

# Spine injury

## Controversies

At this moment there is persistent controversy within the [spinal trauma](#) community, which can be grouped under 6 headings:

First of all there is still no unanimity on the role and timing of medical and surgical interventions for patients with associated neurologic injury.

Type and timing of surgical intervention in multiply injured patients.

In some common injury types like [odontoid fractures](#) and [thoracolumbar burst fracture](#), there is wide variation in practice between operative versus nonoperative management without clear reasons.

The role of different surgical approaches and techniques in certain injury types are not clarified yet.

Methods of nonoperative management and care of elderly patients with concurrent complex disorders are also areas where there is no consensus <sup>1)</sup>.

## Classification

[Spine injury classification](#).

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Traumatic spine injuries are often transferred to regional tertiary trauma centers from OSH and subsequently discharged from the trauma center's emergency department (ED) suggesting secondary overtriage of such injuries.

A study to investigate interfacility transfers with spine injuries found high rate of secondary overtriage of neurologically intact patients with isolated spine injuries. Potential solutions include increasing spine coverage in community EDs, increasing direct communication between the OSH and spine specialist at the tertiary center, and utilization of teleradiology <sup>2)</sup>.

## Complications

[Hydrocephalus](#) is a rare complication of traumatic spine injury. A literature review reflects the rare occurrence with [cervical spine injury](#).

Dragojlovic et al present a case of traumatic injury to the lumbar spine from a gunshot wound, which caused communicating hydrocephalus. The patient sustained a gunshot wound to the lumbar spine and had an L4-5 laminectomy with exploration and removal of foreign bodies. At the time of surgery, the patient was found to have dense subarachnoid hemorrhage in the spinal column. He subsequently had intermittent headaches and altered mental status that resolved without intervention. The headaches worsened, so a computed tomography scan of the brain was obtained, which revealed

hydrocephalus. A ventriculoperitoneal shunt was placed, and subsequent computed tomography scan of the brain showed reduced ventricle size. The patient returned to rehabilitation with complete resolution of hydrocephalus symptoms. Intrathecal hemorrhage with subsequent obstruction or decreased absorption of cerebrospinal fluid at the distal spinal cord was thought to lead to communicating hydrocephalus in this case of lumbar penetrating trauma. In patients with a history of hemorrhagic, traumatic spinal injury who subsequently experience headaches or altered mental status, hydrocephalus should be included in the differential diagnosis and adequately investigated <sup>3)</sup>.

## Management

see [Spinal cord injury management](#)

## Outcome

There is no universally accepted outcome instrument available that is specifically designed or validated for spinal trauma patients, contributing to controversies related to the optimal treatment and evaluation of many types of spinal injuries. Therefore, the [AOSpine](#) Knowledge Forum Trauma aims to develop such an instrument using the [International Classification of Functioning Disability and Health](#) (ICF) as its basis.

Experts from the 5 AOSpine International world regions were asked to give their opinion on the relevance of a compilation of 143 ICF categories for spinal trauma patients on a 3-point scale: “not relevant,” “probably relevant,” or “definitely relevant.” The responses were analyzed using frequency analysis. Possible differences in responses between the 5 world regions were analyzed with the Fisher exact test and descriptive statistics.

Of the 895 invited AOSpine International members, 150 (16.8%) participated in this study. A total of 13 (9.1%) ICF categories were identified as definitely relevant by more than 80% of the participants. Most of these categories were related to the ICF component “activities and participation” (n = 8), followed by “body functions” (n = 4), and “body structures” (n = 1). Only some minor regional differences were observed in the pattern of answers.

More than 80% of an international group of health care professionals experienced in the clinical care of adult spinal trauma patients indicated 13 of 143 ICF categories as definitely relevant to measure outcomes after spinal trauma. This study creates an evidence base to define a core set of ICF categories for outcome measurement in adult spinal trauma patients <sup>4)</sup>.

Early independent risk factors predictive of suboptimal physical health status identified in a level 1 trauma center in polytrauma patients with spine injuries were tachycardia, hyperglycemia, multiple chronic medical comorbidities, and thoracic spine injuries. Early spine trauma risk factors were shown not to predict suboptimal mental health status outcomes <sup>5)</sup>.

## Case series

Two hundred eighty-four consecutively admitted patients with acute spinal trauma were included over a period of 33 months. The median age was 34 (IQR 26-43) years, 83.8% were male, and 50.7% had

experienced injury in a [motor vehicle accident](#). The median time to hospital admission after injury was 2 (IQR 1-6) days; surgery was performed after a further median delay of 22 (IQR 13-39) days. Cervical spine injury comprised 38.4% of the injuries. Admission AIS grades were A in 48.9%, B in 16.2%, C in 8.5%, D in 9.5%, and E in 16.6%. Nearly half (45.1%) of the patients underwent surgery, 12% had at least one functional improvement in AIS grade, and 11.6% died in the hospital. Determinants of surgical intervention were age  $\leq$  30 years, spinal injury level, admission AIS grade, delay in arrival to the referral hospital, undergoing MRI, and type of insurance; admission AIS grade, delay to arrival to the hospital, and injury level for functional improvement; and delay to arrival, injury level, delay to surgery, and admission AIS grade for in-hospital mortality. The best accuracies for the decision tree models were 0.62, 0.34, and 0.93 for surgery, AIS grade improvement, and in-hospital mortality, respectively.

Operative intervention and functional improvement after acute spinal trauma in this tertiary referral hospital in an LMIC environment were low and inconsistent, which suggests that nonclinical factors exist within complex resource-driven decision-making frameworks. These nonclinical factors are highlighted by the authors' results showing clinical outcomes and in-hospital mortality were determined by natural history, as evidenced by the highest accuracy of the model predicting in-hospital mortality <sup>6)</sup>

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One hundred fifteen cervical fractures, 51 thoracic and lumbar major fractures, 214 compression fractures, and 34 transverse process fractures from Los Angeles County-University of Southern California Medical Center and Rancho Los Amigos Hospital were reviewed. Epidemiology, fracture type, and early results of treatment in terms of musculoskeletal and neurologic stability were studied. Flexion-rotation fractures of the cervical, thoracic, and lumbar spine showed significant loss of reduction when not treated with operative internal fixation. Operative intervention did not influence the neurologic outcome. Laminectomy resulted in progressive deformity and a significantly increased incidence of second operations. Epidemiology indicated changing patterns of fracture <sup>7)</sup>.

## Spine injury in Tanzania

In a cohort of patients with traumatic spine injury (TSI) in Tanzania who did not undergo surgery, we sought to: (1) describe this nonoperative population, (2) compare outcomes to operative patients, and (3) determine predictors of nonoperative treatment.

Setting: Tertiary referral hospital.

Methods: All patients admitted for TSI over a 33-month period were reviewed. Variables included demographics, fracture morphology, neurologic exam, indication for surgery, length of hospitalization, and mortality. Regression analyses were used to report outcomes and predictors of nonoperative treatment.

Results: 270 patients met inclusion criteria, of which 145 were managed nonoperatively. Demographics between groups were similar. The nonoperative group was young (mean = 35.5 years) and primarily male (n = 125, 86%). Nonoperative patients had 7.39 times the odds of death (p = 0.003). Patients with AO type A0/1/2/3 fractures (p < 0.001), ASIA E exams (p = 0.016), cervical spine injuries (p = 0.005), and central cord syndrome (p = 0.016) were more commonly managed nonoperatively. One hundred and twenty-four patients (86%) had indications for but did not undergo surgery. After multivariate analysis, the only predictor of nonoperative management was sustaining a

cervical injury ( $p < 0.001$ ).

Conclusions: Eighty-six percent of nonoperative TSI patients had an indication for surgery. Nonoperative management was associated with an increased risk of mortality. Cervical injury was the single independent risk factor for not undergoing surgery. The principle reason for nonoperative management was cost of implants. While a causal relationship between nonoperative management and inferior outcomes cannot be made, efforts should be made to provide surgery when indicated, regardless of a patient's ability to pay <sup>8)</sup>.

## References

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