Cervical Spine Trauma
Recommendations of WFNS Spine Committee 2019

Recommendations for Prevention of Spine Trauma

* The best intervention for the prevention of spinal cord injury associated to road traffic crashes comprise:
  * Legislating and enforcing drink-driving laws (including a blood alcohol concentration limit of 0.05 g/dl for all road users
  * Use of head restraints
  * Use of seat-belts and use of child passenger restraints
  * Setting and enforcing speed limits

* The best intervention for the prevention of spinal cord injury associated to road traffic crashes of two-wheelers comprise:
  * Motorcycle helmets
  * Daytime running lights for motorcycles
  * Road designs that separate pedestrians and two-wheelers from cars and heavier vehicles. Area-wide traffic calming measures
  * Graduated driver licensing systems

* The prevention of SCI related to falls comprise the following interventions:
  * Floor clear of clutter and loose rugs, provision of good lighting, hand-rails and appropriate level furniture, window guards in high-rise buildings, barriers on roofs
  * Safe harvest equipment. Wheelbarrows where applicable.

Recommendations for Transportation and Immobilization of Patients with Cervical Spine Trauma

* Immobilization of patients over the age of 12 years with high risk of SCI during the prehospital setting should include a hard-cervical collar, spinal backboard with tape/straps to immobilize the entire patient.

* In case of limited human resources, alert patients with minimal blunt trauma without penetrating trauma and any spinal pain can be transported without immobilization

* Transport of patients with acute traumatic spinal cord injury to the definitive hospital center for SCI care should occur as soon as possible

* After arriving to the hospital, collar immobilization may be discontinued in the alert asymptomatic patients.

* In-hospital collar immobilization may be discontinued in alert symptomatic patient after a negative high-quality C-spine CT scan

Recommendations for Closed Reduction of Cervical Spine Fractures
* There is no evidence that closed reduction of cervical locked facets have more benefits to open reduction.

* If a closed reduction is attempted, awake patients with incomplete injuries are better candidates.

* If a reduction in patients with decreased consciousness is attempted, pre-reduction MRI and open reduction should be preferred.

* If a closed reduction attempt fails, immediate anterior decompression and surgical reduction are better options.

* Best time for a closed reduction is not well known, although most papers suggest it should be as soon as possible.

* All patients after closed reduction should be operated for stabilization and fusion. This surgery can be with an anterior, posterior or combined anterior and posterior approach.

**Recommendations for Radiologic Assessment of Upper Cervical Trauma**

* In patients with history and physical examination findings suspecting with cervical spinal trauma, cervical CT plays an integral role in diagnosis and surgical planning as the first-line study for screening of the cervical spine.

* Anterior Atlanto-Dental Interval (AADI) > 3 mm or Posterior Atlanto-Dental Interval (PADI) < 13 mm indicate a possible transverse atlantal ligament disruption and Instability in C1-C2.

* Before placement of screws at upper cervical spine in patients with cervical trauma, preoperative 3D CT scanning should be performed to rule out anatomical bony abnormalities.

**Recommendations for Occipital Condyle Fracture**

* Classification system proposed by Mueller et al may be preferable in the management of Occipital Condyle Fracture (OCF).

* CT imaging should better be used to establish the diagnosis and management of OCFs.

* MRI, in addition to CT scan, is recommended to assess the integrity of the cranio-cervical ligaments for determining the stability of OCF.

* Conservative treatment should be preferred to surgical treatment in OCFs without atlanto-occipital dislocation (AOD).

**Recommendations for Atlanto-Occipital Dislocation Injuries**

* CT can be enough to define Condyllo-C1 Interval (CCI) in patients with suspicion of Atlanto-Occipital Dislocation (AOD).

* In case of severe Traumatic Brain Injury (TBI), lower cranial nerve deficit and/or spinal cord injury, an Atlanto-Occipital Dislocation may be suspected.

* Cervical traction is not recommended for AOD.

* Patients with AOD should be operated with occipito-cervical fixation if the general condition of the patient is stable.
**Recommendations for Atlas Fractures**

* Treatment of isolated fractures of atlas should be based on CT and MRI criteria in order to define the fracture type and the integrity of the Transverse Atlantal Ligament (TAL).
* The majority of atlas fractures are stable and are successfully managed conservatively.
* Surgical indications for atlas fractures are atlanto-occipital instability, an intra-ligamentous rupture of the TAL, and any “unstable” atlas fracture

**Recommendations for Odontoid Fractures**

* In adult patients with odontoid fractures, Anterior Atlanto-Dental Interval (AADI) > 3 mm indicates Transverse Atlantal Ligament (TAL) disruption and instability in C1-C2, while AADI ≥ 5 mm implies transverse ligament & accessory stabilizing ligaments ruptured.
* Advanced age, long duration, and preoperative separation of odontoid fracture >4 mm are predisposing factors for fracture nonunion after posterior C1 lateral screw combined with C2 pedicle/laminar screw fixation for type II odontoid fracture.
* For anterior odontoid screw fixation, the interval from injury to operation and fracture “gap” are significantly associated with fusion failure.

**Recommendations for Hangman Fractures**

* For Hangman’s fracture upright X-Ray performed under medical supervision, may be useful besides CT-scan.
* For Levine type IIA Hangman’s fracture surgery is recommended.
* Levine type III Hangman’s fracture may require both anterior and posterior surgery.
* Conservative treatment for Hangman’s fracture should be performed with a rigid collar instead with Halovest due to its complications.

**Recommendations for Combined Atlas and Axis Fractures**

* There is no high-class evidence for the treatment of combined atlas-axis fractures.
* External immobilization is used in most of the cases of C1-C2 combination fractures.
* We should consider surgical treatment for cases of C1-type II odontoid combination fractures with an atlanto-dental interval of ≥ 5 mm and C1-Hangman’s fracture with C2-C3 angulation of ≥11 degrees.

**Recommendations for Subaxial Cervical Spine Injuries Classification**

* Subaxial Injury Classification (SLIC) system is safe and effective in guiding treatment of subaxial cervical spine injury. There is a good agreement rate (>90%) in the SLIC score (morphology, neurology and Disco-Ligamentous Complex - DLC) and the treatment chosen.
* In order to achieve a more precise classification of subaxial fractures we suggest also the use of MRI.

**Recommendations for Subaxial Cervical Spine Injury Management Strategies**
* For injuries with SLIC score of less than 3, non-surgical treatment with rigid collar for 6 to 12 weeks is recommended.
* For injuries with SLIC score of more than 4, early surgery is recommended.
* Surgery is indicated for presence of progressive neurological deficit or for stable incomplete deficit with significant spinal canal compromise.
* Anterior surgeries are recommended for significant anterior column injuries.
* Additional posterior surgeries should be considered for patients who require multilevel corpectomy, and for patients with severe dislocation (complex) injuries.
* Although posterior surgeries are suggested for patients with osteoporosis and ankylosing spondylitis, there is no consensus on that.

**Recommendations for Traumatic Locked Facets**
* In the management of locked facets, if a posterior approach is considered, pre-operative MRI is recommended.
* Traction help in immobilizing the unstable segment and may help for reduction.
* In majority of acute (≤ 3 days) locked facets, anterior surgical techniques are sufficient for a successful management.
* In chronic locked facet (> 2 weeks), lower cervical locked facets with no/insignificant disc prolapse, and in conditions where anterior approach is not feasible a posterior approach is indicated.

**Recommendations for Pediatric Cervical Spine Injuries**
* Children with neurological spinal cord signs and without X Ray/CT-scan abnormalities need MRI.
* Surgery is indicated for irreducible rotatory Atlanto-Occipital Dislocation.
* Minerva cast may be used instead of Halo in children <5 years with cervical spine fracture or dislocation without surgical indication.

**Recommendations for Vertebral Artery Injuries after Cervical Trauma**
* Computed Tomographic Angiography (CTA) is recommended, as a screening tool, in selected patients after blunt cervical trauma with fracture near the vertebral artery course.
* If CTA is abnormal for Vertebral Artery Injury (VAI) and endovascular therapy is a potential treatment, a conventional catheter angiography is recommended.
* For patients in which endovascular treatment for VAI is not suggested, the choice of therapy - anticoagulation therapy versus antiplatelet therapy versus no treatment- should be individualized based on the patient’s vertebral artery injury characteristic, the associated injuries, and the risk of bleeding.
* The role of endovascular therapy in VAI has yet to be defined; therefore, no recommendation regarding its use in the treatment of VAI can be offered.