31 Considerations in Patients with Concomitant Cervical Spine Injury

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Recommendations

Level I

There are insufficient data to support a Level I recommendation for this topic.

Level II

There are insufficient data to support a Level II recommendation for this topic.

Level III

All patients with a severe TBI should have a CT scan of the cervical spine.

Patients with documented cervical spine injury should have a supplementary CT angiography.

The cervical collar may be removed in obtunded adult trauma patients after a negative, high-quality CT scan of the cervical spine.

Surgery in the prone position should be postponed until the ICP is manageable.

Tips, Tricks, and Pitfalls

- Cervical spine injury is rare in TBI patients, but TBI is frequent in patients with cervical spine injuries.
- Protection from hypoxia and hypotension is equally important for the injured brain and spine.
- Surgery of cervical spine injuries should be preceded by an MRI.
- Vascular injuries in relation to cervical spine injuries are more frequent than previously thought.
- Posterior cervical spine surgery should be delayed until the ICP is stable/manageable.

31.1 Overview

Severe TBI is often part of a multi-trauma setting. Due to the biomechanical relationship between the head and neck, there is a clear association between TBI and cervical spine injury: The prevalence of concomitant cervical spine injury in patients with TBI is around 6.5% (12% for patients injured in motor vehicle accidents). Vice versa, the prevalence of concomitant TBI in

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patients with cervical spine injury is approximately 40% (Pandrich et al. 2018). Blunt cerebrovascular injury occurs at a rate of about 9% in patients with severe TBI (Esnault et al. 2017).

Hypotension and hypoxia are two important parameters that predict a poorer outcome in patients with TBI. This may occur in multitraumatized patients due to haemorrhagic shock, thoracic injury or non-patent airways. Notably, spinal cord injury with neurogenic shock can produce severe haemodynamic derangements, which are particularly dangerous for patients with a concomitant TBI. A high cervical cord injury (from C5 and above) may affect respiratory function and create hypoxia. Rapid identification and treatment of hypotension and hypoxia are key to successful management of patients with traumatic brain and spine injuries.

Please refer to Chaps. 15 and 18 Radiological Evaluation of Cervical Spine Trauma for considerations related to admission, diagnostics and planning and Chaps. 28 and 34 for considerations related to acute surgical treatment.

31.1.1 TBI and Concomitant Spine Injury

Care for TBI patients with concomitant injuries is often characterized by conflicts of interests: Rigid cervical collars may compress the jugular veins, which in turn may compromise venous return from the brain and increase ICP (Kolb et al. 1999). Restrictions of mobilization are often required before unstable spinal, pelvic, or extremity fractures have been appropriately managed, while TBI patients benefit from early mobilization. Immobilized trauma patients require low-molecular-weight heparin for thrombus prophylaxis, which again may worsen intracranial haemorrhage.

Cervical spine clearance is a challenge in consciously depressed trauma patients. Neurologic deficits, neck pain, and radiculopathy may be revealed by clinical examinations in awake patients, while this is not so straightforward in obtunded trauma victims. Though CT scanning of the cervical spine reveals bony fractures and misalignment, MRI is needed to visualize traumatic disc herniations, ligamentous injuries, haematomas within the spinal canal, or spinal cord injury. Some institutions therefore advocate the use of MRI before the cervical spine is finally cleared in TBI patients that are intubated and anesthetized. However, transporting such a patient from the intensive care unit to perform an MRI is associated with risks related to compromised airway patency and oxygenation, circulatory monitoring, and fluctuations in ICP. In a recent review of cervical spine clearance in obtunded adult trauma patients, cervical collar removal was recommended after a negative high-quality CT scan of the cervical spine: 100% negative predictive value of finding an unstable cervical spine injury among 1718 patients in 11 studies (Patel et al. 2015).

31.1.2 Timing of Surgery for Concomitant C-spine Injuries

Timing of surgery for extra-cranial injuries is similarly difficult. Injuries causing derangements of circulation or respiration must be dealt with immediately. Early surgical management in the form of orthopaedic damage control (i.e. external fixation) of extremity fractures does not seem to negatively affect the outcome in patients with concurrent TBI. In general, definitive treatment should be postponed until the ICP is manageable and stable (Cryer et al. 2015).

Positioning of a TBI patient on the operating table is crucial in cases where the ICP is in the upper normal range or displays unstable trends. The prone position is known to increase ICP due to reduced venous return and/or increased intrathoracic/abdominal pressures. Thus, posterior spinal procedures should not be undertaken until the ICP is manageable in this position.

31.2 Specific Paediatric Concerns

Data on this topic within the paediatric population is very limited. The recommendations for children therefore generally follow adult protocols.

References

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