Module 1: Cervical Trauma— upper cervical trauma

Case presentation: *Cervical trauma–C1*

Begin the first session of the course with a case presentation to demonstrate the relevance of the content to their daily activities of assessing patients with cervical trauma. The suggested case is a Jefferson C1 fracture with disruption of the transverse ligament.

Participants should discuss the clinical assessment of patients presenting with a cervical injury, the clinical and radiographic processes for a suspected cervical injury, and "clearing" the cervical spine. Also reinforce ATLS principles.

Discussion should lead into the lecture regarding the classification of upper cervical spinal trauma/injury.

Lecture: *Upper cervical injury classification systems*

The presentation should be an overview of the classification systems relevant to upper cervical injuries (C0–1, C1, and C2 injuries). There is no need to present excessive detail. The focus should be to identify factors that indicate the presence of significant instability or poor outcomes if neglected or treated inadequately. Include clinical examples of fracture patterns in the presentation to reinforce learning points.

The provision of handouts or access to online resources would enable participants to review and consolidate knowledge of the relevant classification systems on their own time.

This lecture and the relevant material may be provided to participants prior to the course and considered "assumed knowledge". In this situation focus on the application of the classification system rather than the details of the system itself. Additional time can then be allocated to the discussion of cases.

Learning outcomes

- Recognize an injury to the upper cervical spine
- Evaluate the stability of an upper cervical spinal injury
- Classify the injury according to an appropriate and recognized classification system
- Describe the nature of the injury to a colleague or supervisor
- Outline the surgical principles and procedures that may be used to stabilize an upper cervical spinal injury

Case presentation: *Cervical trauma–C2*

Use the case to review the process for clinical and radiographic assessment of patients with upper cervical spinal trauma. Discuss prognostic factors in relation to upper cervical injuries, particularly the incidence of nonunion with this sort of injury, age-related factors, and indications for surgical intervention. Also consider comorbidities (such as osteoporosis, cardiac, and respiratory disease) and how the presence of these conditions influences management.

Conclude the discussion with a brief summary of the key points and take-home messages.

Discussion

Review relevant points and discuss topics identified during discussion that warrant further emphasis or clarification.

Lecture: *Spinal biomechanics*

The presentation should focus on assessment of injury mechanism and morphology and clinical and radiographic features indicating the presence of instability. Identify differences between the upper and lower cervical regions and the ligamentous and bony structures that contribute to the stability of both regions.

Discuss nonoperative methods used to stabilize the spine for transportation or during clinical and radiographic evaluation. Discuss the features of various types of braces and their application and the general principles in relation to the indications for surgical stabilization.

Conclude the discussion with a brief summary of the key points and take-home messages.

Learning outcomes

- Define the mechanism and morphology of a spinal injury
- Recognize the presence of instability
- Describe the principles of spinal biomechanics

Lecture: *Imaging in spinal trauma–tips and special features*

Discuss the application and interpretation of screening radiographic imaging (plain x-rays and CT) and the indications for and interpretation of more advanced forms of imaging such as MRI, dynamic films, angiography etc.

The focus should be on the practical “day-to-day” process of assessing a patient following spinal trauma and the use and interpretation of imaging to “clear” the spine and to define the morphology of the injury, canal compromise, and injury to the spinal cord. Correlation with clinical features should be made where possible.

Conclude the discussion with a brief summary of the key points and take-home messages.

Learning outcomes

- Describe the imaging modalities that are indicated for the assessment of spinal trauma
- Interpret abnormalities evident on x-rays, dynamic films, CT, MRI, etc used to assess spinal trauma

- Identify radiographic features of instability and spinal cord injury

Module 1: Cervical Trauma– subaxial cervical trauma

Case presentation: *Cervical trauma–cervical burst fracture*

Participants should discuss the clinical assessment of patients presenting with a cervical injury, particularly in relation to the assessment of neurological loss. Review the ASIA scoring system and the relevance of neurological compromise in relation to the indications for and timing of treatment. Also discuss the need to achieve stability of the spinal column and decompression of the neural elements, the role of bracing, and the application of traction. Also reinforce ATLS principles and the management of patients with spinal cord injury in relation to associated injuries to the axial skeleton.

Discussion should lead into the lecture regarding the classification of subaxial cervical spinal trauma.

Lecture: *Subaxial cervical injury classification systems*

The presentation should summarize relevant points only (there is no need to go over all historical classification systems unless relevant to the learning outcomes). Focus on what residents can use in their day-to-day practice that will assist them when they communicate with attending surgeons and colleagues. There is no need to present excessive detail. The focus should be to identify factors that indicate the presence of significant instability or poor outcomes if neglected or treated inadequately. Include clinical examples of fracture patterns in the presentation to reinforce learning points and indicate the need for surgical intervention.

The provision of handouts or access to online resources would enable participants to review and consolidate knowledge of the relevant classification systems on their own time.

This lecture and the relevant material may be provided to participants prior to the course and considered "assumed knowledge". In this situation focus on the application of the classification system rather than the details of the system itself. Additional time can then be allocated to the discussion of cases.

Conclude the discussion with a brief summary of the key points and take-home messages.

Learning outcomes

- Recognize an injury to the subaxial cervical spine
- Evaluate the stability of a subaxial cervical spinal injury
- Classify the injury according to an appropriate and recognized injury classification system
- Describe clearly the nature of the injury to a colleague or supervisor
- Describe the surgical principles and procedures that may be used to stabilize an upper cervical spinal injury

Case presentation: *Cervical trauma–cervical dislocation*

Use the case to review the process for clinical and radiographic assessment of patients with subaxial cervical spinal trauma. As bilateral facet dislocation is usually associated with neurological compromise, discuss the need for a multidisciplinary approach to the management of acute spinal cord injury (ASCI).

The application of traction, the use of traction to achieve reduction, and the role of closed reduction and the associated risks should be discussed.

Also discuss the mechanism of injury and the importance of considering this in determining the structures that have been disrupted and the most appropriate surgical approach when surgery is indicated.

Lecture: *Spinal cord injury assessment*

Discuss the ASIA scoring system and common spinal cord injury patterns, the assessment of spinal shock, and strategies that can be used to minimize secondary spinal cord damage due to compression, edema, and instability.

Discuss the implications of cord injury in relation to the indications for treatment and the timing of this, and the current evidence regarding medical strategies to minimize cord injury (drugs, hypothermia, etc) and experimental treatments such as stem cells.

Cover the principles and techniques for the application of cervical traction and reduction of a dislocation, fracture dislocation, or subluxation.

Common complications associated with the management of spinal cord injured patients (pressure sores, DVT, contractures, psychological distress, autonomic dysreflexia, etc) and strategies to avoid or manage these issues should also be addressed.

Reinforce the need for collaboration with a multidisciplinary rehabilitation team early in the management of spinal cord injured patients.

Conclude the discussion with a brief summary of the key points and take-home messages.

Learning outcomes

- Assess neurological status of spinal injured patients using the ASIA scale
- Describe the prognostic factors associated with spinal cord injury
- Recognize complications associated with the presence of a significant spinal cord injury and outline the principles of their management
- Apply and manage cervical traction

Case presentation: *Cervical trauma–cervical dislocation*

Use the case to discuss the natural history of central cord syndrome in this group of patients, and the association with preexisting cervical canal stenosis, degenerative disease, and associated comorbidities.

Discuss clinical assessment, features of cord injury syndromes, and indications for surgical intervention.

Lecture: *Cervical trauma–special considerations*

Cover injuries where the identification of the injury may be masked or not readily apparent and where the nature of the injury requires special attention and/or management, or where there is an increased incidence of complications.

Address the management strategies that can be used to identify, avoid, or overcome these factors. Discuss these strategies using case examples.

Conclude the discussion with a brief summary of the key points and take-home messages.

Learning outcome

- Recognize features in patients with spinal column or spinal cord injuries that require special consideration and treatment.

Discussion

Review relevant points and discuss topics identified during discussion that warrant further emphasis or clarification. It is also possible to discuss other cases such as a Hangman's fracture or an odontoid fracture in the elderly if relevant to the needs of the participants and if there is time available. These types of cases could also be covered at the end of the day in the hour allocated for discussion.