Emergency Department Evaluation and Treatment of Cervical Spine Injuries

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KEYWORDS

• Emergency department • Cervical spine • Spinal cord • Neurologic injury • Cooling • Corticosteroid use

KEY POINTS

- Most spinal cord injuries involve the cervical spine, highlighting the importance of recognition and proper management by emergency physicians.
- Initial cervical spine injury management should follow the ABCDE (airway, breathing, circulation, disability, exposure) procedure detailed by Advanced Trauma Life Support.
- NEXUS (National Emergency X-Radiography Utilization Study) criteria and Canadian C-spine Rule are clinical decision-making tools providing guidelines of when to obtain imaging.
- Computed tomography scans are now the preferred initial imaging modality.
- Consider administering intravenous methylprednisolone after discussion with the neurosurgical consultant in patients who present with spinal cord injuries within 8 hours.

Patients who arrive at the emergency department (ED) with potential cervical spine injuries pose a common challenge for emergency physicians (EPs). EPs should be prepared to manage these patients efficiently and effectively while protecting the cervical spine to prevent additional neurologic injury during evaluation and transfers. EPs must understand the complex anatomy of the cervical spine, and the mechanism and types of injuries, as well as being comfortable recognizing and managing associated injuries. EPs must also have an understanding of the utility and limitations of available imaging

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modalities. In addition, EPs should be aware of issues surrounding the management of specific patient populations at risk for neck and cervical spine injuries.

EPIDEMIOLOGY

The incidence of spinal cord injury remains unknown; however, in the United States and Canada, the incidence is estimated to be between 30 and 46 cases per million population.[1,2]

- Most patients with spinal cord injury (82%) are male, and aged 16 to 30 years.[3]
- The risk of cervical spine injury increases with age among children and adolescents (13.2 per 100,000 per year for those aged >11 years, compared with 1.2 per 100,000 in those younger than 11 years).[4]
- Most spinal cord injuries result from motor vehicle accidents (47%), falls (23%), gunshot wounds/violence (14%), and sports-related activities (9%).[5,6]
- Spinal cord injuries occur in 10% to 20% of patients with spinal fractures and are found in nearly 50% of patients with bony cervical vertebral injuries.[7]
- Cervical injuries occurred in 65% of the spinal cord injuries from motor vehicle collisions, 53% of the cord injuries from falls from heights, 37% of the cord injuries from gunshot wounds, and 97% of the cord injuries from diving.[8]
- It is estimated that cervical fractures occur in 1% to 3% of patients with blunt trauma.[8,9]

Significant cervical spine injuries can occur following minor trauma in the elderly[10] as well as in patients with predisposing arthritic conditions, such as:

- Ankylosing spondylitis[11,12]
- Psoriatic cervical spondyloarthropathy[13]
- Rheumatoid arthritis[14]

ANATOMY

Understanding the anatomy of the cervical spine is critical to recognizing injury patterns.

- The spinal column consists of 33 vertebrae:
  - 7 cervical, 12 thoracic, 5 lumbar, 5 sacral (fused), and 4 coccygeal (fused) (**Fig. 1**)
- The anterior and posterior longitudinal ligaments hold the vertebral bodies together.
- Intervertebral discs separate the vertebral bodies and provide cushioning and flexibility.
- The spinal cord is housed in a bony ring made up of 2 pedicles (or pillars) on which the roof of the vertebral canal (the lamina) rests.
- Afferent and efferent nerve roots pass through the intervertebral foramina.

The occipitoatlantoaxial complex is made up of the articulations between the base of the skull, atlas (C1), and axis (C2) (**Fig. 2**); and several strong ligaments (**Fig. 3**) with unique articular and ligamentous relationships[15] that protect the upper cervical spine while allowing a wide range of motion.[16]

- Occipital condyles articulate with the corresponding concavities in the lateral masses of the atlas to allow for flexion and extension.
- The tectorial membrane functions to stabilize extension of the occiput on the atlas.