

Overview

- 95% of # in longitudinal or oblique vertical plane. 5% incl Chance # are horizontal.
- 20-50% of TL #s are seen in association with other skeletal injuries: E.g.:
 - Lover's triad: Compression # at TL junction + calcaneal # + forearm #.
 - Upper thoracic spine wedge #s + sternum #.

Injury Mechanisms

- Hyperflexion
- Axial loading
- Translational injuries
- Flexion-distraction
- Direct blow

Stable vs Unstable Injuries

- The spine may be split into three "columns" for the purpose of assessment of stability:
 - Anterior column - ant 2/3 of vertebral body/intervertebral disc & ant long lig.
 - Middle column - posterior 1/3 of vertebral body/intervertebral disc & post long lig.
 - Posterior column - lamina, facet joints, spinous processes, & associated ligaments.
- An injury is unstable if 2 of 3 columns disrupted. Generally, if middle column is disrupted, either the ant or post columns are also involved, and the injury is unstable.
- The middle column is the fulcrum from which the spine pivots into flexion and extension. If it remains intact then simple flexion and extension injuries are probably stable. Axial compression, distraction and rotational injuries, usually disrupt the middle column.

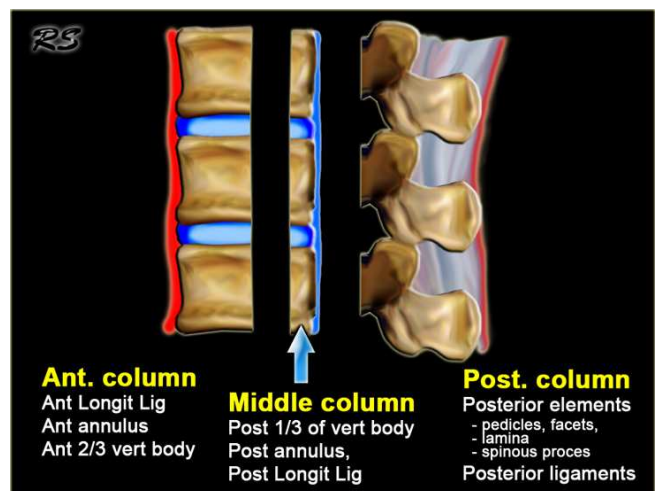
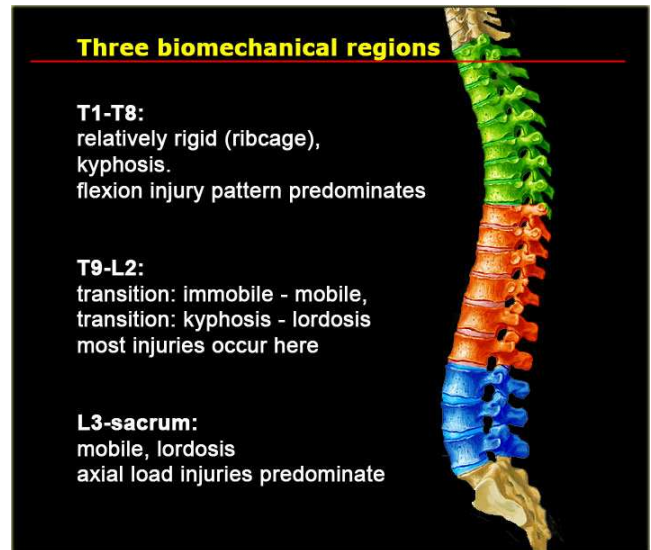
Injury Patterns

Wedge or Compression Fracture

- Caused by flexion and axial loading.
- Common in osteoporosis where it can occur spontaneously.
- Frequently L1 > L2 > T12.
- Posterior part of vertebral body (& so middle column) usually intact → stable # unless ant margin compressed by >50% & posterior ligament injured.
- Mx: Symptomatic + osteoporosis Rx + ?salmon calcitonin.

Burst Fracture

- Axial loading.
- Loss of ant & post vertebral body height
- Unstable as ant & middle columns disrupted.
- Risk of fragment protrusion into spinal canal.



- AP view may show widened pedicles

Flexion-Distraktion Injuries

- Ant column acts as hinge as spine flexed and there is traction on middle & post columns causing horizontal splits in each.
- Unstable
- Chance Fracture - special type of flexion-distraktion injury
 - Flexion around axis anterior to anterior longitudinal ligament such as a seat belt.
 - Horizontal injury - complete disruption through spinous process, laminae, transverse processes, pedicles & body (i.e. all 3 columns)
 - May be missed on XR or CT (if between slices) - so need CT reconstructions.
 - ~2/3 have associated intestinal or mesenteric injuries.

Translational Injury

- Direct AP or PA trauma
- Disrupts all 3 spinal columns → unstable
- Spinal canal alignment at risk.

Transverse Process Fracture

- Difficult to see on plain XR
- Frequency: L3 > L2 > L1, L4 > L5
- Associated with other injuries
 - Renal, ureter, spleen, liver, adrenal, diaphragm, pancreas
 - Pelvis # if L5 transverse process #

Ligamentous Injury

- May be suggested by vertebral displacement:
 - Angulation greater than 20 degrees.
 - Translation of 3.5 mm or more.

Imaging

Plain XR

- AP & lateral views
- Only 75% sensitive for #s

CT Scan

- 95% sensitive

TL-Spine X-ray Interpretation

On both views:

- Height of vertebral bodies should be equal.
- Width of intervertebral disc spaces should be uniform.
- Continuity of superior and inferior endplates: should remain unbroken.
- Distance between spinous process should be equal.
- Trace the posterior elements; the pedicles, laminae, and spinous processes.

On AP view:

- Soft tissue signs - Widening of the paraspinal line adjacent to the left side of the thoracic spine is indicative of a haematoma resulting from a fracture
- Pleural cap - Refers to a paraspinal haematoma, which dissects over lung apex.
- Inter-pedicular distance. Should become gradually wider from L1 to L5. If the sequence is disrupted → ?burst #.

- Check for an "empty" vertebral body on the AP film; the posterior elements should be superimposed.
- Transverse processes should remain intact.

On Lateral view:

- Malalignment. Trace the anterior, posterior and spinolaminar lines. If two of these lines are disrupted, the injury is considered unstable.
- Posterior vertebral body cortex should be slightly concave. If convex then ?burst #

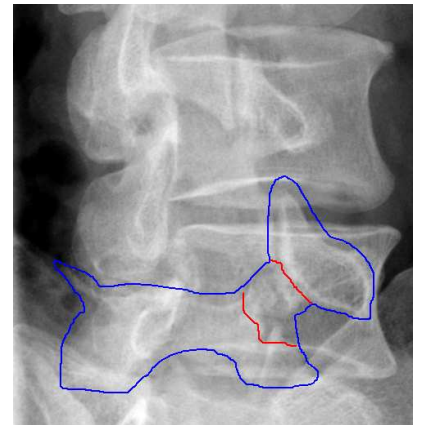
Other pathology that may be seen on these films:

Spondylosis:

- Osteoarthritis of spine. Disc space narrowing, osteophytes which may encroach on the intervertebral foramina.

Spondylolysis:

- Acute or chronic # across the pars interarticularis (area of the lamina that lies within the sup & inf facets). Can be bilateral and so lead to a spondylolisthesis. Spondylolysis is evident on an oblique film by identifying the "Scotty dog":
 - Nose = Transverse process
 - Eye = Pedicle
 - Ear = Superior facet
 - Front leg = Inferior facet
 - Collar through neck = Fracture



Spondylolisthesis:

- Forward displacement of one vertebra upon another. May be due to:
 - Trauma
 - Congenital weakness of the pars interarticularis
 - Degenerative facet joint disease
- May be asymptomatic. If severe, may cause foraminal stenosis, causing nerve root impingement. Consequently it will be treated surgically. Grade I refers to a displacement of up to 25%, and a grade II refers to malalignment of 25-50%:

Paget's disease:

- The lumbar spine is often affected. There are three key features:
 - Bone is expanded
 - The cortex is thickened
 - The trabeculae are coarse

Metastatic disease:

- Primary tumours may metastasize to the vertebral bodies. May either demonstrate a "moth-eaten", permeative appearance, OR, in the lumbar spine, an "ivory vertebra" OR destruction of the pedicle

AA:

- May be seen on either AP or lateral lumbar spine films, if the aorta is calcified:

Ankylosing spondylitis

- "Bamboo spine" from calcification of ant and post long. lig. and intervertebral discs