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**Q1. What is spinal cord injury? Write about complete and incomplete spinal cord injury?**

Spinal cord injury

A spinal cord injury is damage to the spinal cord. It’s an extremely serious type of physical trauma that’s likely to have a lasting and significant impact on most aspects of daily life.

The spinal cord is a bundle of nerves and other tissue that the vertebrae of the spine contains and protects. The vertebrae are the bones stacked on top of each other that make up the spine. The spine contains many nerves, and extends from the brain’s base down the back, ending close to the buttocks.

Classification of SCI

SCI is classified into 2 types:

# Complete SCI

A complete SCI produces total loss of all motor and sensory function below the level of injury. Nearly 50% of all SCIs are complete. Both sides of the body are equally affected. Even with a complete SCI, the spinal cord is rarely cut or transected. More commonly, loss of function is caused by a contusion or bruise to the spinal cord or by compromise of blood flow to the injured part of the spinal cord.

# Incomplete SCI

In an incomplete SCI, some function remains below the primary level of the injury. A person with an incomplete injury may be able to move one arm or leg more than the other or may have more functioning on one side of the body than the other.

# Q2. Explain the following?

**a) Central cord syndrome**

**b) Anterior cord syndrome**

**c) Brown sequards syndrome**

**d) Cauda equaina syndrome**

central cord syndrome

# DEFINITION

Central cord syndrome (CCS) is a type of incomplete spinal cord injury. CCS is marked by damage to the nerve fibers that bring messages from the brain to the body. This condition affects how you can use your arms and hands, and in some cases, your legs. There may be a loss of sensation and motor control.

# CAUSES

CCS is caused by damage to the central part of the spinal cord. This damage may occur when the neck is hyperextended. This can be associated with:

* Syringomyelia (syrinx)—a cyst in the spinal cord
* Loss of blood supply to the area
* Bleeding in the spinal cord
* Swelling

**Common causes of injury include:**

* Trauma , such as car accident, sports injuries, and falls
* Degenerative condition of spine—often found in older people
* Pre-existing condition, such as being born with a narrow spine

**CSS can also be due to**:

* Structural problems
* Tumors within the spinal cord

# Symptoms

Symptoms of CCS may include:

* Inability to lift arms and hands completely, or numbness and tingling
* Difficulty with fine motor control, such as buttoning a shirt
* Muscle weakness in legs, difficulty walking
* Loss of bladder control

# Diagnosis

* You will be asked about your symptoms and medical history. A physical exam will be done. A neurologic exam may also be done.
* Images may be taken of your spinal cord. These can be done with:
* MRI scan
* CT scan
* Myelogram
* X-ray

# Treatment

Treatment options include the following:

* Nonsurgical Treatment
* In most cases, surgery is not needed. Often treatment involves:
* Restricting neck movement
* Giving steroids
* Doing physical and occupational therapy
* Surgery
* Surgery is needed if there is a large compression of the spinal cord fibers. Surgery may also be done after a period of recovery. For example, if you still have cord compression after a recovery period.

2.Anterior cord syndrome

Anterior spinal cord syndrome involves complete motor paralysis and loss of temperature and pain perception distal to the lesion. Since posterior columns are spared, light touch, vibration, and proprioceptive input are preserved.

# Etiology

* Direct anterior Cord Compression (e.g. disc protrusion, posterior abdominal aortic aneurysm, mass)
* Hyper flexion injury of cervical spine
* Thrombosis of anterior spinal artery
* Spinal cord tracts

# clinical features

* Paraplegia below level of lesion (corticospinal)
* Loss of pain/temperature (lateral spinothalamic)
* Autonomic dysfunction, orthostasis
* Bowel, bladder, sexual dysfunction
* Preservation of modalities carried by dorsal columns i.e. vibration, proprioception, 2-point discrimination

# Management

* Consider intubation injuries at C5 or above
* Consider surgical intervention for:
* Progressive neurologic deficits
* Unstable spine fractures
* Steroids are no longer recommended

3.BROWN SUARD SYNDROME

# Definition

This syndrome involves injury to only 1 side of spinal cord.

It causes paralysis, loss of vibration sensation, and loss of proprioceptive input ipsilaterally, with contralateral loss of pain and temperature perception because of involvement of posterior columns and spinothalamic tracts on the same side.

# Signs and symptoms

* Symptoms of Brown-Séquard syndrome usually appear after an affected individual experiences a trauma to the neck or back.
* First symptoms are usually loss of the sensations of pain and temperature, often below the area of the trauma.
* There may also be loss of bladder and bowel control. Weakness and degeneration (atrophy) of muscles in the affected area may occur.
* Paralysis on the same side as that of the wound often occurs.
* Paralysis may be permanent if diagnosis is delayed.

# Causes

* This syndrome is often a consequence of a traumatic injury by a knife or gunshot to the spine or neck. In many cases, however,
* it is caused by, or is the result of, other spinal disorders such as cervical spondylosis, arachnoid cyst or epidural hematomas.
* Brown-Séquard syndrome may also accompany bacterial or viral infections.
* Blunt traumas, such as occur in a fall or automobile accident, on rare occasions may be the cause of the Brown-Séquard syndrome.

# Treatment

Treatment may involve drugs that control muscle symptoms, and there is some dispute as to whether high-dose steroid administration is effective.

Devices that help an affected individual continue daily activities such as braces, hand splits, limb supports, or a wheelchair are important. Various

other aids may be necessary if the patient has difficulty breathing or swallowing. Other treatment is symptomatic and supportive.

4.QUADA AQUINA SYNDROME

# DEFINITION

Cauda equina syndrome is a rare but serious condition that describes extreme pressure and swelling of the nerves at the end of the spinal cord.

Cauda equina syndrome is a medical emergency that calls for urgent surgical intervention.

# Causes

These are the most common causes of cauda equina syndrome:

* A severe ruptured disk in the lumbar area (the most common cause)
* Narrowing of the spinal canal (stenosis)
* A spinal lesion or malignant tumor
* A spinal infection, inflammation, hemorrhage, or fracture
* A complication from a severe lumbar spine injury such as a car crash, fall, gunshot, or stabbing
* A birth defect such as an abnormal connection between blood vessels (arteriovenous malformation).

# Symptoms

* Severe low back pain
* Pain, numbness, or weakness in one or both legs that causes you to stumble or have trouble getting up from a chair
* Loss of or altered sensations in your legs, buttocks, inner thighs, backs of your legs, or feet that is severe or gets worse and worse; you may experience this as trouble feeling anything in the areas of your body that would sit in a saddle (called saddle anesthesia)
* Recent problem with bladder or bowel function, such as trouble eliminating urine or waste (retention) or trouble holding it (incontinence)
* Sexual dysfunction that has come on suddenly.

# Diagnosis

A doctor can diagnose cauda equina syndrome. Here's what you may need to confirm a diagnosis:

* A medical history, in which you answer questions about your health, symptoms, and activity
* A physical exam to assess your strength, reflexes, sensation, stability, alignment, and motion. You may also need blood tests
* Magnetic resonance imaging (MRI) scan, which uses magnetic fields and computers to produce three-dimensional images of your spine
* A myelogram -- an X-ray of the spinal canal after injection of contrast material -- which can pinpoint pressure on the spinal cord or nerves
* A computed tomography (CT) scan.

# Treatment

* If you have cauda equina syndrome, you'll need prompt treatment to relieve pressure on nerves.
* Surgery must be done quickly to prevent permanent damage, such as paralysis of the legs, loss of bladder and bowel control, sexual function, or other problems.
* It is best if this occurs within 48 hours of the onset of symptoms. Depending on the cause of your CES, you may also need high doses of corticosteroids.
* These can reduce swelling. If you are diagnosed with an infection you may need antibiotics.
* If a tumor is responsible, radiation or chemotherapy may be needed after surgery.

## Q3. Name cranial nerves and write its functions. Also write effectiveness of MRP?

CRANIAL NERVES AND ITS FUNCTIONS ;

Your cranial nerves are pairs of nerves that connect your brain to different parts of your head, neck, and trunk. There are 12 of them, each named for their function or structure.

# 1.OLFACTORY NERVE

1. The olfactory nerve transmits information to the brain regarding a person’s sense of smell.
2. When a person inhales fragrant molecules, olfactory receptors within the nasal passage send the impulses to the cranial cavity, which then travel to the olfactory bulb.
3. Specialized olfactory neurons and nerve fibers meet with other nerves, which pass into the olfactory tract.
4. The olfactory tract then travels to the frontal lobe and other areas of the brain that are involved with memory and notation of different smells.

# 2.OPTIC NERVE

1. The optic nerve transmits information to the brain regarding a person’s vision.
2. When light enters the eye, it hits the retina, which contains rods and cones. These are photoreceptors that translate signals from light into visual information for the brain.
3. Cones are located in the central retina and are involved with color vision. Rods are located in the peripheral retina and are involved with non-color vision.
4. These photoreceptors carry signal impulses along nerve cells to form the optic nerve. Most of the fibers of the optic nerve cross into a structure called the optic chiasm. Then, the optic tract projects to the primary visual cortex in the occipital lobe at the back of the brain. The occipital lobe is where the brain handles visual information.

# 3.OCULOMOTOR NERVE

1. The oculomotor nerve helps control muscle movements of the eyes.
2. The oculomotor nerve provides movement to most of the muscles that move the eyeball and upper eyelid, known as extraocular muscles.
3. The oculomotor nerve also helps with involuntary functions of the eye:
4. The sphincter pupillae muscle automatically constricts the pupil to allow less light into the eye when the light is bright. When it is dark, the muscle relaxes to allow more light to enter.
5. The ciliary muscles help the lens adjust to short range and long range vision. This happens automatically when a person looks at near or far objects.

# 4.TROCHLEAR NERVE

1. The trochlear nerve is also involved in eye movement.
2. The trochlear nerve, like the oculomotor nerve, originates in the midbrain. It powers the contralateral superior oblique muscle that allows the eye to point downward and inward.

# 5.TRIGEMINAL NERVE

1. The trigeminal nerve is the largest cranial nerve and has both motor and sensory functions.
2. Its motor functions help a person to chew and clench the teeth and gives sensation to muscles in the tympanic membrane of the ear.
3. Its sensory division has three parts that connect to sensory receptor sites on the face:
4. The ophthalmic part gives sensation to parts of the eyes, including the cornea, mucosa in the nose, and skin on the nose, the eyelid, and the forehead.
5. The maxillary part gives sensation to the middle third of the face, side of the nose, upper teeth, and lower eyelid.
6. The mandibular part gives sensation to the lower third of the face, the tongue, mucosa in the mouth, and lower teeth.
7. Trigeminal neuralgia is a common disorder of the trigeminal nerve that can cause intense pain and facial tics.

# 6.ABDUCENS NERVE

1. The abducens nerve also helps control eye movements.
2. It helps the lateral rectus muscle, which is one of the extraocular muscles, to turn the gaze outward.
3. The abducens nerve starts in the pons of the brainstem, enters an area called Dorello’s canal, travels through the cavernous sinus, and ends at the lateral rectus muscle within the bony orbit.

7.FACIAL NERVE

1. The facial nerve also has both motor and sensory functions.
2. The facial nerve is made up of four nuclei that serve different functions:
3. movement of muscles that produce facial expression
4. movement of the lacrimal, submaxillary, and submandibular glands
5. the sensation of the external ear
6. the sensation of taste
7. The four nuclei originate in the pons and medulla and join together to travel to the geniculate ganglion.
8. Bell’s palsy is a common disorder of the facial nerve, which causes paralysis on one side of the face and possibly loss of taste sensation.

# 8.VESTIBULOCOCHLEAR NERVE

* + 1. The vestibulocochlear nerve is involved with a person’s hearing and balance.
		2. The vestibulocochlear nerve contains two components:
		3. The vestibular nerve helps the body sense changes in the position of the head with regard to gravity. The body uses this information to maintain balance.
		4. The cochlear nerve helps with hearing. Specialized inner hair cells and the basilar membrane vibrate in response to sounds and determine the frequency and magnitude of the sound.
		5. These fibers combine in the pons and exit the skull via the internal acoustic meatus in the temporal bone.

# 9.GLASSOPHARYNGEAL NERVE

1. The glossopharyngeal nerve possesses both motor and sensory functions.
2. The sensory function receives information from the throat, tonsils, middle ear, and back of the tongue. It is also involved with the sensation of taste for the back of the tongue.
3. The motor division provides movement to the stylopharyngeus, which is a muscle that allows the throat to shorten and widen.
4. The glossopharyngeal nerve starts in the medulla oblongata in the brain and leaves the skull through the jugular foramen, which leads to the tympanic nerve.

# 10.VAGUS NERVE

1. The vagus nerve has a range of functions, providing motor, sensory, and parasympathetic functions.
2. The sensory part provides sensation to the outer part of the ear, the throat, the heart, abdominal organs. It also plays a role in taste sensation.
3. The motor part provides movement to the throat and soft palate.
4. The parasympathetic function regulates heart rhythm and innervates the smooth muscles in the airway, lungs, and gastrointestinal tract.
5. The vagus nerve is the longest cranial nerve as it starts in the medulla and extends to the abdomen.

# 11.ACCESSORY NERVE

1. The accessory nerve provides motor function to some muscles in the neck:
2. It controls the sternocleidomastoid and trapezius muscles that allow a person to rotate, extend, and flex the neck and shoulders.
3. The accessory nerve separates into spinal and cranial parts.
4. The spinal component starts in the spinal cord and travels into the skull through the foramen magnum. From there, it meets the cranial component of the accessory nerve and exits the skull along the internal carotid artery.
5. The cranial part of the accessory nerve combines with the vagus nerve.

# 12.HYPOGOSSAL NERVE

1. The hypoglossal nerve is a motor nerve that supplies the tongue muscles.
2. The hypoglossal nerve originates in the medulla.
3. Disorders of the hypoglossal nerve can cause paralysis of the tongue, most often occurring on one side.

EFECTIVENESS OF MRP

* The hypoglossal nerve is a motor nerve that supplies the tongue muscles.
* The hypoglossal nerve originates in the medulla.
* Disorders of the hypoglossal nerve can cause paralysis of the tongue, most often occurring on one side.

**Q4.NAME BALANCE AND CO ORDINATION TESTS . WHAT IS MRP ?**

BALANCE AND COORDINATION TESTS:

# Balance test

# Static balance

# Rhomberg test

# Stroke leg test

# Single leg stance test

# Dynamic balance

# Berg balance test

# Anticipatory balance

# Functional reach test

# Reactive balance

# Pastor Day and Marsden Test

# COORDINATION TESTS

* Finger to nose test
* Finger to therapist finger
* Finger to finger
* Alternate nose to finger
* Finger opposition
* Mass grasp
* Pronation – supination
* Rebound test
* Tapping (hand)
* Tapping (foot)
* Pointing and past pointing
* Alternate – heel to knee-heel to toe
* Toe to examiners finger
* Heel on chin
* Drawing a circle
* Fixation or position holding

MRP

* It is a task-oriented approach to improving motor control, focusing on the relearning of daily activities.
* Retraining of motor control basing on understanding of normal movement & analysis of motor dysfunction.
* Emphasis of MRP is on practice of specific activities, the training of cognitive control over muscles & movt.
* Components of activities & conscious elimination of unnecessary muscle activity.
* In rehabilitation programme involve – real life activities included.

## Q5.. Define PNF? Discuss the following. (10)

## a) Irradiation

## b) Slow reversal

## c) Rhythmic stabilization

## d) Contract and hold relax.

PNF

# DEFINITION

Proprioceptive neuromuscular facilitation (PNF) is an effective way of using reflexes to assist muscular relaxation. Stretching using these principles is only one

part of a system used by physical therapists to help muscular strengthening, stability, neuromuscular control, as well as mobility and coordination. This has been shown to be superior to static stretching in some literature.

# A.IRRADIATION

* The spread of response to stimulus.
* The response to stimulus increase in intensity and duration
* Properly applied resistance leads to irradiation and reinforcement.
* Increase facilitation in the synergistic pattern of movt.
* No perfect rule b/c each pt react differently.
* For example hip flexion \_\_\_\_abdomanlis
* Supinator/pronator\_\_rotators

# B.SLOW REVERSAL

* Isotonic contraction of the antagonist followed immediately by an isotonic contraction of agonist.
* The initial contraction facilitate agonist contraction
* Slow reversal hold:
* Isotonic contraction of agonist followed immediately by an isometric contraction, which hold command given at the end of each active movt.
* Strength at specific point.

# C.RHYTHMIC STABILIZATION

* Isometric contraction of agonist followed by isometric contraction of antagonist to produce contraction and stability of the two opposing.
* Command is always hold.

# D.CONTRACT AND HOLD RELAX

* Stretching tech
* Contracture, tightness and flexibility
* Isotonic resistance to antagonist ms,pt relax and passively moved into agonist pattern.
* In Hold relax isometric contraction of antagonist against resistance followed by a concentric contraction of the agonist.

#  Thank you