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Holistic approach to the Neuromusculo Diseases related to Spinal Cord and Vertebral Column

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ABSTRACT

The spinal cord is a complex organization of nerve cells responsible for movement and sensation. It carries signals between the brain and the rest of the body. Spinal cord injuries can range from sensory loss to incomplete or complete paralysis. Spinal cord diseases are a heterogeneous group of conditions that cause damage or dysfunction of the spinal cord. They include infections, inflammatory disorders, vascular diseases and disorders that affect the meninges or perimeningeal spaces that surround the spinal cord. Motor, sensory, reflex, and sphincter abnormalities may be used to determine the location of a lesion within one of four major longitudinal divisions of the spinal cord. The divisions are cervical (C1–C5 spinal cord segments), cervical enlargement (C6–T2), thoracolumbar (T3–L3), and lumbar enlargement (L4–Cd5). A disorder of each of the four regions of the spinal cord results in a combination of neurological signs that is specific for the region involved. Recognition of a characteristic group of clinical signs therefore allows accurate localization of a spinal cord lesion. Spinal Cord disorders are conditions that cause damage and deterioration to the spinal cord. These conditions include Spinal stenosis, Herniated Discs, Degenerative disc disease etc. Symptoms of Spinal Cord Disorders are weakness or paralysis of limbs, loss of sensation, uncontrolled muscle spasms and back pain etc. Having knowledge of the location and structure of the protective spinal cord can help healthcare professionals to provide pain relief for certain procedures.

Key words: Spinal cord, Marma Chikitsa, Ayurvedic Drugs, Panchkarma

INTRODUCTION

The spinal cord is an organ primarily made up of nervous tissue that is found within protective membranes and the bony vertebral column. This organ

carries sensory and motor information between the brain and most other parts of the body. To carry out this function, the spinal cord is the origin of many spinal nerves, which allow communication with the peripheral organs.

Gross Anatomy of the Spinal Cord

The adult spinal cord is approximately 45cm (18 in.) long, with a maximum width of about 14 mm (0.55 in.).

Instead, the adult spinal cord extends inferiorly from the brain and ends between vertebrae L1 and L2. There are four spinal cord regions: cervical, thoracic, lumbar, and sacral.

The spinal cord contains both grey matter (primarily made up of neuron cell bodies) and white matter (primarily myelinated axons). The entire spinal cord is divided into 31 segments on the basis of the origins of

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the spinal nerves. The posterior (dorsal) surface of the spinal cord has a shallow longitudinal groove, the posterior median sulcus. The anterior median fissure is a deeper groove along the anterior (ventral) surface. In addition, the spinal cord has an internal passageway called the central canal. The amount of grey matter is greatest in segments of the spinal cord dedicated to the sensory and motor control of the limbs.

These segments are expanded, forming two enlargements of the spinal cord. The cervical enlargement supplies nerves to the shoulder and upper limbs. The lumbosacral enlargement

innervates structures of the pelvis and lower limbs. Inferior to the lumbosacral enlargement, the spinal cord becomes tapered and conical. This region is the conus medullaris. The filum terminale a slender strand of fibrous tissue, extends from the inferior tip of the conus medullaris. The white matter tracts containing ascending sensory and descending motor pathways are located peripherally, whereas nerve cell bodies are clustered in an inner region of grey matter. The membranes that cover the spinal cord the pia, arachnoid, and dura-matter are continuous with those of the brain, and the cerebrospinal fluid is contained within the subarachnoid space between the pia and arachnoid matter.

Diseases of Spinal Cord

Brown-Sequard syndrome

This is caused due to hemisection of the spinal cord. Various features are:

Below the level of lesion:

- Ipsilateral upper motor neuron paralysis caused by pyramidal tract damage.
- Ipsilateral loss of conscious proprioceptive sensations caused due to damage to posterior white column.
- Contralateral loss of pain and temperature and touch caused due to damage to lateral spinothalamic and anterior spinothalamic tracts.

At the level of lesion:

- Ipsilateral lower motor neuron paralysis caused due to damage to ventral nerve roots.
- Ipsilateral anaesthesia over the skin of the segment due to injury to the ventral nerve roots.

Above the level:

- Ipsilateral hyperaesthesia above the level of lesion due to irritation of dorsal nerve roots.

Syringomyelia

There is formation of cavities around the central canal usually in the lower cervical region. Its features are:

- Bilateral loss of pain and temperature occurs due to injury to the decussating fibres of lateral spinothalamic fibres.
- Bilateral loss of touch occurs due to injury to anterior spinothalamic tract.

As the decussation of lateral and anterior spinothalamic tracts occurs at different levels, there is dissociated sensory loss.

As this disease occurs in lower cervical and upper thoracic regions there is problem in both the upper limbs and front of chest.

Syringomyelia disrupts the crossing fibres of anterolateral system. The medial lemniscal system is spared.

Conus medullaris syndrome

Due to injury to S2, S3, S4 segments of spinal cord. Features are:

- Anaesthesia in the perineum. The region is supplied by these three segments.
- Involvement of bladder and bowel is early S2, S3, S4 segments carry sacral component of the parasympathetic system which supplies the bladder and lower bowel.
- Sexual functions are affected as same nerves carry out sexual functions as well.

Cauda equina syndrome

Damage to cauda equina results in:

- a) Lower motor neuron type of paralysis in the lower limbs due to compression of ventral nerve roots.
- b) Root pains are an important symptom due to involvement of dorsal nerve roots.

Poliomyelitis

It is a viral disease which involves anterior horn cells leading to flaccid paralysis of the affected segments. It is a lower motor neuron paralysis.

If poliomyelitis affects the upper cervical segments of spinal cord it may be fatal because of the involvement of C4 segment which supplies the diaphragm.

Tabes Dorsalis

It occurs during tertiary stage of syphilis. There are degenerative lesions of dorsal nerve roots and of posterior white columns. Its feature is severe pain in lower limbs, as the disease occurs in lower thoracic and lumbosacral segments. The lower limbs are mainly affected.

Kyphosis

Kyphosis is an exaggeration in the sagittal curvature present in the thoracic part of the vertebral column. It can be caused by muscular weakness or by structural changes in the vertebral bodies or by intervertebral discs. In sickly adolescents, for example, where the muscle tone is poor, long hours of study or work over a low desk can lead to a gently curved kyphosis of the upper thoracic region. The person is said to be "round-shouldered." Crush fractures or tuberculous destruction of the vertebral bodies leads to acute angular kyphosis of the vertebral column. In the aged, osteoporosis (abnormal rarefaction of bone) and/or degeneration of the intervertebral discs leads to senile kyphosis, involving the cervical, thoracic, and lumbar regions of the column.

Lordosis

Lordosis is an exaggeration in the sagittal curvature present in the lumbar region. Lordosis may be caused by an increase in the weight of the abdominal contents, as with the gravid uterus or a large ovarian tumor, or it may be caused by disease of the vertebral column such as spondylolisthesis. The possibility that it is a postural

compensation for a kyphosis in the thoracic region or a disease of the hip joint (congenital dislocation) must not be overlooked.

Scoliosis

Scoliosis is a lateral deviation of the vertebral column. This is most commonly found in the thoracic region and may be caused by muscular or vertebral defects. Paralysis of muscles caused by poliomyelitis can cause severe scoliosis. The presence of a congenital hemivertebra can cause scoliosis. Often, scoliosis is compensatory and may be caused by a short leg or hip disease.

Congenital Spondylolisthesis

In congenital spondylolisthesis, the body of a lower lumbar vertebra, usually the fifth, moves forward on the body of the vertebra below and carries with it the whole of the upper portion of the vertebral column. The essential defect is in the pedicles of the migrating vertebra. In this condition, the pedicles are abnormally formed and accessory centers of ossification are present and fail to unite. The spine, laminae, and inferior articular processes remain in position, whereas the remainder of the vertebra, having lost the restraining influence of the inferior articular processes, slips forward. Because the laminae are left behind, the vertebral canal is not narrowed, but the nerve roots may be pressed on, causing low backache and sciatica. In severe cases, the trunk becomes shortened, and the lower ribs contact the iliac crest.

Degenerative Spondylolithesis

This condition is common in the elderly and involves degeneration of the intervertebral discs in the lumbar region and osteoarthritis of the intervertebral joints. Anterior slippage of the fifth lumbar vertebra often occurs, and the lumbar nerve roots may be pressed upon causing low back pain and pain down the leg in the distribution of the involved nerve.

Herniated Intervertebral Discs

The discs most commonly affected are those in areas where a mobile part of the column joins a relatively immobile part, that is, the cervicothoracic junction and

the lumbosacral junction. In these areas, the posterior part of the annulus fibrosus ruptures, and the nucleus pulposus is forced posteriorly like toothpaste out of a tube. This is referred to as a herniation of the nucleus pulposus. This herniation can result either in a central protrusion in the midline under the posterior longitudinal ligament of the vertebrae or in a lateral protrusion at the side of the posterior ligament close to the intervertebral foramen. The escape of the nucleus pulposus will produce narrowing of the space between the vertebral bodies, which may be visible on radiographs. Slackening of the anterior and posterior longitudinal ligaments results in abnormal mobility of the vertebral bodies, producing local pain and subsequent development of osteoarthritis.

Disc Herniation Protrusion of the nucleus pulposus through the annulus fibrosus: Ninety-five percent at the L4/5 or L5/S1 level. Usually, posterolateral herniation where annulus is thinnest Herniation into the vertebral canal may compress the nerve root below the disc and cause pain in the related dermatome.

Lumbar Spinal Stenosis: Narrowing of the vertebral canal.

Stenosis, which means narrowing, can cause pressure on spinal cord or the nerves that go from spinal cord to muscles. Spinal stenosis can happen in any part of the spine but is most common in the lower back. Compression of spinal cord caused by age-related degenerative changes such as bulging of the IV discs or arthritis.

Pott's Spine

Tuberculous spondylitis, also known as Pott's disease, refers to vertebral body osteomyelitis and intervertebral discitis from tuberculosis, usually due to haematogenous spread from other sites, often the lungs. The lower thoracic and upper lumbar vertebrae areas of the spine are most often affected.

It causes a kind of tuberculous arthritis of the intervertebral joints. The infection can spread from two adjacent vertebrae into the adjoining intervertebral disc space. If only one vertebra is affected, the disc is normal, but if two are involved, the

disc, which is avascular, cannot receive nutrients, and collapses. In a process called caseous necrosis, the disc tissue dies, leading to vertebral narrowing and eventually to vertebral collapse and spinal damage. A dry soft-tissue mass often forms and superinfection is rare.

The spine is the most frequent location of musculoskeletal tuberculosis, and commonly related symptoms are back pain, kyphotic deformity of the spine, lower limb weakness, and paraplegia.

Spina Bifida

In spina bifida, the spines and arches of one or more adjacent vertebrae fail to develop. The condition occurs most frequently in the lower thoracic, lumbar, and sacral regions. Beneath this defect, the meninges and spinal cord may or may not be involved in varying degrees. This condition is a result of failure of the mesenchyme, which grows in between the neural tube and the surface ectoderm, to form the vertebral arches in the affected region. Types of Spina bifida are:

- Spina bifida occulta: The defect is only bony.
- Meningocele: Meninges protrude through the bony defect.
- Meningomyelocele: Meninges and spinal cord protrude through the bony defect.
- Rachischisis: The spinal cord and meninges do not develop.

Ankylosing spondylitis (AS)

Ankylosing spondylitis (AS) is a chronic, inflammatory disease of the axial spine that can manifest with various clinical signs and symptoms. Chronic back pain and progressive spinal stiffness are the most common features of the disease. Involvement of the spine and sacroiliac (SI) joints, peripheral joints, digits, entheses are characteristic of the disease. Impaired spinal mobility, postural abnormalities, buttock pain, hip pain, peripheral arthritis, enthesitis, and dactylitis ("sausage digits") are all associated with AS.

DISCUSSION

Systemic disease of the Spinal Cord includes Brown-Sequard syndrome, Syringomyelia, Partial cord lesion

(unilateral), Conus medullaris syndrome, Cauda equina syndrome, Poliomyelitis, Tabes dorsalis, Kyphosis, Lordosis, Scoliosis, Congenital Spondylolisthesis, Degenerative Spondylolithesis, Herniated Intervertebral Discs, Lumbar Spinal Stenosis, Pott Disease, Spina Bifida, Ankylosing spondylitis.

The anatomical aspect of each and every disease of spinal cord is very essential to know about the disease management. Some *Ayurvedic* procedures like *Marma* Therapy, *Panchkarma*, *Shodhana* and *Shaman* drugs will be able to manage the pathophysiology and give the relief in above mentioned diseases.

Actually, in the above mentioned diseases neurological disturbances are seen. Therefore, in these neurological diseases *Marma Chikitsa* plays significant role by giving relief in pain due to the diseases so it is beneficial to the patient.

As *Panchkarma Chikitsa* is one of the *Shodhana Chikitsa* in *Ayurveda* and it will cure all neurological compression through *Shodhana* Therapy.

In our *Ayurveda* many drugs are available to cure the nerve compression takes place due to spinal diseases like *Ekanerveer Rasa*, *Sameerpannaga Rasa*, *Swarna Bhasma*, Immunomodulator (*Rasayan* drugs). These all drugs will subside pain, swelling due to nerve compression.

Mode of action of Ayurvedic drugs

The *Ayurvedic* management of all spinal diseases includes *Shodhana* and *Shaman Chikitsa*.

In *Shodhana Chikitsa* indication of many types of *Basti* and *Katibasti* is mentioned in *Ayurvedic* texts. There are two types of *Basti* cited in these texts *Anuvasan* and *Niruha Basti*. *Anuvasan Basti* is totally *Sneha Basti* in which different types of oils were given to the patients. These oils are having properties like anti-inflammatory, analgesics etc. Therefore, it shows drastic improvement in such diseases. *Asthapana Basti* is a combination of *Madhu*, *Kalka*, *Lavana*, *Kwath* and *Prachepa Dravya*.

Swarna Bhasma acts as an adjuvant for various medicines, herbs and boosts their action and

increasing their efficacy. According to *Ayurveda* it is a good nervine tonic and improves overall health.

The Action of all these drugs is able to pacify pain and inflammations occur due to nerve compression.

CONCLUSION

From above study we conclude that clinic-anatomical aspect of spinal diseases is an essential feature to treat the diseases. It is beneficial for the management of these types of diseases as they give information about anatomical changes takes place in such diseases and through *Ayurvedic* various therapies and *Drugs* encouraging results can be given to the patients.

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