A Surgical Emergency: “Cauda Equina Syndrome”

Authors:
Sarkar S*1, Akther SMQ2, Mazumder U3, Khan MN4, Dey A5

1, 2, 4 Department of Neurosurgery, Shaheed Suhrawardy Medical College, Dhaka, Bangladesh,
3, 5 Dhaka Medical College Hospital, Dhaka, Bangladesh, 3Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh

*Corresponding Author:
Dr. Saumitra Sarkar *,
* Associate Professor & Head, Department of Neurosurgery, Shaheed Suhrawardy Medical College, Dhaka, Bangladesh
E-mail: saumitra_nsurg@yahoo.com

Abstract:
Background:
Cauda equina syndrome (CES) is a serious neurologic condition in which neurological dysfunction affects the lumbar and sacral nerve roots within the vertebral canal. The nerves of the Cauda equine supply the muscles that control the bladder, bowel and the legs and the dysfunction of the sacral and lumbar nerve roots within the vertebral canal producing impairment of bladder, bowel or sexual function and perianal or saddle numbness. Elucidation of these findings in the clinical examination is crucial. Recognition of CES is not only important to Neurosurgeons and Spine surgeons, but also to primary care practitioners, emergency room physicians, physiotherapists and allied health care professionals involved in management of back pain. It is an important diagnosis from a clinical and medico-legal perspective. Undiagnosed, delays to diagnosis or a delay in treatment can have a disproportionate medico-legal impact. This article aims to provide an understanding of CES with illustrations of its common causes and mimics. The number of potential aetiologies is vast but the most common causes are disc herniation, tumours, infection, spinal stenosis, inflammatory causes and vasculature occlusion. Early surgical decompression is advocated by most authors to best aid patient’s recovery and reduces long term disability.

Keywords: Benign Cauda equina, saddle anaesthesia, disc herniation, early surgery.

Introduction:
Cauda Equina Syndrome (CES) Is a Serious Neurologic Condition in Which Neurological Dysfunction Affects the Lumbar and Sacral Nerve Roots within the Vertebral Canal. The Spinal Cord Extends From the Brain Down Through A Canal
Inside the vertebral column. At each level of the spine, nerves are responsible for sending signals to and from the muscles and other structures throughout the body. The spinal cord finishes just above the waist; below this is the group of nerves called the cauda equina (CE). The nerves of the cauda equina supply the muscles that control the bladder, bowel, and the legs. Cauda equine syndrome is the symptoms which occur when the nerves of the cauda equina are compressed. The term “cauda equina” was first applied by the French anatomist Lazarius. In 1934, Mixter and Barr published the first definition of CES in English literature. They reported a spectrum of neurological and autonomic dysfunction in patients with a lumbar disc prolapse, which resulted in a severe compression of the cauda equina requiring emergency decompression.

Recognition of CES is not only important to neurosurgeons and orthopaedic surgeons, but also to primary care practitioners, emergency room physicians, physiotherapists, and allied health care professionals involved in management of back pain. It is an important diagnosis from a clinical and medico-legal perspective. Undiagnosed delays to diagnosis or a delay in treatment can have a disproportionate medico-legal impact. This article aims to provide an understanding of CES with illustrations of its common causes and mimics.

Pathophysiology:
The pathophysiological mechanisms of CES are not completely understood. It may result from any lesion affecting the CE nerve roots such as direct mechanical compression, inflammation, and venous congestion or ischemia. CE nerve roots are especially vulnerable to injury of compressive and tensile stresses. They are autonomic nerves and have or Schwann cell covering. Parke et al. suggest there is an area of relative hypovascularity at the proximal portion of the root which is sensitive to neuroischemic manifestations concurrent with degenerative changes.

Delamarter et al. analyzed evoked potentials and the pathology of cauda equina nerve root compression. They discovered that mild compression (25%) may not show signs of neurologic dysfunction, moderate compression (50%) may show signs of mild motor weakness with major changes in cortical evoked potentials and severe constriction (75%) may show signs of significant weakness, urinary incontinence, and signs of complete nerve root atrophy at the level of the constriction. They found that chronic severe constriction blocked the axoplasmic flow, leading to distal motor Wallerian degeneration and proximal sensory Wallerian degeneration.

Incidence:
CES occurs in approximately 2% of cases of herniated lumbar discs and is one of the spinal surgical emergencies. Following a lumbar disc prolapsed, Kostuik et al. report an incidence of between 2-6%. Podnar et al. reports an annual incidence rate of 1.5-3.4 million and period prevalence of 4.5-8.9 per 100,000 populations calculated.

Symptoms:
Cauda equina syndrome presents as one or a combination of the following symptoms. Most commonly these symptoms develop suddenly and may worsen rapidly, within hours or days. However, some people develop symptoms gradually.

Saddle anaesthesia
- Loss of feeling between the legs
- Numbness in or around the back passage and/or genitals
- Inability to feel the toilet paper when wiping

Bladder disturbance:
- Inability to urinate (pass water)
- Difficulty initiating urination (urinary hesitancy)
- Loss of sensation when you pass urine.
• Inability to Stop or Control Urination (Incontinence)
• Loss of the Full Bladder Sensation

**Bowel Disturbance:**
• Inability to Stop a Bowel Movement (Incontinence)
• Constipation
• Loss of Sensation When Passing A Bowel Motion.

**Sexual Problems:**
• Inability to Achieve an Erection or Ejaculate (Males)
• Loss of Sensation during Intercourse

**Diagnosis: History and Clinical Examination:**
There Are No Accepted Criteria In The Literature Defining CES. Timely Diagnosis And Prompt Treatment Are However Widely Accepted. CES Is A Clinical Diagnosis From The Patient History And Physical Examination. Radiographic Studies Serve To Confirm The Diagnosis And Define The Pathological Level Of The Lesion.

Gitelmanet A\textsuperscript{12} Reviewed 105 Articles And Proposed A Single Definition. **For A Diagnosis of CES, One or More of the Following Must Be Present:**

1. Bladder And/Or Bowel Dysfunction,
2. Reduced Sensation in the Saddle Area, And
3. Sexual Dysfunction, With Possible Neurologic Deficit In The Lower Limb (Motor/Sensory Loss, Reflex Change).

**3. Clinical Scenarios for CES:** \textsuperscript{12}

1. Rapid Onset without a Previous History of Back Problems.
3. Chronic Backache and Sciatica with Gradually Progressing CES Often With Canal Stenosis.

**Classification:**
CES May Be Divided Into Complete or Incomplete.\textsuperscript{13}

Incomplete Cauda Equina Syndrome Patients Present With Saddle Anaesthesia and Retention/Incontinence of Bladder or Bowel.

In Incomplete CES There Is Saddle Anaesthesia But Bladder And Bowel Dysfunction Has Not Progressed To Full Retention Orincontinence.

**Investigation:**
Plain Radiography Has Limited Role In Confirming CES. The Accepted Gold Standard Is Magnetic Resonance Imaging (MRI). This Clearly Depicts The Patient’s Soft Tissue Pathology And Delineates The Level. Disadvantages Include Difficulties Accessing Availability And Contraindications Such As Pacemakers And Poor Patient Tolerance Due To Claustrophobia.\textsuperscript{14}

Myelography And CT Myelography Can Be Used As An Alternative For Patients Not Suitable For MRI But Have The Disadvantage Of Being Invasive Techniques. High Resolution Fine Slice CT Maybe Used As A Non-Invasive Tool In Where MRI Is Not Possible.\textsuperscript{14} Inflammatory Markers And CSF Studies Should Be Performed When An Inflammatory Or Infectious Aetiology Is Being Considered.
The Most Common Cause Of CES Is Lumbar Disc Herniation At The L4-L5 And L5-S1 Level. Multiple Other Pathologies Can Damage The Anatomical Structures Involved.

<table>
<thead>
<tr>
<th>Causes</th>
<th>Lesions</th>
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<tr>
<td><strong>Congenital</strong></td>
<td>Spinal Dysraphism</td>
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<td>Vertebral Body Malformations</td>
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<td>Dwarfing Syndromes</td>
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<td></td>
<td>Congenital Tumours</td>
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<td><strong>Acquired</strong></td>
<td>Trauma</td>
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<td>Spinal Fracture Or Dislocation</td>
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<td>Infective</td>
<td>Bacterial Abscess</td>
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<td>Tuberculosis</td>
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<td>Neoplastic</td>
<td>Primary Tumour</td>
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<td>Secondary Metastases</td>
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<td>Degenerative</td>
<td>Spondylolisthesis</td>
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<td>Spinal Stenosis</td>
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<td><strong>Disc Prolapse</strong></td>
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<td>Inflammatory</td>
<td>Rheumatoid Arthritis</td>
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<td>Ankylosing Spondylitis</td>
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<td>Vascular</td>
<td>AV Malformation</td>
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<td>Epidural Or Subdural Haematoma</td>
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Management: The Aim Of Management For Patients Is To Act As Soon As Possible To Reduce The Risk Of Permanent Damage To The Affected Nerves. In Acute Compression Of The Conus Medullaris Or Cauda Equina, Immediate Surgical Decompression Is Essential To Reduce The Pressure And Increase The Space In The Vertebral Canal. Traditionally, Cauda Equina Syndrome Has Been Considered A Surgical Emergency, With Surgical Decompression Considered Necessary Within 48 Hours After The Onset Of Symptoms, And Preferably Performed Within 6 H Of Injury. Most Authors Advocate Emergency Surgical Decompression To Improve Outcomes In CES, However There Is Controversy With Regard To The Timing Of Surgery. Although The Majority Of Authors Advocate Early Surgery Within 24 Hours To Improve Functional Outcome, Several Authors Have Shown Little Benefit To Patients With Complete Cauda Equina Syndrome.
 Syndrome And Early Operative Intervention. While There Is Debate About The Exact Timing Of Surgery In Theliterature, The Consensus View Is That Those With Incomplete Cauda Equina Syndrome Or Indeterminate Cases Should Bedecompressed Immediately As Their Neurologic And Urologicoutcomes Are Clearly Improved If The Patient Does Not Progress To Complete Cauda Equina Syndrome.\textsuperscript{16,17} Corticosteroid Therapy May Be Beneficial In Suppressing An Inflammatory Response But Treatment Must Be Started Within Eight Hours Of Injury. If Treatment Begins After This Time There Appears To Be No Benefit and May Even Have Detrimental Effects.\textsuperscript{18}

**Surgical Technique:**
The Accepted Surgical Technique For CES Treatment Iswide Laminectomy And Extensive Decompression With Foraminotomies As CES Is Oftensecondary To A Large Lumbar Disc Herniation. Several Authors Also Aggressively Remove Disc Space Material After Decompression. As For Compressive Hematomas Or Abscesses, Tumours Thorough Evacuation Becomes The Mainstay Of Treatment.\textsuperscript{15}

**Conclusion:**
Considering The Significant Financial And Social Burden Of Thiscondition Of A Developing Country, All Primary Care Physicians Have To Be Trainedin Identifying CES Early Among Lot Of Nonspecific Backaches.CES Results From Dysfunction Of The Sacral And Lumbarnerve Roots Within The Vertebral Canal Producing Impairmentof Bladder, Bowel Or Sexual Function And Perianal Or Saddle Numbness. Elucidation Of These Findings In The Clinicalalexamination Is Crucial. The Number Of Potential Aetiologies Is Vast But The Mostcommon Causes Are Disc Herniation, Tumours, Infection, Spinal Stenosis, Inflammatory Causes And Vasculature Occlusion. Early Surgical Decompression Is Advocated By Most Authorsto Best Aid Patient’s Recovery And Reduces Long Term Disability.There Is Evidence To Suggest Intervention Within 24 Hours Significantly Improves Outcomes.

**References:**


