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 Condylo-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 recomended 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.