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# CONUS MEDULLARIS SYNDROME-A REVIEW

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***ABSTRACT***

*The spinal cord tapers and ends at the level between the first and second lumbar vertebrae in an average adult. The most distal bulbous part of the spinal cord is called the conus medullaris, and its tapering end continues as the filum terminale. Distal to this end of the spinal cord is a collection of nerve roots, which are horsetail-like in appearance and hence called the cauda equine. These nerve roots constitute the anatomic connection between the central nervous system (CNS) and the peripheral nervous system (PNS). They are arranged anatomically according to the spinal segments from which they originated and are within the cerebrospinal fluid (CSF) in the subarachnoid space with the dural sac ending at the level of second sacral vertebra. Conus medullaris syndrome refers to a characteristic pattern of neuromuscular and urogenital symptoms resulting from the simultaneous compression of multiple lumbosacral nerve roots below the level of the conus medullaris. These symptoms include low back pain, sciatica (unilateral or, usually, bilateral), saddle sensory disturbances, bladder and bowel dysfunction, and variable lower extremity motor and sensory loss .*

***KEYWORDS:*** *cauda equine;conus medullaris;distal bulbous spinal cord tapers;low back pain;saddle sensory*

## I. INTRODUCTION

During development, the vertebral columns grow more rapidly than the spinal cord. Spinal nerves exit the vertebral columns at more progressive oblique angles because of the increased distance between the spinal cord segments and the corresponding vertebrae. Lumbar and sacral nerves travel almost vertically down the spinal canal to reach their foramen to make an exit.[1]The spinal cord ends at the intervertebral disc in between the first and second lumbar vertebrae is known to bea tapered structure which is called as conus medullaris. It consists of sacral spinal cord segments. The filum terminaleis the fibrous extension of the cord. It is a non-neural element that extends down to the coccyx.

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The cauda equine is a bundle of intradural nerve roots at the end of the spinal cord. These cauda equine is seen in the subarachnoid space distal to the conus medullaris. Sensory innervations provide cauda quina to the saddle area, sphincters from motor innervations, and the bladder and lower bowel from parasympathetic innervatios. However, the nerve root in the cauda equina region carries sensation from the lower extremities, perineal dermatomes, and outgoing motor fibers to the lower extremity myotomes.

Primary blood supply to the conus medullaris is obtained from three major spinal artery which are the anterior median longitudinal arterial trunk and two posterolateral trunks.[2]Least prominent source of blood supply include radicular arteries the branch of aorta, lateral sacral arteries, and the fifth lumbar, iliolumbar, and middle sacral arteries. Even though the vascular supply of cauda equine is not in a segmental fashion, but it contributes latter. It is not like the blood supply to the peripherals nerve. The nerve roots also supplies from diffusion of surrounding CSF. Moreover, zone of relative hypovascularity will be seen in the proximal area of the nerve roots.[3]

## II. PATHOLOGY

Any lesion that compresses cauda equina nerve roots leads to a syndrome called conus medullaris . Compressed nerve roots are particularly susceptible to injury, because they have a poor developing epineurium. A well-developing epineurium such as peripheral nerves have the ability to protect against compressive and tensile stresses.[4]The micro vascular systems of nerve roots have a region of relative hypovascularity in their proximal third.

Increase in vascular permeability followed by subsequent diffusion from the surrounding cerebral spinal fluid supplement the nutritional supply. This increased permeability property is associated with tendency toward edema formation of the nerve roots, which results in edema compounding initial and also might seems to be slightly injured. Many studies show that the magnitude is not the only reason but also the length and the speed of obstruction were also have an important role in damaging the cauda equina region.[5] Blood flow reduces in the intermediate nerve segment when pressure is applied along the path of the nerve in cauda equina.[6]

## III. CAUSES

Any narrowing of the spinal canal that compresses the nerve roots below the level of the spinal cord causes conus medullaris syndrome.[7] There are numerous reasons forthis conus medullaris syndrome have been reported, including disc herniation, traumatic injury intradural disc rupture, spinal stenosis secondary to other spinal conditions, primary tumours like ependymomas and schwannomas, metastatic tumours, arteriovenous malformation or haemorrhage, infectious conditionsand iatrogenic injury.[8, 9]

Lumbar stenosis and spinal trauma including fractures are the most common causes of conus medullaris syndromes.[10] On the other hand, the herniated nucleus pulposus has caused2-6% of cases of conus medullaris syndrome[11, 12, 13] Moreover , neoplasm such as metastases, astrocytoma, neurofibroma, and meningioma affects 20% of all spinal tumours this region. Some other rare conditions are also leads to conus

medullaris syndrome, for example, inferior vena cava thrombosis spinal arteriovenous malformations, advanced-stage of ankylosing spondylitis, neurosarcoidosis and multiple sclerosis[14]

## IV. INFLAMMATORY AND INFECTIOUS CONDITIONS

Long-lasting inflammation of the spine, including Paget disease and ankylosing spondylitis, may leads to conus medullaris syndrome secondary to spinal stenosis or fracture. Infectious conditions, including epidural abscess, may lead to deformity of the nerve roots and spinal cord.[15] The general symptoms are severe back pain and a rapid progression in motor weakness. Infectious condition of conus medullaris syndrome can be pyogenic or nonpyogenic.

Generally, pyogenic abscesses are found in an immunocompromised or host with poor nourishment. Staphylococcus aureus causes epidural abscesses which increases the incidence of infections with methicillin-resistant s.aureus, Pseudomonas species, and Escherichia coli also been recorded [16].Nonpyogenic condition causing an abscess is rare, including tuberculosis. Resurgence of tuberculosis is secondaryfor immunocompromised individuals with HIV infection. They requires a high index of suspicion, as the development of conus medullaris syndrome can be followed by an indolent course.[17] Conus medullaris syndromes are classified as clinical syndromes of the spinal cord.

Conus medullaris syndrome is rare condition, and it can beatraumatically as well as traumatically. Although infrequently, it is a diagnosis that must be considered important as patients chief complaint is lower back pain associated with neurologic complaints, especially urinary symptoms.[18]

## V. TREATMENT

So far, there is no proven medical treatment exists. The therapy is available which is directed towards treating the underlying cause of this syndrome. For penetrating trauma, steroids have not shown any significant benefit. Surgical procedure is still controversial. The timing of decompression is controversial, with immediate, early, and late surgical decompression shows vary in results.[19, 20, 21] For mechanical compression of the cauda due to disk herniation, surgical intervention may be indicated. In aute conditions it is mandatory to do surgical decompression as soon as possible to relieve the nerves from pressure and increasing the space of the spinal canal.A practice guidelines have been introduced for the management of low back pain.[22, 23] Admit patients to the appropriate services usually under neurology, neurosurgery, or orthopedic surgery with frequent neurologic checks.

Ethically, the physician should start examine the patient at the time of admission [24,25]. Patients in whom has acute cauda equina syndrome should be considered to not be treated or investigated on an outpatient basis without evaluation by a consultant and appropriate imaging.[26, 27]For deep venous thrombosis/pulmonary embolism, patients should be given with antiembolic compression stockings and subcutaneous heparin for 3 months as prophylaxis.[28] Low molecular weight heparin is alsoan approved prescription for prophylaxis. Ultrasound should be taken as the initialscreening test in the lower extremities region. Patients with herniated disk recommended treatment is the laminectomy, followed by discectomy and

gentle retraction for decompression of the canal. Patient education, Biofeedback, and relaxation therapies may also be used.[29]

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