



# Thoracolumbar Trauma Epidemiology and Classification

# Epidemiology of thoracolumbar injuries I.

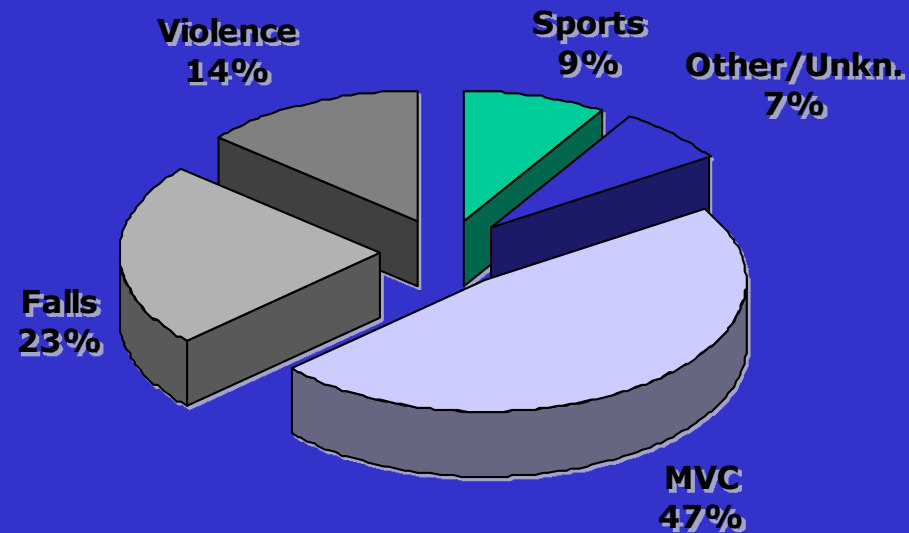
- Incidence of spinal injuries is c.a. 64/100,000 population/year
- Thoracolumbar fractures are more frequent in men, and the peak incidence is observed between 20 and 40 years
- Thoracic and lumbar fractures account for 30% to 60% of all spinal injuries

# Epidemiology of thoracolumbar injuries II.

- Among the thoracolumbar injuries: 50% in the transitional zone (T11-L2), 35% in the thoracic spine and 15% in the lower lumbar spine and sacrum
- Multi-level spinal fractures are present in 20% of spinal injury patients
- Incidence of neurological deficit ranged from 22% to 51% depending on the fracture type (22% in type A, 28% in type B and 51% in type C fractures, according to the AO classification)

# Thoracolumbar injuries - Causes

- Motor vehicle collision  
47%
- Fall from height 23%
- Sports 9%
- Violence (blunt trauma)  
14%



# Böhler 1930

- Importance of injury mechanism
- Determines proper reduction maneuver
- Evaluated fractures using:
  - Plain X-rays, anatomic dissection of fatalities
- 6 types of spinal fractures included in system
  - Compression
  - Flexion
  - Extension
  - Lateral flexion
  - Shear
  - Torsional

Böhler, Verlag von Wilhem Maudrich 1930

Böhler, Fractures and Dislocation of the Spine, 1956

# Morphologic Classification

Watson-Jones 38



- Descriptive terms based on 252 X-ray films

- 7 types

Examples:

- Wedge fracture (compression fx)
- Comminuted fracture (burst fx)
- Fracture dislocation



# Morphologic Classification

## Stable vs. Unstable

Nicoll 49

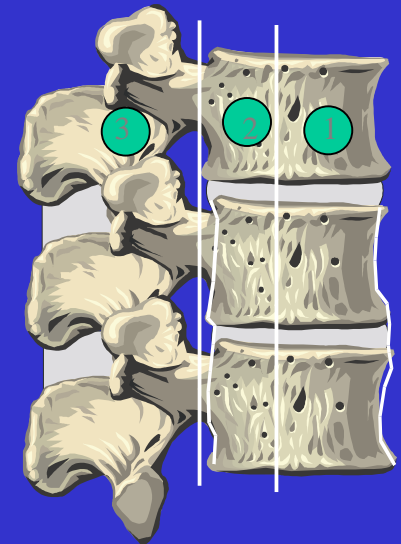
- Based on review of 152 coal miners
- Recognized importance of posterior ligaments
- 4 fracture types:
  - Stable = post ligaments intact
  - Unstable = post elements disrupted

# 3 Column Theory

Denis 83

Posterior Middle Anterior


- Based on radiographic review of 412 cases
- 5 types, 20 subtypes
  - ① Anterior- ALL , anterior 2/3 body
  - ② Middle - post 1/3 body, PLL
  - ③ Posterior- all structures posterior to PLL

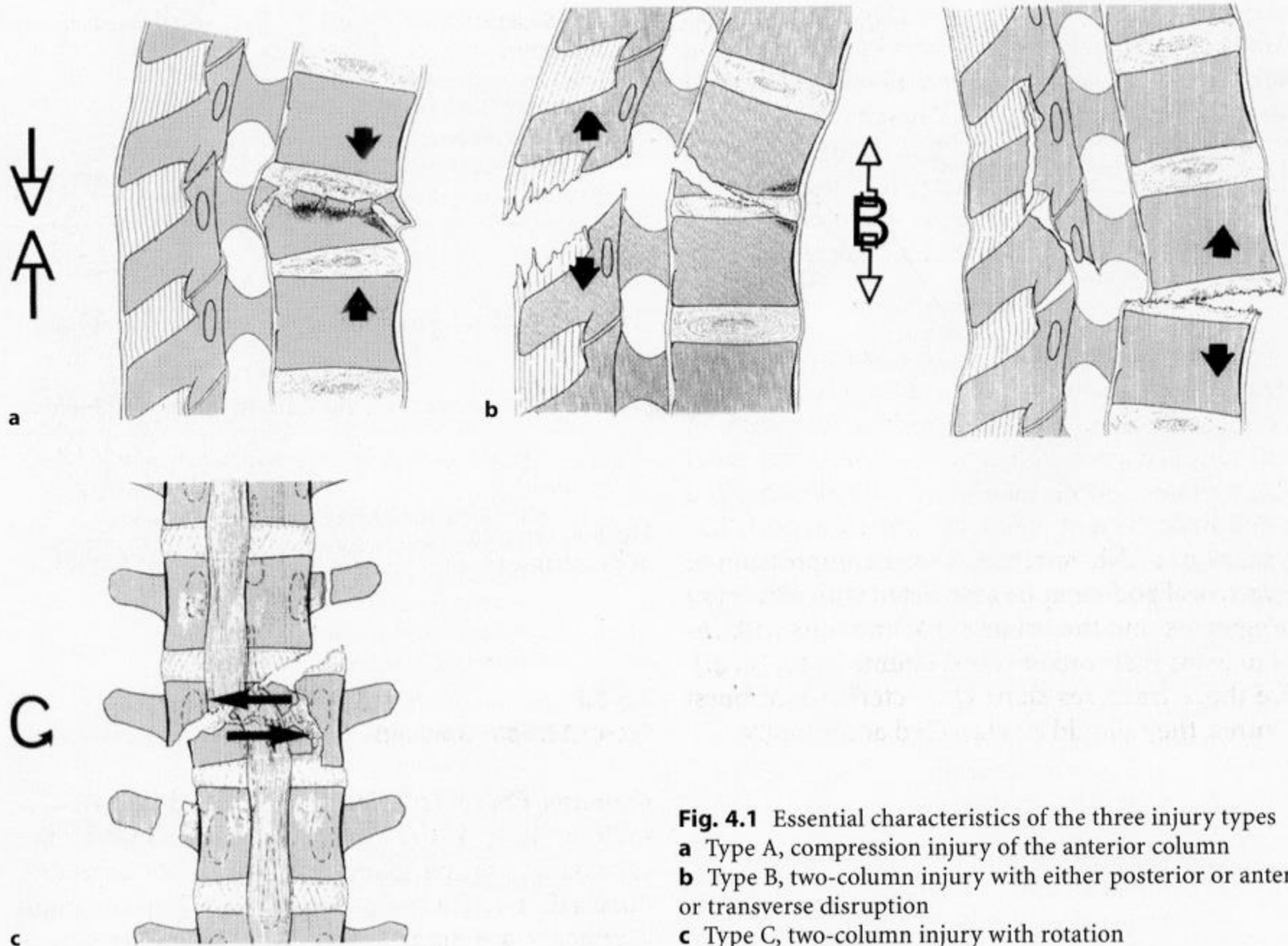




# Mechanistic Classification

## AO

- Review of 1445 cases (Magerl, Gertzbein et al. European Spine Journal 1994)
  - Based on direction of injury force
  - 3 types, 53 injury patterns
    - Type A - Compression
    - Type B - Distraction
    - Type C - Rotational
- Increasing severity
- 



**Fig. 4.1** Essential characteristics of the three injury types  
**a** Type A, compression injury of the anterior column  
**b** Type B, two-column injury with either posterior or anterior or transverse disruption  
**c** Type C, two-column injury with rotation

# Spine Trauma Study Group Thoracolumbar Injury Classification and Severity Scale

TLICS 3 independent predictors				
1	<b>Morphology</b> immediate stability	<ul style="list-style-type: none"> <li>- Compression</li> <li>- Burst</li> <li>- Translation/rotation</li> <li>- Distraction</li> </ul>	1 2 3 4	<ul style="list-style-type: none"> <li>- Radiographs</li> <li>- CT</li> </ul>
2	<b>Integrity of PLC</b> longterm stability	<ul style="list-style-type: none"> <li>- Intact</li> <li>- Suspected</li> <li>- Injured</li> </ul>	0 2 3	<ul style="list-style-type: none"> <li>- MRI</li> </ul>
3	<b>Neurological status</b>	<ul style="list-style-type: none"> <li>- Intact</li> <li>- Nerve root</li> <li>- Complete cord</li> <li>- Incomplete cord</li> <li>- Cauda equina</li> </ul>	0 2 2 3 3	<ul style="list-style-type: none"> <li>- Physical examination</li> </ul>
<b>Predicts</b>		<ul style="list-style-type: none"> <li>- Need for surgery</li> </ul>	0 – 3 4 > 4	<ul style="list-style-type: none"> <li>- nonsurgical</li> <li>- surgeon's choice</li> <li>- surgical</li> </ul>

# Actual AO classification

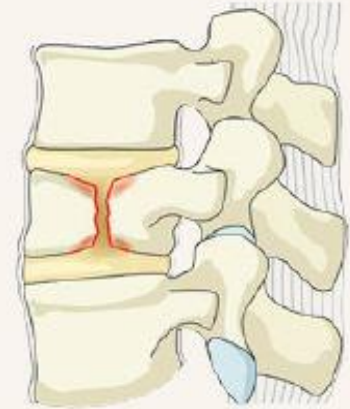
- Simplify old AO classification
- Merging old AO classification with TLICS (posterior tension band!)

# Actual AO classification: Compression injuries (A)

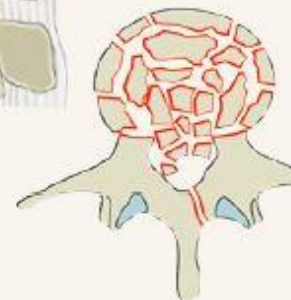
## A0. Minor, nonstructural fractures



## A1. Wedge-compression A2. Split



## A3. Incomplete burst



## A4. Complete burst

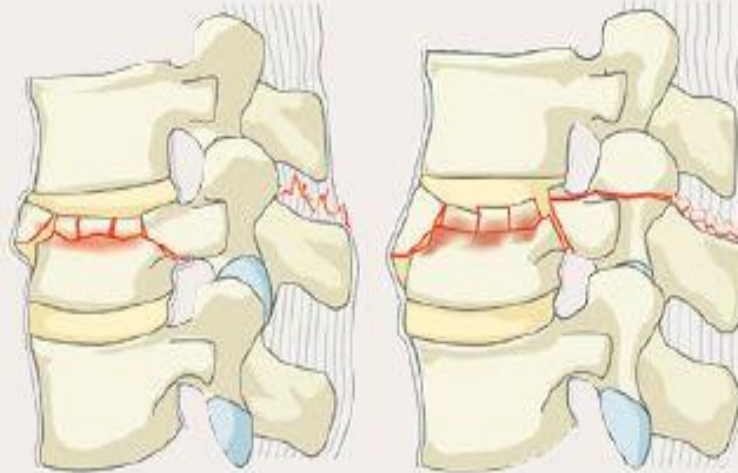


# Actual AO classification: Distraction injuries (B)

**B1. Transosseous tension  
band disruption /  
Chance fracture**



**B2. Posterior tension  
band disruption**

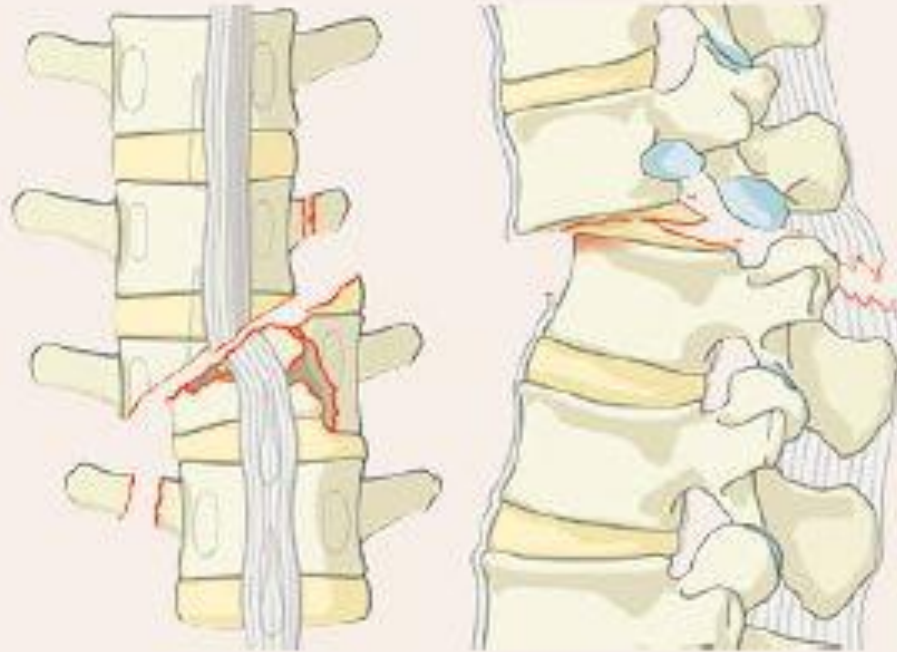


**B3. Hyperextension**

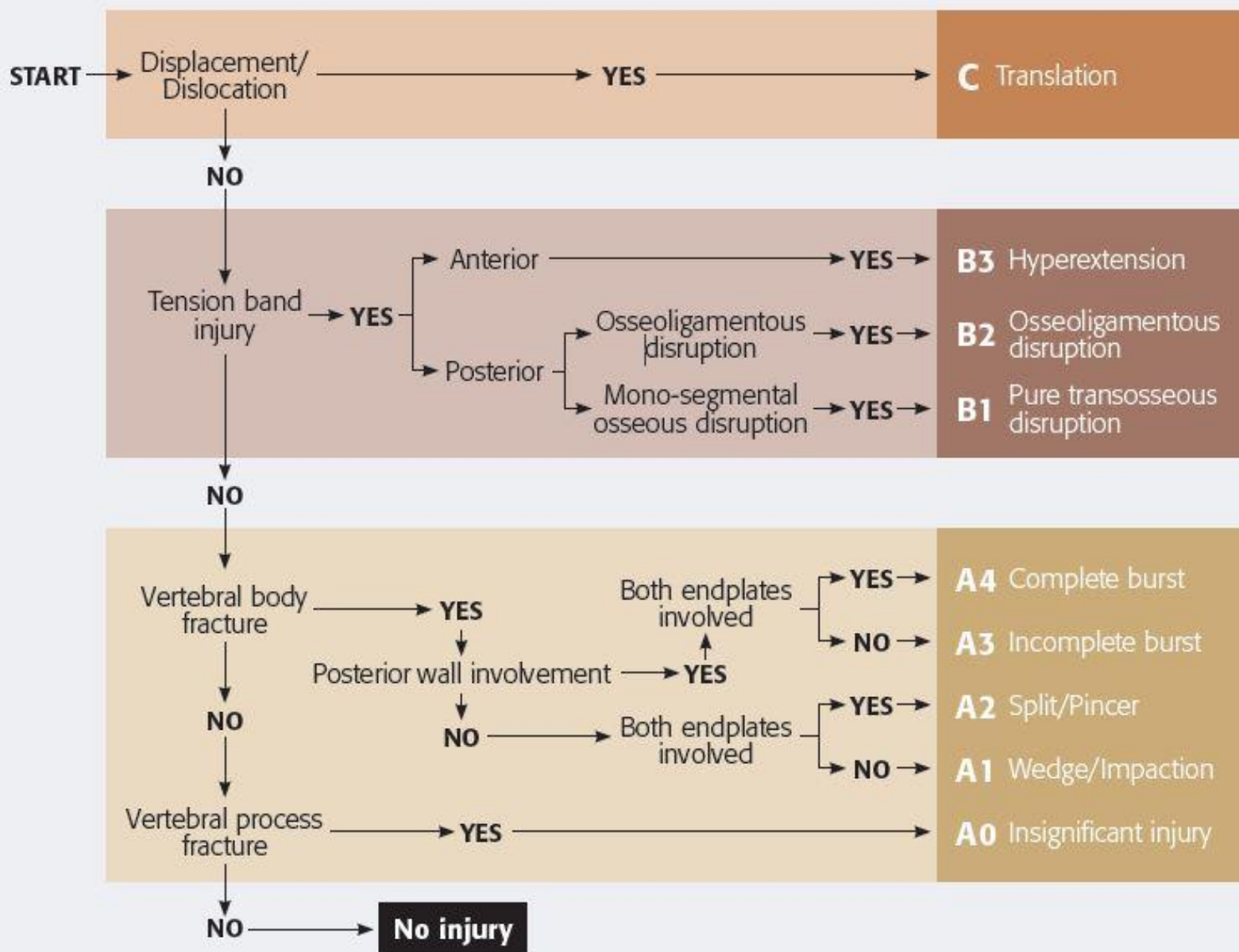


# Actual AO classification: Translation injuries (C)

## C. Displacement / Dislocation



# Actual AO classification





# Actual AO classification: Neurology and Modifiers (better communicate or describe injuries e.g. in ER)

## Neurologic injury

Neurologic status at the moment of admission should be scored according to the following scheme:

Type	Description
<b>N0</b>	Neurologically intact
<b>N1</b>	Transient neurologic deficit, which is no longer present
<b>N2</b>	Radicular symptoms
<b>N3</b>	Incomplete spinal cord injury or any degree of cauda equina injury
<b>N4</b>	Complete spinal cord injury
<b>NX</b>	Neurologic status is unknown due to sedation or head injury

## Modifiers

There are two modifiers, which can be used in addition to ad 1 and 2:

Type	Description
<b>M1</b>	This modifier is used to designate fractures with an indeterminate injury to the tension band based on spinal imaging with or without MRI. This modifier is important for designating those injuries with stable injuries from a bony standpoint for which ligamentous insufficiency may help determine whether operative stabilization is a consideration.
<b>M2</b>	Is used to designate a patient-specific comorbidity, which might argue either for or against surgery for patients with relative surgical indications. Examples of an M2 modifier include ankylosing spondylitis or burns affecting the skin overlying the injured spine.

# A1 - wedge and A2 – split fracture



**A1. Wedge-compression**



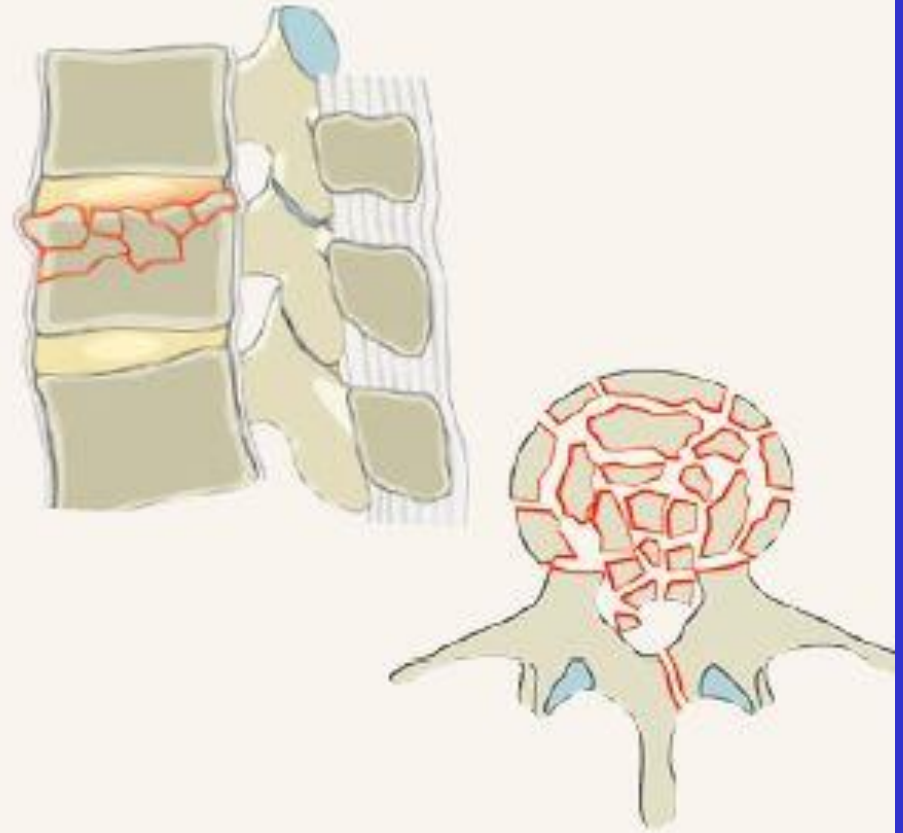
**A2. Split**



# A3 - incomplete burst



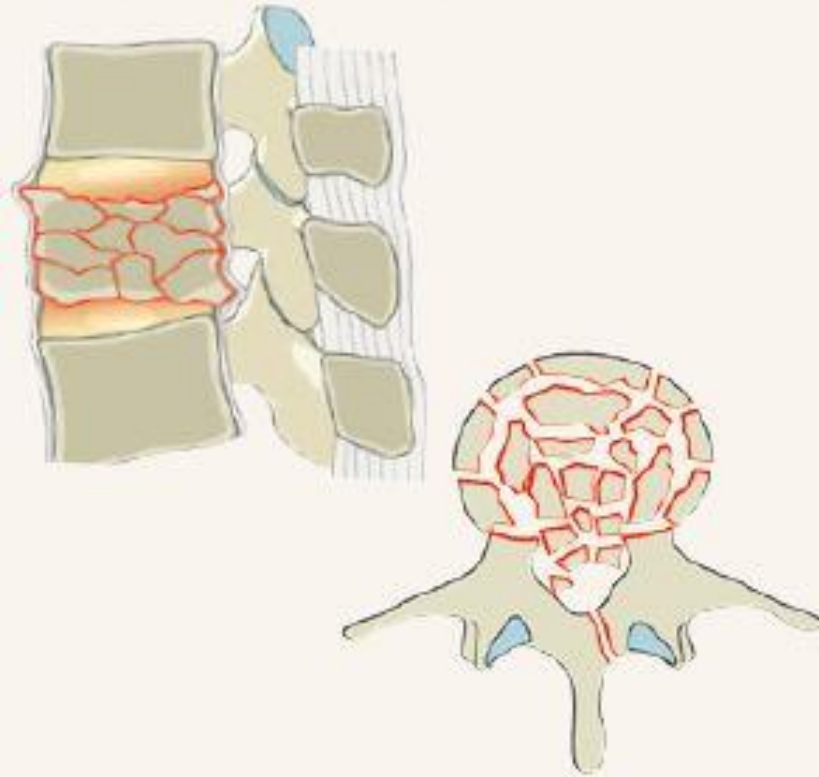
## A3. Incomplete burst



# A4 - complete burst



**A4. Complete burst**



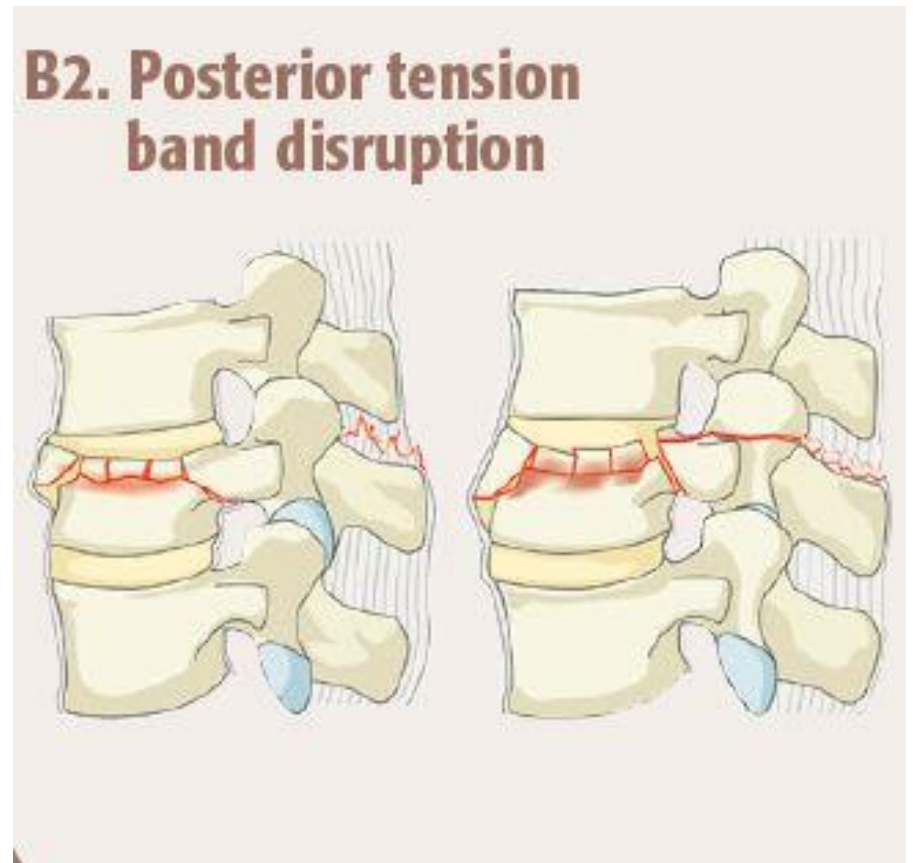
# B1 distraction injury (bony)



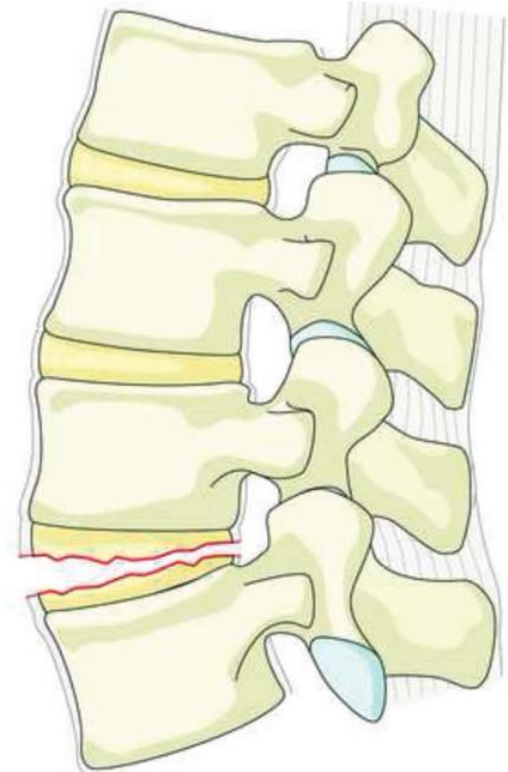
**B1. Transosseous tension band disruption / Chance fracture**



# B2 distraction injury (ligamentous)

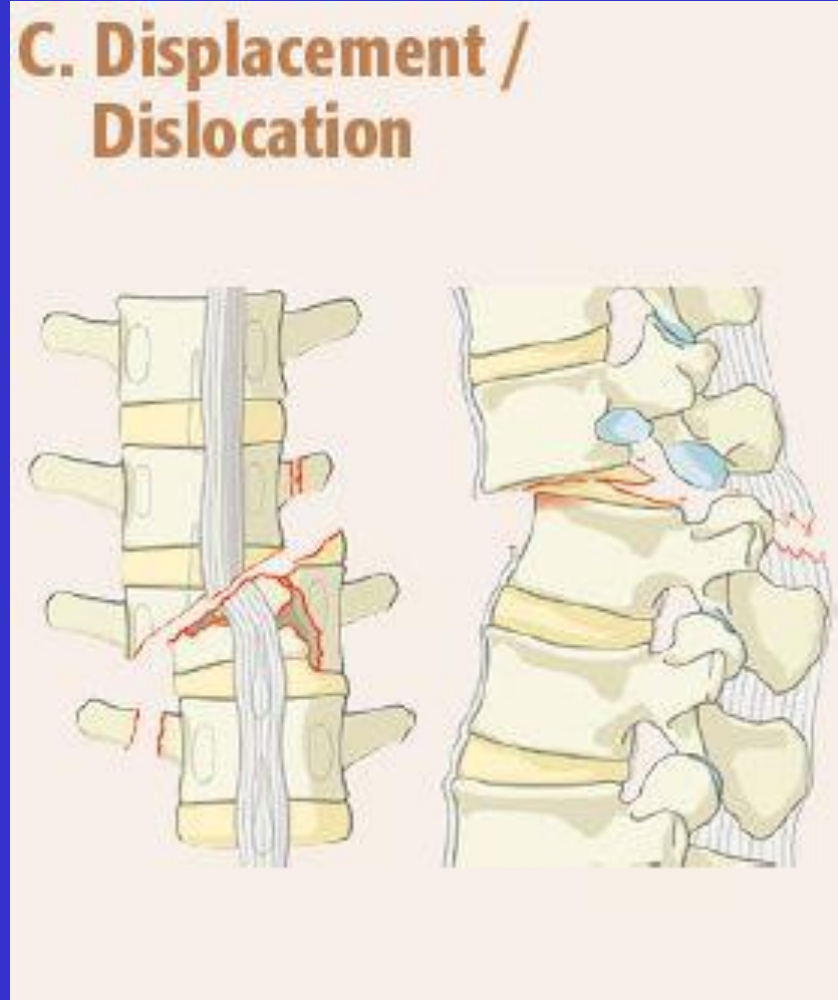
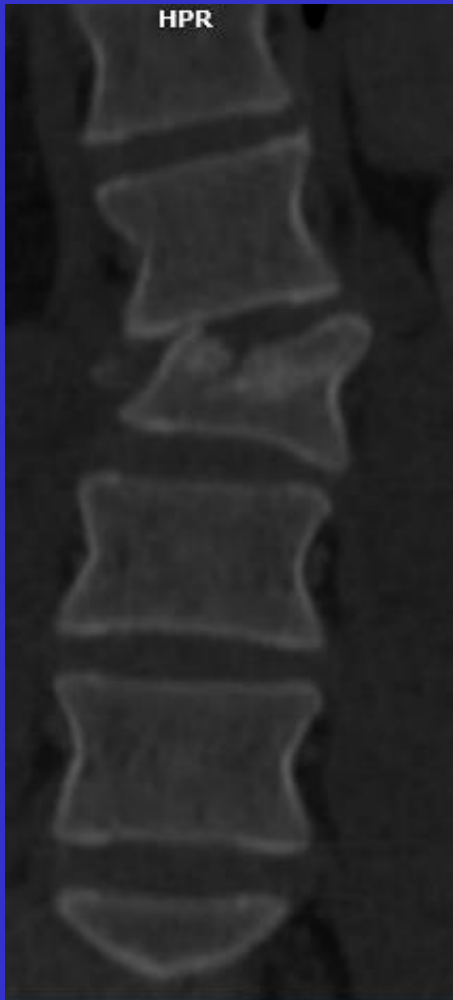


# B3 - Th.IV-Th.V disc rupture



**B3**

# C – translation injury





# Classifications Necessary for.....

- Uniform method of description
- Facilitate communications e.g. in ER
- Directing treatment (!)
- Facilitating outcome analysis
- Should be:

Comprehensive

Reproducible

Usable

Accurate

