ABSTRACT

ACUTE TETRAPLEGIA AND PARAPLEGIA

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Learning Objectives:

1. To discuss the clinical diagnosis and findings of acute tetraplegia and paraplegia.
2. To review the radiological evaluation of traumatic and nontraumatic spinal cord injuries (SCI) causing acute tetraplegia and paraplegia.
3. To briefly review current concepts in treatment of acute tetraplegia and paraplegia.

Purpose:

To be comfortable with the imaging work-up and follow-up of traumatic and nontraumatic SCIs causing acute tetraplegia and paraplegia.

General Content:

SCI is a devastating condition defined as damage or trauma to the spinal cord with subsequent loss of or impaired function resulting in reduced mobility or feeling.

<table>
<thead>
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<th>Acute Spinal Cord Injury Can be Caused By:</th>
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<tr>
<td><strong>Trauma</strong></td>
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<td><em>Inflammatory and degenerative central nervous system diseases</em></td>
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<td><em>Vascular insults</em></td>
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<td><em>Intervertebral disk herniations</em></td>
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<td><em>Spinal stenosis</em></td>
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<td><em>Primary and metastatic tumors</em></td>
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<td><em>Infections</em></td>
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<td><em>Spontaneous hematomas</em></td>
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<td><em>Miscellaneous (i.e. syringomyelia, radiation myelopathy)</em></td>
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Tetraplegia (quadriplegia) comprises a spinal cord injury above the first thoracic vertebra (T1). The lesion usually affects the cervical spinal nerves, C1 to C8, resulting in paralysis of all four limbs. This may result in partial or complete paralysis of the arms as well as complete paralysis of the legs. Paraplegia comprises complete paralysis of the lower half of the body, including both legs, caused by SCI. Incomplete SCIs comprise; anterior, central, and posterior cord syndromes, Brown-Séquard syndrome, conus medullaris syndrome, and cauda equina syndrome.

Much confusion surrounds the terminology associated with spinal cord injury levels, severity, and classification. The American Spinal Injury Association (ASIA) Spinal Cord Injury Classification approach has now been adopted by almost every major organization associated with spinal cord injury. This has resulted in more consistent terminology.
ASIA Classification of Spinal Cord Injuries:

A - Complete: No sensory or motor function is preserved in sacral segments S4-S5.
B - Incomplete: Sensory, but not motor, function is preserved below the neurologic level and extends through sacral segments S4-S5.
C - Incomplete: Motor function is preserved below the neurologic level, and most key muscles below the neurologic level have muscle grade less than 3.
D - Incomplete: Motor function is preserved below the neurologic level, and most key muscles below the neurologic level have muscle grade greater than or equal to 3.
E - Normal: Sensory and motor functions are normal.

Acute traumatic SCI is optimally managed in a level 1 trauma center. Spinal cord decompression, stabilization of the spine, and maintenance of tissue perfusion are fundamental to optimizing outcomes. Additionally, in the cases caused by spinal infection proper antibiotic therapy is of great importance. Clinical trials have shown that early high dose steroid treatment improves recovery by about 20% when administrated within 8 hours after injury but does not help when started more than 8 hours after injury. However, this topic is controversial and some clinicians believe that there is no definite benefit of early steroid therapy in patients with SCI. Establishing a diagnosis and treatment plan is essential, in conjunction with prevention of complications and early physiatric intervention.

Magnetic resonance imaging (MRI) with its superb contrast resolution is a study of choice for the evaluation of SCI including patients with traumatic and nontraumatic conditions causing tetraplegia and paraplegia. However, computed tomography (CT) [with or without myelography] with its superb spatial resolution and coronal, sagittal, and 3D reformatting may also contribute the diagnosis and pretreatment planning. CT is the study of choice for patients on whom the MRI studies cannot be performed due to contraindications.

In acute spinal cord compression early diagnosis is necessary to initiate prompt operative intervention with decompression to prevent progressive neurological deficits. In ischemic spinal cord lesion, therapy is restricted to prevent further cardiovascular complications which additionally induce spinal cord dysfunction.

The most important prognostic variable relating to neurologic recovery in a patient with a spinal cord injury is the completeness of the lesion. When an incomplete cervical spinal cord lesion exists, younger patients and those with either a central cord or Brown-Sequard syndrome have a more favorable prognosis for recovery.
Multiple patients presented with acute neurologic deficit with complete or partial paralysis caused by trauma and several nontraumatic conditions.

19 year-old male patient presented post motor vehicle roll over, sustained complex proximal cervical spine injury including a Type III dens fracture and perched right C2-C3 facets, presented with incomplete tetraplegia.

34 year-old female patient presented post motor vehicle accident, sustained complete anterior dislocation at the T11-T12 level with T12 fracture and complete spinal cord transection.
9 year-old male patient with Acute Disseminated Encephalomyelitis (ADEM) and concurrent meningitis following respiratory illness, presented with acute tetraparesis.

86 year-old female patient presented with acute onset paraparesis related to T8 acute spinal cord infarct secondary atherosclerotic disease.
39 year-old male patient presented with acute paraplegia secondary to congenital stenosis of the thoracic spinal canal with herniated disk-osteophyte complexes at multiple consecutive levels in the upper thoracic spine

49 year-old male patient presented with acute paraplegia secondary to T4 pathologic fracture from metastatic disease of unknown primary tumor, causing spinal cord compression
65 year-old female patient with disseminated Coccidioidomycosis infection presented with acute paraplegia caused by diskitis/osteomyelitis of the thoracic spine centered at the T7-T8 levels with a large paraspinal component. Abnormal increased signal in the spinal cord is caused by venous infarction.

57 year-old female patient presented with spinal cord compression and acute paraplegia caused by epidural hematoma following spinal cord stimulator placement