Spine Trauma - When to Operate

Andrea Halliday, M.D.
Oregon Neurosurgery Specialists
Spine Trauma-When to Operate

- Indications for surgery
  - Unstable spinal injury
  - Preservation or improvement in neurologic function
  - The return of the patient to an optimal level of functioning as soon as possible
Spine Trauma-When to Operate

- Some surgeons believe that non-operative treatment is the treatment of choice.
- All surgeons agree that an absolute indication for emergent surgery is a progressive neurologic deficit in the presence of a surgically correctable compressive lesion or instability.
- An unstable ligamentous injury is an absolute indication for surgery but is not emergent unless there is a progressive neurologic deficit.
Relative indications for surgery include:

- The ability to accelerate the rehabilitation process, decreasing morbidity and decreasing the cost of care.
- The prevention of a progressive spinal deformity which may result in chronic pain, loss of function or a neurologic deficit.
- The ability to reduce complications from prolonged immobilization.
Delayed Spinal Deformity
Spine Trauma-When to Operate

- The integrity of the ligaments contributes significantly to spinal stability
- In all areas of the spine, complete ligamentous injury results in progressive spinal deformity and the risk of neurologic injury
  - AO dislocation
  - Bilateral facet dislocations
  - Ligamentous Chance fractures
  - Rupture of the transverse ligament
Transverse Ligament Rupture
Atlanto-occipital Dislocation
Bilateral Jumped Facets
Ligamentous Chance Fracture
The controversial areas in terms of spinal stability are cases of partial ligamentous disruption or bony disruption without significant loss of sagittal or coronal alignment.

The indications for surgical treatment of burst fractures is probably the most controversial.
Spine Trauma-When to Operate

- No one classification system for stability is agreed upon.
- One widely used approach is to expand the three column theory proposed by Denis to include the following:
  - If a column has primarily bony injury, the fragments are in close apposition and the coronal and sagittal alignment are satisfactory then the column should heal in a brace.
L1 Burst Fracture
Spine Trauma-When to Operate

- Non-operative management may consist of bed rest and/or the use of an orthosis.
- Most patients are unable to tolerate long term bed rest and bed rest carries the risk of pneumonia, DVT, constipation, skin breakdown and de-conditioning.
- Some orthoses are difficult to tolerate. Halo devices in the elderly are often problematic as they affect the patient’s balance.
Odontoid Fracture
Spine Trauma-When to Operate

- Each region of the spine has different biomechanical properties that affect the decision whether or not to operate.
Spine Trauma-When to Operate

- The cervical spine, due to its unique anatomy, is viewed as two distinct regions, the upper cervical (occiput to C2) and the lower cervical (C3-T1).

- The upper cervical spine is very mobile with the majority of flexion/extension occurring between the occiput and C1 and the majority of rotation occurring C1 and C2.
Spine Trauma-When to Operate

- The lower cervical spine is lordotic and more stable than the upper cervical spine however, the space for the neural elements is smaller.

- Therefore any acute sagittal displacement may result in significant neurologic compromise.
There are two generally agreed upon indications for acute neurosurgical intervention in cervical spine trauma:

- A neurologically incomplete patient with a deteriorating neurologic examination and an associated facet dislocation unreducible by traction
- A neurologically deteriorating patient with spinal cord compression.
The STASCIS trial published in 2/2012 was a non-randomised multicentre trial of patients with acute cervical SCI undergoing early (24 hours) vs. late surgery.

The key finding was that 19.8% of patients undergoing early surgery showed a ≥ grade 2 improvement in ASIA score compared with 8.8% in the late decompression group.

However, the early surgery group was younger with greater neurologic deficit and the chance of a 1 grade ASIA improvement was not statistically significant.
Spine Trauma-When to Operate
Spine Trauma-When to Operate

- The thoracic spine is very stable due to the articulating rib cage, sternum and clavicles.
- Most injuries to the thoracic spine are a result of axial loading with flexion.
- Indications for operative intervention often include loss of anterior vertebral body height greater than 50% with loss of the posterior ligamentous structures, fracture-dislocations or flexion distraction injuries.
Thoracic Fracture-Dislocation
Spine Trauma-When to Operate

- The thoraco-lumbar junction is a transition zone from the stiff thoracic spine to a mobile lumbar spine rendering this section of the spine vulnerable to injury.
- This anatomic zone accounts for approximately 50% of all vertebral body fractures and 40% of all spinal cord injuries.
Spine Trauma-When to Operate

As with other areas of the spine the indication for operative intervention largely depends on the patient’s neurologic status, the degree of bony comminution and the integrity of the posterior ligamentous complex.
Spine Trauma-When to Operate
Spine Trauma-When to Operate

- As mentioned earlier operative indications for lumbar burst fractures are controversial.

- A high degree of vertebral comminution, reflecting an inability to resist axial loads, is a relative indication for surgery.

- The presence of an incomplete neurologic deficit with residual canal compromise is a relative indication for surgery.
Spine Trauma-When to Operate

- Advantages to non-operative management of burst fractures
  - Preservation of motion segments
  - Less invasive
  - Potentially less expensive
L4 Burst Fracture
Spine Trauma-When to Operate

- Fracture-dislocations and three column shear injuries result in disruption of all three columns of the spine.
- Because these injuries are grossly unstable, surgical stabilization is necessary.
Three Column Shear Injury
Spine Trauma-When to Operate

- In summary, the absolute indication for emergent surgery is a progressive neurologic deficit in the presence of a surgically correctable compressive lesion or instability.

- An absolute indication for surgery is an unstable ligamentous injury but surgery is not emergent in the absence of a progressive neurologic deficit.
Spine Trauma-When to Operate

- An absolute indication for surgery is a neurologic deficit in the setting of a surgically correctable compressive lesion.
- The timing of surgery when the neurologic injury is stable is controversial.
Spine Trauma-When to Operate

The relative indications for surgery are:

- The ability to accelerate the rehabilitation process or the inability to tolerate non-operative management.
- The prevention of a progressive spinal deformity which may result in chronic pain, loss of function or a neurologic deficit.
Spine Trauma - When to Operate

Thank you