early acute management in spinal cord injury

Hasan Sjahrir
Department of Neurology
Sumatera Utara University
Medan

http://neurologiusu.id

• 2–4% of trauma patients have cervical spine injuries (CSIs), of which roughly 20% have spinal cord injury (SCI),
• 10% have multi-level injuries, and
• 10% have pure ligamentous injuries

• The most common levels of injury on admission are:
  • C4, C5 (the most common), and C6,
  • T12.

• sundstrøm t et al. journal of neurotrauma 31:531–540 (march 15, 2014)
Assessment for spinal injury
On arrival at the scene of the incident, use a prioritising sequence to assess people with suspected trauma, for example <C>ABCD:

- catastrophic haemorrhage
- airway with in-line spinal immobilisation
- Breathing
- circulation
- disability (neurological)

PRE HOSPITAL CARE

- stabilize on the hard backboard and immobilize the spine on the basis of injury and pain in the vertebral
- The patient is best treated initially in the supine position full in-line spinal immobilisation
- Use analgesics appropriately and aggressively to maintain the patient's comfort
- Stabilization of unstable injured motion segments plays an important role in preventing further injury.
- Depending on the level of neurologic deficit and injuries, the patient may require admission to the ICU
Prehospital Use of Cervical Collars in Trauma Patients: A Critical Review

Terje Sundstrøm,1–3 Helge Asbjørnsen,4,5 Samer Habiba,3 Geir Arne Sunde,4,6 and Knut Wester2,3

• It has been argued that collars cause more harm than good, and that we should simply stop using them
• effective strategy for prehospital spinal immobilization that does not include routine use of collars.

• approximately 5% of patients with spinal injuries experience some degree of neurological worsening, even with good immobilization of the spine
• the collar should, in theory, protect patients from secondary spinal cord traumas by restricting inadvertent movements of unstable CSIs.
• using a collar does not effectively reduce motion in an unstable spine
• Collar efficacy on motion control has never been examined in real trauma patients
• The existing evidence for using collars is weak
• Assess whether the person is at high, low or no risk for cervical spine injury using the Canadian C-spine rule as follows:
  • the person is at high risk if they have at least one of the following high-risk factors:
    • age 65 years or older
    • dangerous mechanism of injury (fall from a height of greater than 1 metre or 5 steps, diving, high-speed motor vehicle)
    • paraesthesia in the upper or lower limbs

the person is at low risk if they have at least one of the following low-risk factors:
  • comfortable in a sitting position ambulatory at any time since the injury
  • no midline cervical spine tenderness
  • delayed onset of neck pain
  • unable to actively rotate their neck 45 degrees to the left and right

the person has no risk if they:
  • have one of the above low-risk factors and
  • are able to actively rotate their neck 45 degrees to the left and right.
Assess the person with **suspected thoracic or lumbosacral spine injury** using these factors:

- age 65 years or older and reported pain in the thoracic or lumbosacral spine
- dangerous mechanism of injury (fall from a height of greater than 3 metres, ejection from a high speed motor vehicle, horse riding accidents)
- pre-existing spinal pathology, or known or at risk of osteoporosis – for example steroid use
- suspected spinal fracture in another region of the spine abnormal neurological symptoms (paraesthesia or weakness or numbness)
on examination:
- abnormal neurological signs (motor or sensory deficit)
- new deformity or bony midline tenderness (on palpation)
- bony midline tenderness (on percussion)
- midline or spinal pain (on coughing)

on mobilisation (sit, stand, step, assess walking):
- pain or abnormal neurological symptoms (stop if this occurs)
Pain management in pre-hospital and hospital settings

- Offer medications to control pain in the acute phase after spinal injury.
- For people with spinal injury use intravenous morphine 5 mg as the first-line analgesic and adjust the dose as needed to achieve adequate pain relief.
- If intravenous access has not been established, consider the intranasal route for atomised delivery of diamorphine or ketamine.
- Consider ketamine in analgesic doses as a second-line agent (1-4.5 mg/kg IV or 6.5-13 mg/kg IM).

NICE guideline 2016
Suspected spinal cord or cervical column injury

- Perform MRI for children (under 16s) if there is a strong suspicion of:
  - cervical spinal cord injury as indicated by the Canadian C-spine rule and by clinical assessment or
  - cervical spinal column injury as indicated by clinical assessment or abnormal neurological signs or symptoms, or both.
- Consider plain X-rays in children (under 16s) who do not fulfil the criteria for MRI in recommendation but clinical suspicion remains after repeated clinical assessment.

Perform CT in adults (16 or over) if:

- imaging for cervical spine injury is indicated by the Canadian C-spine rule or
- there is a strong suspicion of thoracic or lumbosacral spine injury associated with abnormal neurological signs or symptoms.
- If, after CT, there is a neurological abnormality which could be attributable to spinal cord injury, perform MRI.
Suspected thoracic or lumbosacral column injury only (children and adults)

- Perform an X-ray as the first-line investigation for people with suspected spinal column injury without abnormal neurological signs or symptoms in the thoracic or lumbosacral regions (T1–L3).
- Perform CT if the X-ray is abnormal or there are clinical signs or symptoms of a spinal column injury.
- If a new spinal column fracture is confirmed, image the rest of the spinal column.

NICE guideline 2016

The thoracic spine is

- functionally rigid due to coronally oriented facet joints, thin intervertebral discs and the ribcage.
- Thus, it requires huge amounts of energy to produce fractures and dislocations.
- The narrow spinal canal in this region predisposes to spinal cord damage resulting in a high incidence of neurological deficit.
- Fractures of the thoracolumbar region are the most common injuries of the vertebral column.

### Spinal cord injury pathology

- injury mechanisms leading to neural tissue destruction
- degree of neural injury is directly related to the duration of spinal cord compression
  - **The primary injury** (non modifiable)
    - consists of the initial traumatic compressive force applied to the spinal cord causing laceration and or
    - intramedullary hematoma formation

---

### a cascade of secondary injury: (potentially modifiable).

- exacerbate the degree of tissue destruction, beginning immediately after the primary injury, include
  - free radical formation,
  - cellular ionic imbalance,
  - cell membrane lipid peroxidation,
  - release of excitotoxic glutamate
  - vascular dysfunction phenomenon, such as vasospasm and perfusion reperfusion injury.
  - inflammation and delayed apoptotic cell death

---

Wilson JR & Fehlings MG. The American Society for Experimental NeuroTherapeutics, Inc. 2011


Wilson JR & Fehlings MG. The American Society for Experimental NeuroTherapeutics, Inc. 2011

hasansjahri
Neurogenic shock management and treatment goals

• isotonic crystalloid solution to a maximum of 2 L is the initial treatment of choice.
• Overzealous crystalloid administration may cause pulmonary edema, because these patients are at risk for the acute respiratory distress syndrome (ARDS).
• Head injuries and neurologic evaluation

The Management of Acute Traumatic Spinal Cord Injury

• The National Acute Spinal Cord Injury Studies (NASCIS) II and III, a Cochrane Database of Systematic Reviews article and other published reports, have verified significant improvement in motor function and sensation in patients with complete or incomplete spinal cord injuries (SCIs) who were treated with high doses of methylprednisolone within 8 hours of injury.
• the following steroid protocol:
  • methylprednisolone 30 mg/kg bolus over 15 minutes
  • And an infusion of methylprednisolone at 5.4 mg/kg/h for 23 hours beginning 45 minutes after the bolus.
The risks of steroid therapy are increased incidence of infection and avascular necrosis has been documented.

Updated guidelines in the American Association of Neurological Surgeons (AANS) recommend against the use of steroids early after an acute SCI.

- The guidelines recommend that methylprednisolone not be used for the treatment of acute SCI within the first 24-48 hours following injury.

The previous standard was revised because of a lack of medical evidence supporting the benefits of steroids in clinical settings and evidence that high-dose steroids are associated with harmful adverse effects.

the administration of monosialotetrahexosyl ganglioside (GM-1) complex following acute spinal cord injury, improving neurologic recovery at a 3-month

- The available medical evidence does not support a significant clinical benefit.
- It was evaluated as a treatment adjunct after the administration of methylprednisolone.
Numerous pharmacological agents thought to mitigate the secondary injury have been extensively studied. These include:

- the steroids (anti-inflammatory), gangliosides, naloxone (opiate receptor antagonist), calcium channel blockers, free radical scavengers and neurotropic agents
- that evidence of the drug’s efficacy and impact is weak
- the use of high dose methyl prednisolone in the treatment of acute SCI is not proven as a standard of care.
- In a systematic review of studies, concluded that there is no evidence for the effectiveness of bracing in patients with traumatic thoracolumbar fractures.

Early management in the emergency department after traumatic spinal cord injury

- Do not use the following medications, aimed at providing neuroprotection and prevention of secondary deterioration, in the acute stage after acute traumatic spinal cord injury:
  - Methylprednisolone, nimodipine, naloxone.
  - Do not use medications in the acute stage after traumatic spinal cord injury to prevent neuropathic pain from developing in the chronic stage.

Communication with tertiary services/trauma centre

• the trauma team leader should immediately contact the spine neurosurgical or spinal surgeon orthopaedic on call
• performing early decompression and restore stability
• One systematic review, concluded that early spinal surgery (<24 h) results in better neurological outcome than delayed surgery (>24 h) for patients with incomplete injuries (class 2 evidence)
• Vaccaro et al. randomized patients to either early surgery (<72 h) or late surgery (>72 h), and found no difference in neurologic recovery or length of hospital stay between these groups. (class 2 evidence)

Wilson JR & Fehlings MG. The American Society for Experimental NeuroTherapeutics, Inc. 2011
NICE guideline 2016

hasansjahrir
• In June 2012, the FDA approved the use of pregabalin for the management of neuropathic pain associated with spinal cord injury.
• Dosed pregabalin (150-600 mg/d)
• Studies showed pregabalin significantly reduced neuropathic pain. More patients taking pregabalin showed 30% and 50% reductions in pain than those taking placebo at 12 and 16 weeks.
• The precise mechanism of action is unknown but is a GABA analog which binds to a subunit of voltage-gated calcium channels in CNS.

Recommendations for research
The guideline committee has made the following recommendations for research.

• Neuropathic pain relief
• Does early treatment with a centrally acting analgesic (for example pregabalin) reduce the frequency or severity of neuropathic pain in people with spinal cord injury?
Why this is important

• Neuropathic pain occurs in 40% of people with spinal cord injury.
  • It can be severe and disabling, and in people with spinal cord injury it can lead to further impairment of function.
  • Having neuropathic pain can also result in increased care needs and costs of care.
  • It also increases the risk of significant depressive illness and suicide.
• Research is needed to address whether early treatment of spinal cord injury with a centrally acting analgesic such as pregabalin might reduce the frequency or severity of neuropathic pain.