Seizures**

- Epilepsy is a common neurological disorder caused by disturbances in the normal electro/chemical functions of the brain.

### *Categories of Seizures*

- Partial seizure- occurs in one area of the brain
- Generalized seizure- affects nerve cells throughout the brain

### *Signs of Onset of Seizure*

- A feeling of uneasiness or discomfort, called an aura, may precede an epileptic attack.
- A visual phenomenon such as flickering lights or “sunbursts”.

### *Risk Factors for Having Seizures*

- Stress
- Sleep deprivation
- Fatigue
- Insufficient food intake
- Flashing Lights
- Failure to take prescribed anti-convulsant medications

### *Causes of Seizures*

- More than one-half of seizures are of unknown origin.
- Head injuries
- Brain tumors
- Exposure to toxic agents
- Structural abnormalities in the brain
- Certain genetics
- Vascular and infectious illnesses

## **Multiple Sclerosis (MS)**

- Multiple sclerosis is a common disease of the central nervous system.
- The myelin, fatty covering that insulates nerve cell fibers in the brain and spinal cord is damaged.
- At present, there is no cure for MS; however, there are effective treatments that can help reduce the severity and frequency of exacerbations and help manage the symptoms.

### *What causes MS?*

- Many experts believe that MS is an autoimmune disease- one in which the body, through its immune system, launches a defensive attack against its own tissues.
- The nerve-insulating myelin comes under attack.
- Such assaults may be linked to an external factor such as a viral infection.

### *Types of MS*

- Relapsing-remitting- the person experiences attacks during which new symptoms appear or existing symptoms become more severe. These relapses are usually followed by remissions.
- Secondary-progressive- the person will have a steady pattern of relapses and recoveries. Over a period of time, the symptoms will worsen with no periods of remission.
- Chronic-progressive- there are no periods of remission and symptoms simply become progressively worse.

### *Symptoms of MS*

- Balance and coordination problems
- Vertigo
- Weakness
- Spasticity of muscles
- Pain
- Blurred vision
- Bladder and bowel problems
- Sexual dysfunction
- Cognitive abnormalities

### **Alzheimer's Disease (AD)**

- Alzheimer's Disease is a progressive, neurodegenerative disease characterized by loss of function and death of nerve cells in several areas of the brain, leading to loss of mental functions such as memory and learning.
- This brain disease eventually causes confusion, personality and behavior changes, and impaired judgement.

### *Causes of Alzheimer's Disease*

- No one is clear about what actually causes this disease.
- Studies show that smoking may lead to mental decline in the later years of life.
- It was found that smokers were 4 times more likely to experience a significant intellectual decline than non-smokers.
- Mounting studies continue to show that those people who exercise their brains will put off the chance of developing AD.
- Further, studies found that those who engaged in stimulating mental activities such as reading, playing a musical instrument, playing board games, or even dancing had a lesser chance of developing AD.

### *Symptoms of AD*

- Poor judgment
- Temperamental
- Language Problems
- Lack of initiative
- Misplacing things
- Memory loss
- Difficulty in performing familiar tasks
- Disorientation of time and place

### **Parkinson's Disease (PD)**

- PD is a progressive, neurological disease that mainly affects movement.
- Parkinson's disease results from the destruction of nerve cells in a part of the brain called the basal ganglia.

### *Who gets PD?*

- Although PD is more common in older persons, some people do begin to show symptoms before they are 40 years old.

### *Causes of PD*

- Genetics
- Environmental Factors
- Oxidative damage
- Mitochondrial dysfunction
- Excitotoxicity

### *Common Symptoms of PD*

- Tremor- the affected body part trembles when it is not doing work and often subsides with action
- Rigidity- stiffness or inflexibility of the muscles
- Bradykinesia- slowing of voluntary movement

### *Secondary Symptoms of PD*

- Speech changes
- Loss of facial expression
- Micrographia (small, cramped handwriting)
- Difficulty swallowing
- Drooling
- Pain
- Dementia or confusion
- Sleep disturbances
- Constipation
- Skin problems
- Depression
- Memory difficulties and slowed thinking
- Sexual dysfunction
- Urinary problems
- Fatigue and aching
- Loss of energy

### *Stages of PD*

- Stage I: Symptoms are only on one side of the body.
- Stage II: Symptoms are on both sides of the body
- Stage III: Balance is impaired
- Stage IV: Assistance is required to walk and other symptoms are severe
- Stage V: Wheelchair bound

## **Shaken Baby Syndrome**

- Shaken Baby Syndrome, also known as “Shaken Impact Syndrome”, is non-accidental trauma inflicted upon a child.
- The injuries to the brain are the direct result of rotational forces acting on the brain.
- These forces are most commonly produced by severe shaking, which flops the infant’s head both forward and backward.

### *Injuries that result from Shaken Baby Syndrome*

- Retinal hemorrhages
- Intracranial vessel tears with hematoma formation
- Diffuse axonal disruption

### *More on Shaken Baby Syndrome*

- Who Are the Victims of Shaken Baby Syndrome? Children less than three years old, with the majority of cases in the first year of life
- Who are the most common perpetrators? (in descending order) the father, the boyfriend of the mother, female babysitter, or the mother
- What is the scope of the abuse? In the U.S., approximately 10-12 percent of all infant deaths that result from abuse or neglect are the result of rigorous shaking.
- What is the prognosis? Generally, poor. Most will be left with considerable disability affecting their cognitive abilities, and with severe retinal hemorrhages affecting their vision.

## **Cerebral Palsy (CP)**

- In cerebral palsy, faulty development or damage to motor areas in the brain impair the body’s ability to control movement and posture, resulting in a chronic number of neurological disorders.
- CP is usually associated with events that occur before or during birth, but may be acquired during the first few months or years of life as the result of head trauma or infection.

### *Types of CP*

- Spastic- stiff, permanently contracted muscles; 50-75% of cases
- Athetoid- slow, uncontrolled, writhing movements; 10-20% of cases
- Ataxic- poor coordination, balance, and depth perception; 5-10% of cases
- Mixed- two or more types present; 10% of cases

### *Causes of CP*

- Acquired- brain infections like bacterial meningitis or head trauma sustained from an accident or fall, or from inflicted injuries
- Congenital- the type that is present at birth- often for unknown reasons. Certain events during pregnancy, labor, and delivery can damage motor centers in the developing brain.
- Infections during pregnancy- ie: Rubella, Cytomegalovirus, Toxoplasmosis.
- Asphyxia or head trauma during labor and/or delivery.
- Brain hemorrhaging can occur in the fetus or in newborns around the time of birth. These hemorrhages are a type of stroke that may be caused by broken, abnormal, or clogged blood vessels in or leading to the brain, or by respiratory distress, a common breathing disorder in premature infants.
- Severe untreated jaundice in newborns and infants can damage brain cells.

### **Spina Bifida**

- Spina Bifida is a rare birth disorder which is the most serious birth disorder affecting the nervous system, compatible with life. It occurs when a portion of the fetal spinal cord, during the third or fourth weeks or pregnancy, fails to properly close. As a result, a part of the spinal cord is exposed.
- The exposed part of the spinal cord is usually closed during the first 24-48 hours after birth. It must be repaired to prevent further injury and to prevent infection.
- 80-85% of children who develop Hydrocephalus will require a ventricular shunt to control the buildup of spinal fluid.

### *Causes of Spina Bifida*

- Genetic
- Environmental

### *More on Spina Bifida*

- Amazingly, with the proper medical care, children with Spina Bifida can lead active and productive lives. These children are a testament to the human spirit. Most are successful in school and many are involved in modified sports activities, despite their physical challenges.