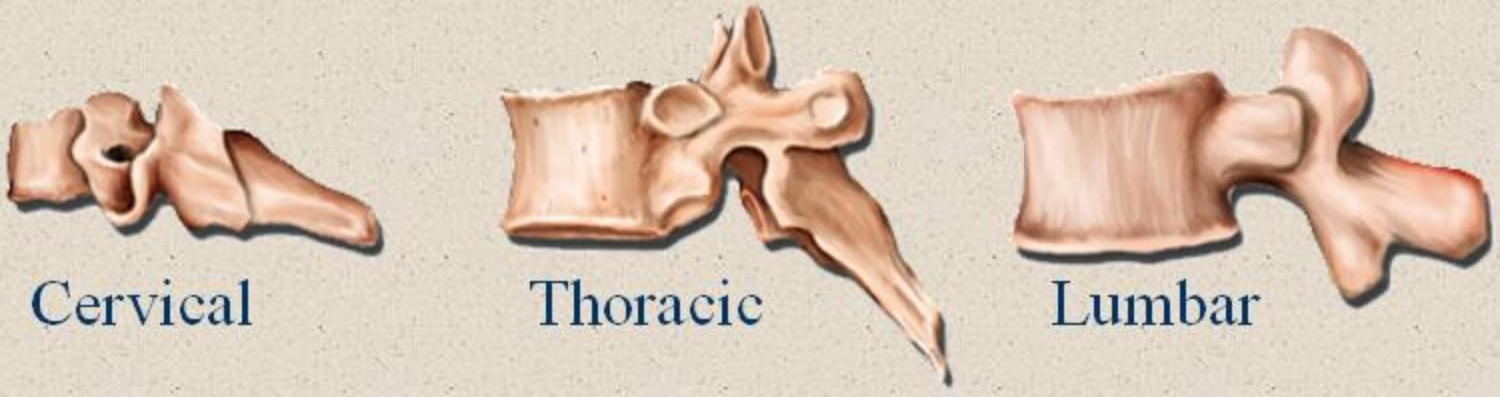
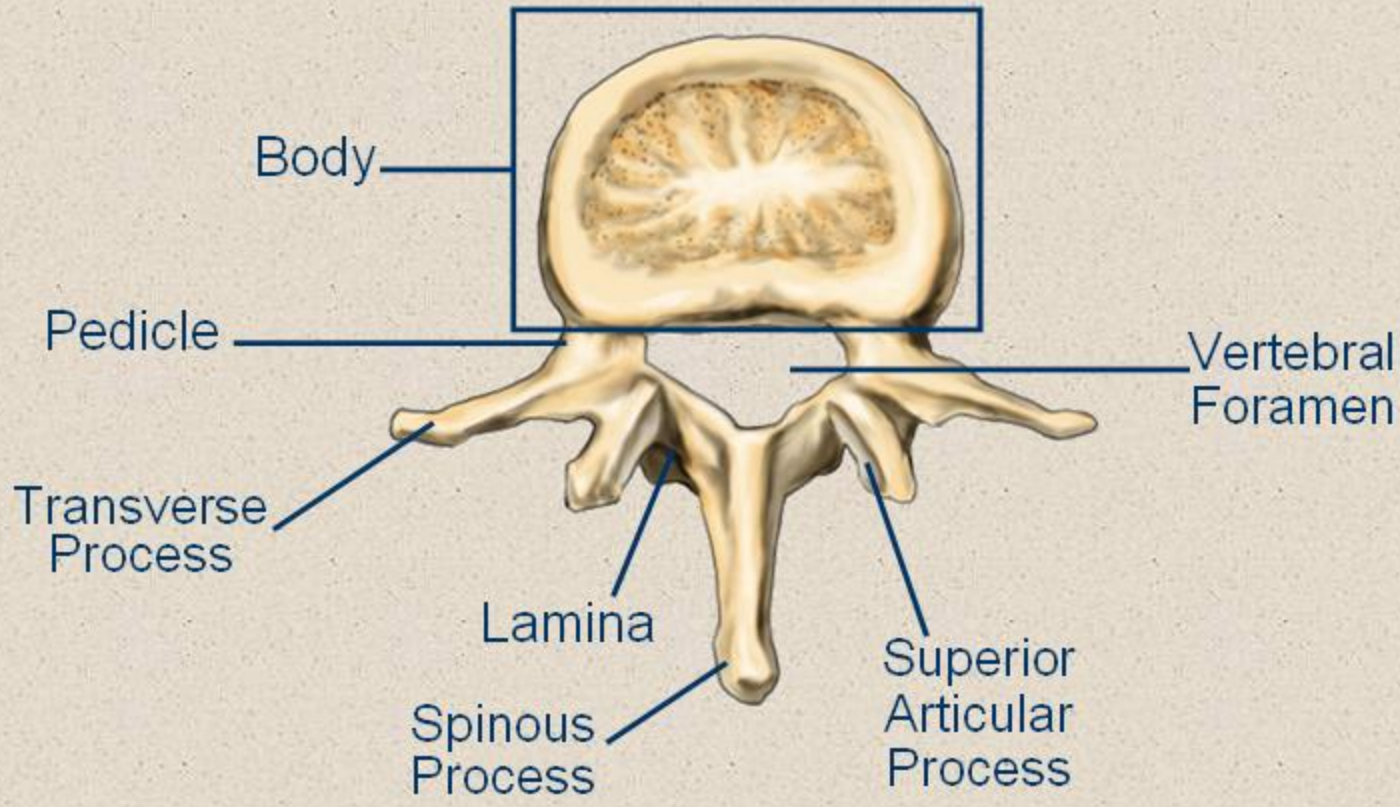
Anatomy of spine

Basic Vertebral Structures



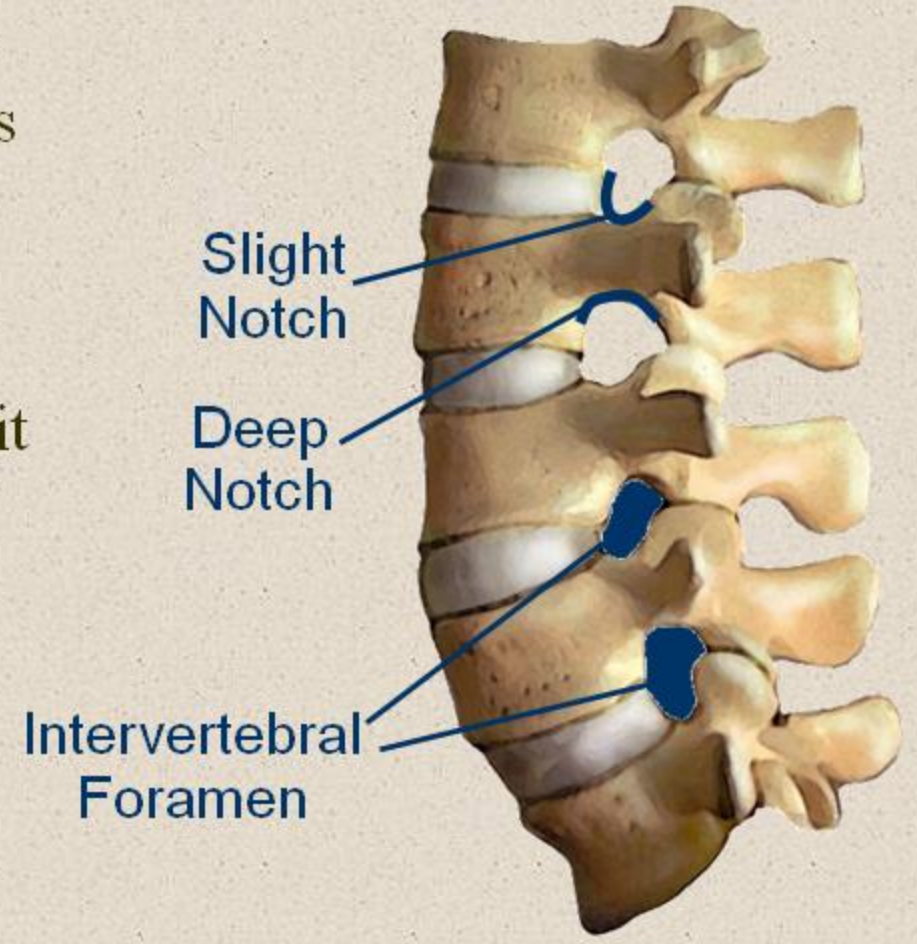
Cervical Thoracic Lumbar

Vertebral Structures



Vertebral Structures

- Pedicle notches
- Intervertebral foramen
- Nerve roots exit



Regions of the Spine

- Cervical
  - Upper cervical: C1-C2
  - Lower cervical: C3-C7
- Thoracic
- Lumbar
- Sacrococcygeal

Spinal Trauma

Spinal Trauma

- Definition: injury has occurred to any of the following structures:
  - Bony elements
  - Soft tissues
  - Neurological structures
- Two concerns of spinal trauma:
  - Instability of the vertebral column
  - Actual or potential neurological injury

Spinal Instability

- Definition: Loss of normal relationship between anatomic structures with a resulting alteration of natural function:
  - Spine can no longer carry normal loads
  - Permanent deformity may occur resulting in severe pain
  - Potential for catastrophic neurological injury
- Instability results from:
  - Fracture of vertebral body, lamina, and/or pedicles
  - Dislocation of anatomic components caused by disruption of soft tissues
  - Fracture and dislocation may occur together

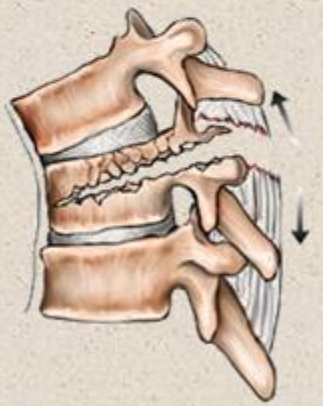
Mechanism of Injury

- Understanding details of the injury aids in diagnosis
- Spinal trauma patients may have injury to other anatomic structures, impeding neurologic evaluation
- If possible, question witnesses for additional details

Traumatic Forces

- Axial
  - Fibers are pushed together in a crushing manner
  - Tends to fracture vertebrae in multiple pieces
  - Usually associated with flexion, extension, or rotational injuries

- Distraction
  - Bony, disc, or soft tissue elements are pulled apart
  - Usually associated with flexion or extension injuries

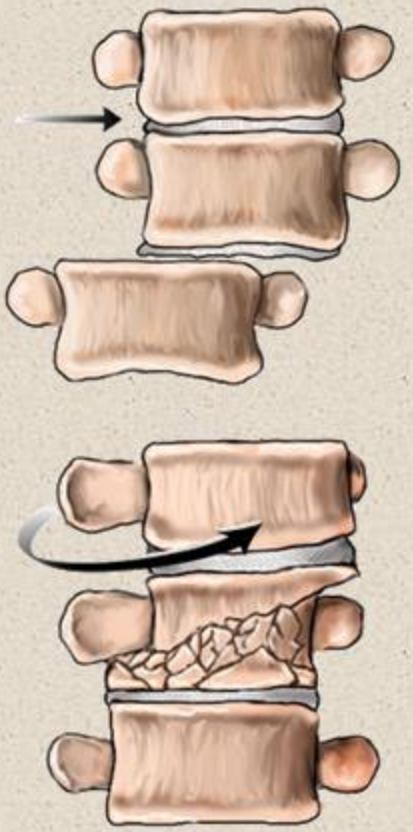


Traumatic Forces

- Flexion
  - Severe forward bending of the neck or trunk
  - Causes compressive force on the anterior vertebral column; teardrop or wedge type fracture to v. body
- Extension
  - Severe backward bending of the neck or trunk
  - Axial loads often also associated
  - Causes fractures to the spinous process and lamina

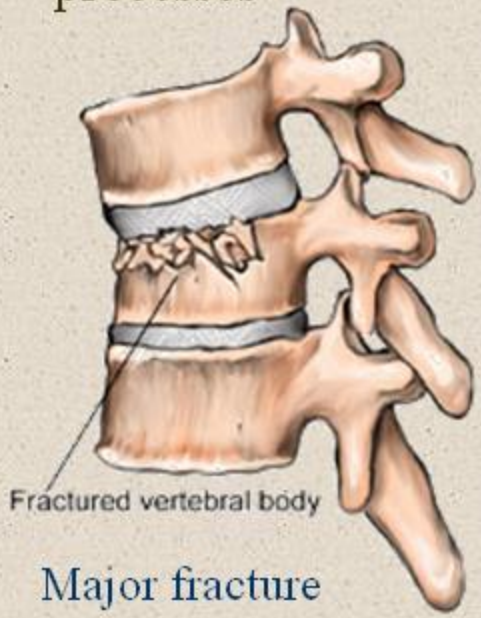
Traumatic Forces

- Shear
  - Force parallel to the surface on which it acts; results in a translation or subluxation movement
  - Usually result in anterior or lateral displacement of affected elements
- Rotational
  - Torsional force that creates a rotational tension on tissue fibers
  - Often associated with axial forces

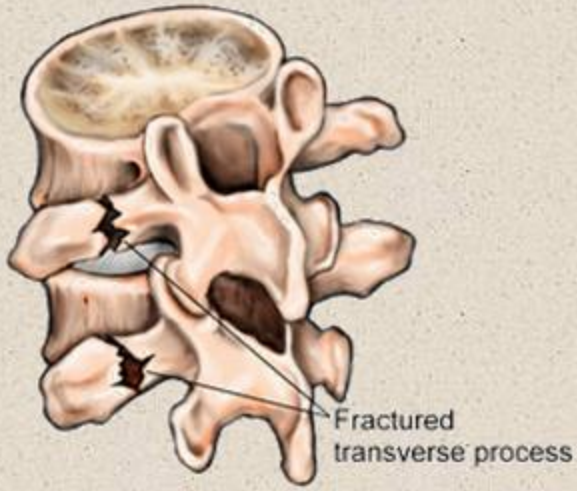


Classification of Fractures

- Major and Minor
  - Major = fracture of vertebral body, pedicles, lamina
  - Minor = fracture of transverse, spinous, articular processes



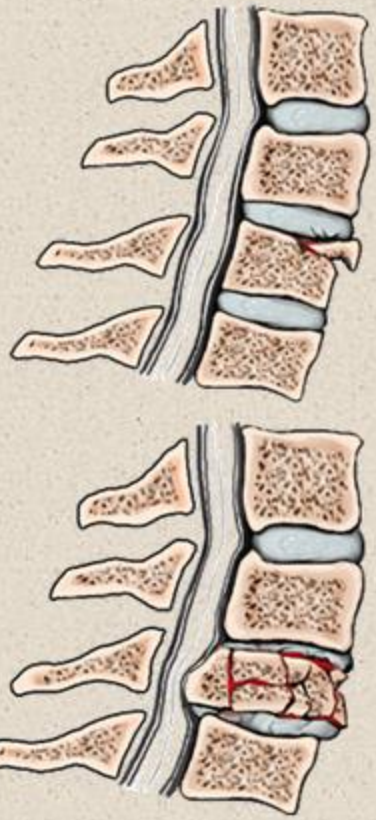
Major fracture



Minor fracture

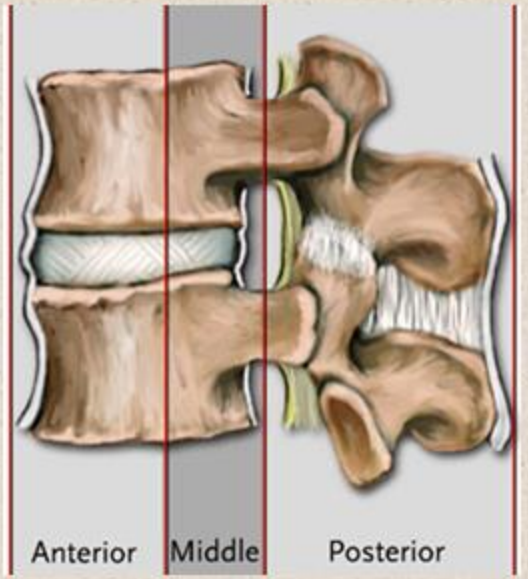
Classification of Fractures

- Stable and Unstable
  - Stable
    - Spine can withstand physical loads
    - No significant displacement or deformity to bone or soft tissue
  - Unstable
    - Spine may not be able to carry normal loads
    - Most likely have significant deformity and pain
    - Potential for catastrophic neurologic injury



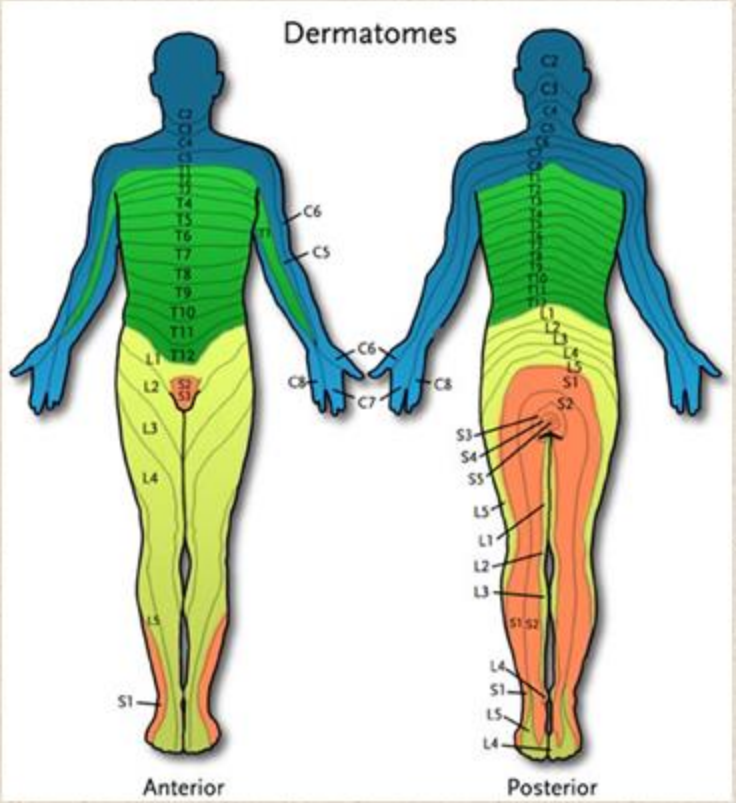
Denis Classification Method

- Used to grade thoracolumbar and cervical fractures
- Based on 3-column theory of the spine:
  - Anterior = ALL and anterior 2/3 of vertebral body/disc
  - Middle = posterior 1/3 of vertebral body/disc and PLL
  - Posterior = pedicles, lamina, facets, post. Ligaments
- Middle column is key to stability



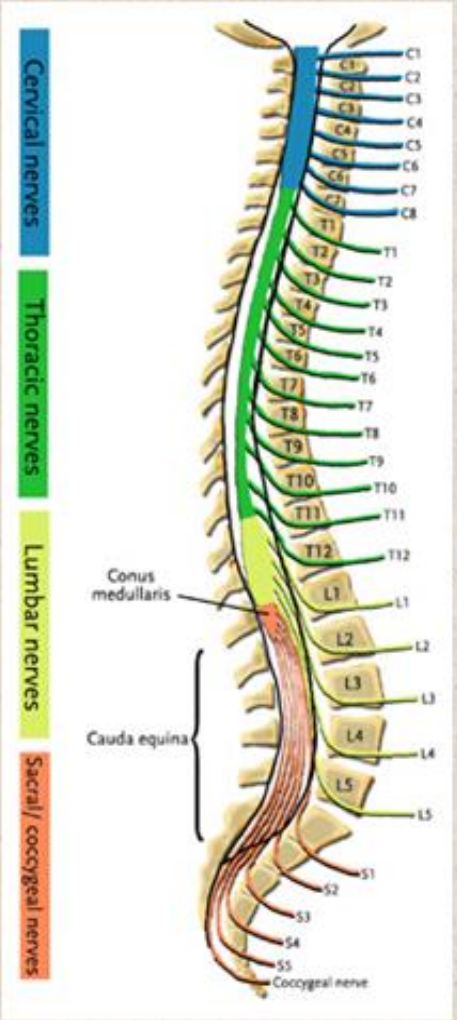
Neurologic Injury

- Definition: trauma to spinal cord, cauda equina, nerve roots
- Can result from bone, bone fragments, or disc material compressing on neuro. structures
- All structures innervated by the affected neuro. structure may lose all or partial function



Classification of Neurologic Injury

- 31 pairs of spinal nerves; each has a motor and sensory component:
  - Injury to a specific nerve results in neuro loss only to structures it innervates
  - These nerves have a good chance of recovery following trauma
- Injury to the spinal cord can result in:
  - Complete cord lesion: permanent loss of neuro function below the affected level
  - Incomplete cord lesion: can show some neuro improvement, particularly when motor function remains intact
- Injury to cauda equina nerves may result in complete or incomplete neuro function
- Injury to conus medullaris generally results in complete loss of function with no chance of recovery



Diagnosis

- History:

  ask about;

- 1-major accident.
  2-head injury.
  3-pain and neck stiffness.

Dx

- Examination: During examination move the patient as a single piece.
-

  1-bruising in the head.
  2-spinous processes gap.
  3-penetrating injury.
  4-deformity.
  5 - sever tenderness.

Dx

- Neurological examination:

  1- cord longitudinal column function.

  2- sacral sparing (anal tone; perianal sensation; great toe flexion).

Red Flags

- Loss of bowel or bladder control, saddle anesthesia or arm/leg weakness (cauda equina syndrome?)

Imaging

1-X-ray: Ap , Lateral and other views are needed.

2-C.T: It demonstrates damage in bony parts of column.

3-MRI.demonstrates soft tissue damage (spinal cord,lig., and neural tissues)

RADIOLOGY

Treatment

- Early treatment :

  1-ensure adequate airway.
  2-control bleeding.
  3-care of uncoscious patient.
  4-manag. Other injuries.
  5-Immobilization (cervical : thoracolumbar).

Treat.

- Definitive treatment :

  1-to preserve neurological function.
  2-to relieve any reversible compression.
  3-to restore alignment of spine.
  4- to immobilize the spine.
  5- to rehabilitate the spine.

Treat.

- Patient with no neurological injury:

  -If the spinal injury is stable:

  treated by rest,firm collars or lumbar brace.

  -If the spinal injury is unstable:

  it should be held sequre until the tissues heal ;usually treated by traction;or alternativly by internal fixation.

Treat.

- Patient with a neurological injury:

  -If the spinal injury is stable: usually treated conservatively.

- -If the injury is unstable: treated usually conservatively ,but can be treated by surgery ,in order to reduce pain and facilitates nursing.

Methods of treatment

- Cervical spine:
  1-collars.
  2-tongs.
  3-halo ring.
  4-fixation..

Methods of treatment

Thoraco-lumbar spine:

1-beds.

2-brace.

3-decompression and stabilization.

Thank you