Stability and Decision-Making in Thoracolumbar Injuries: Insights from the Two-Column Theory

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Lecture Plan

- Instability
- Classification for decision making
- Summary

Stability:

Ability of the spine, under physiological loads, to maintain alignment so there is no neurological injury, no deformity and no chronic pain.

Traumatic Instability: definition

- **Potential to displace significantly under physiological loads and cause neurological deficit,deformity or chronic pain.**


L HARASI
5
10

L HARASI
5
10

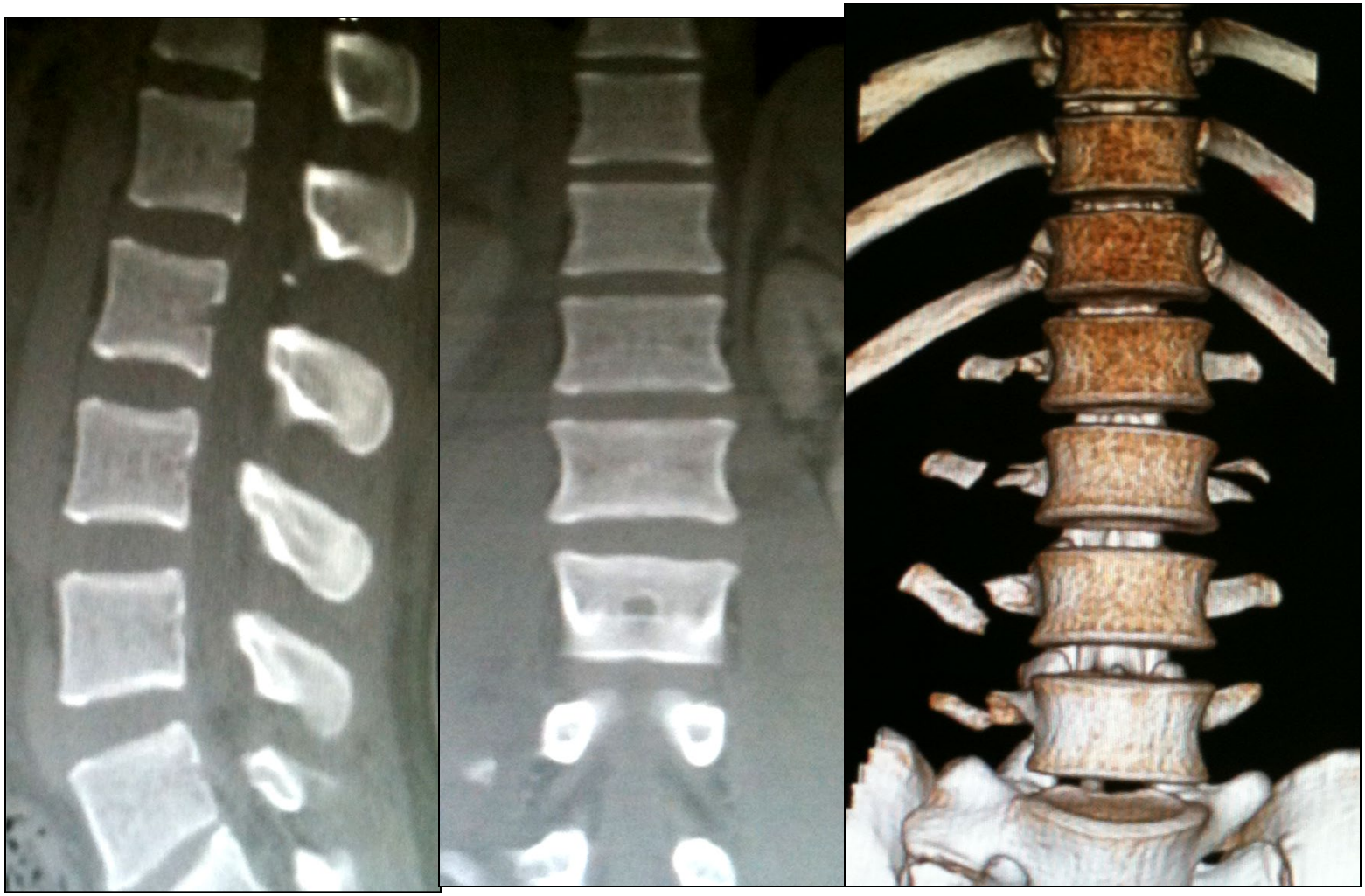
AL HARASI
5
10

RASI
10

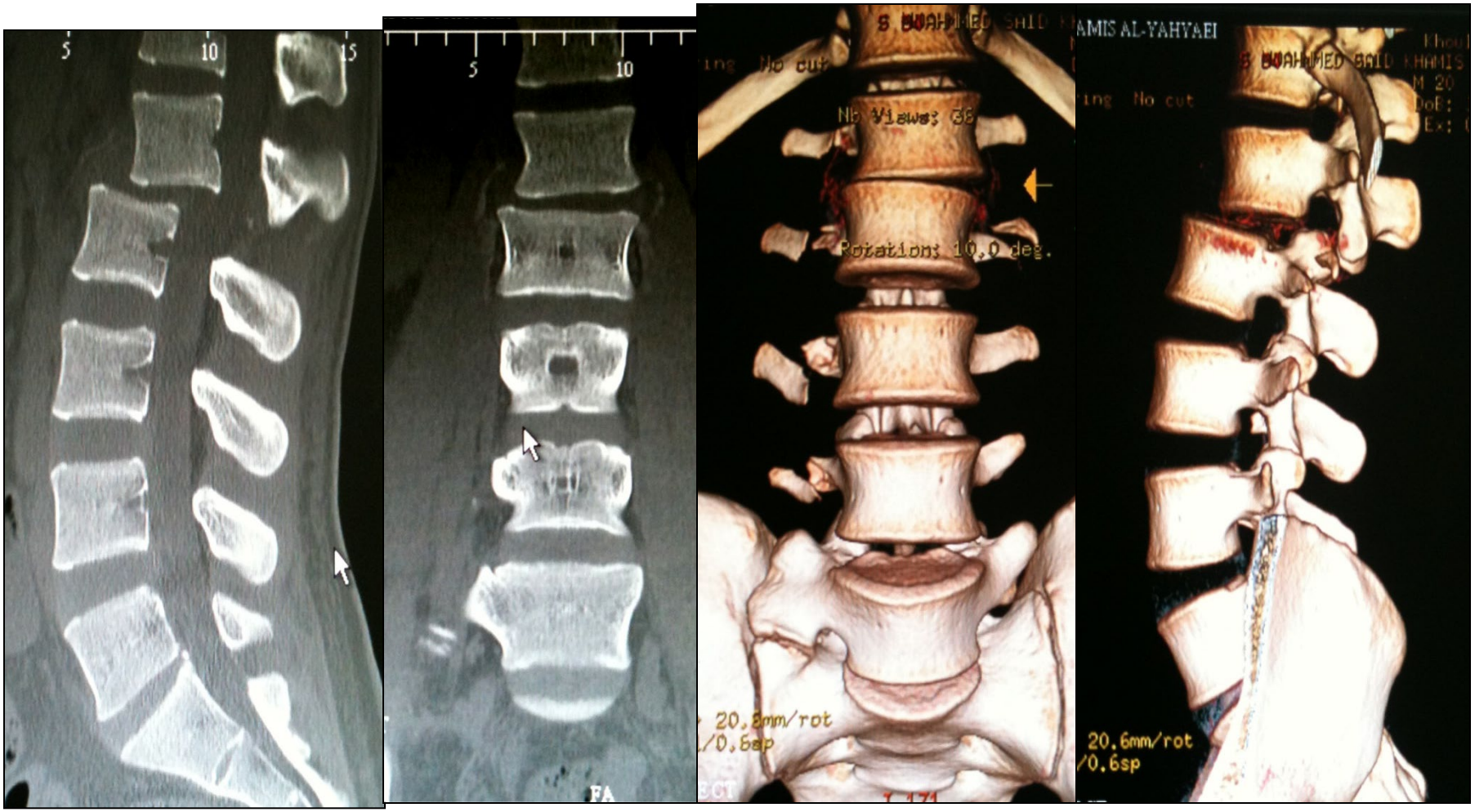

0
5
10


1.1
Mag = 2.5
8.93kHz

Occult Instability!



The Same Patient



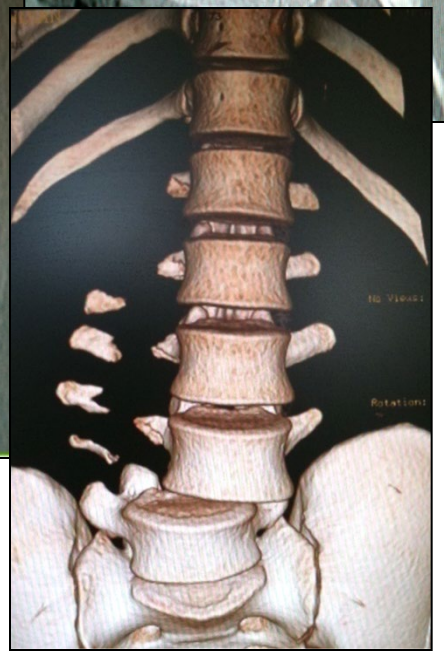

0
5
10

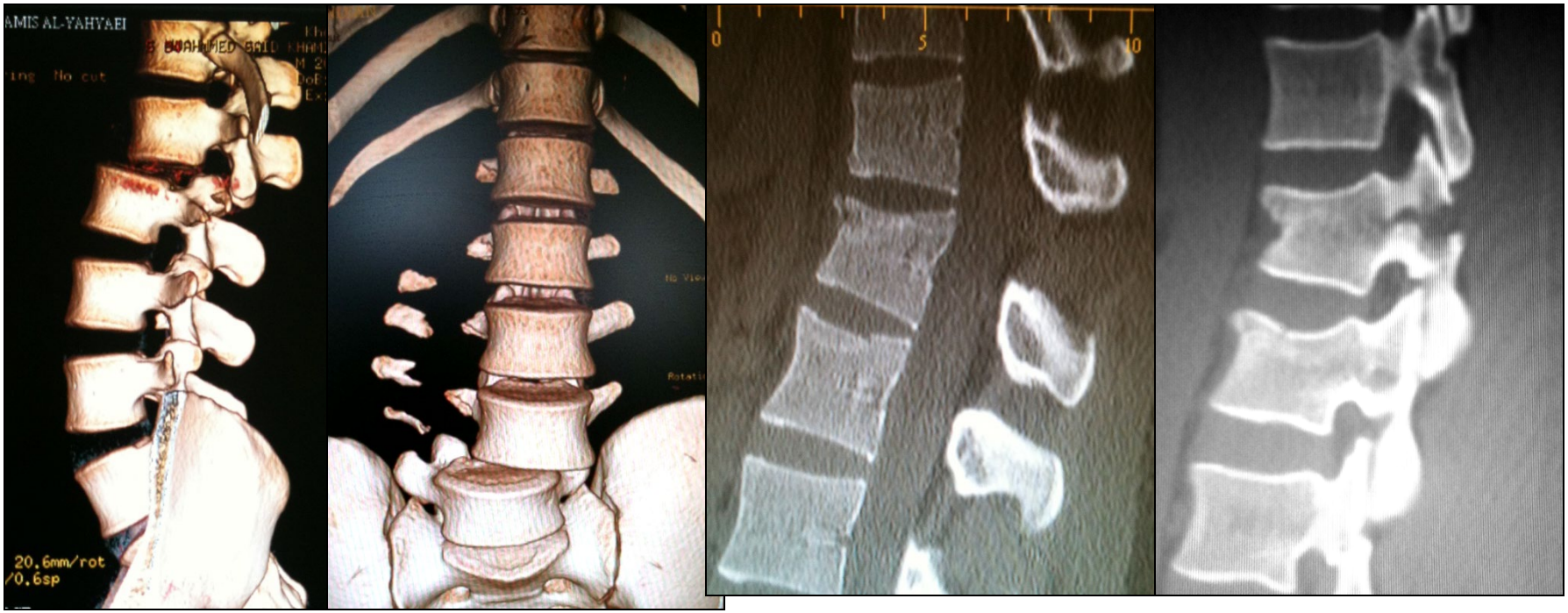

R

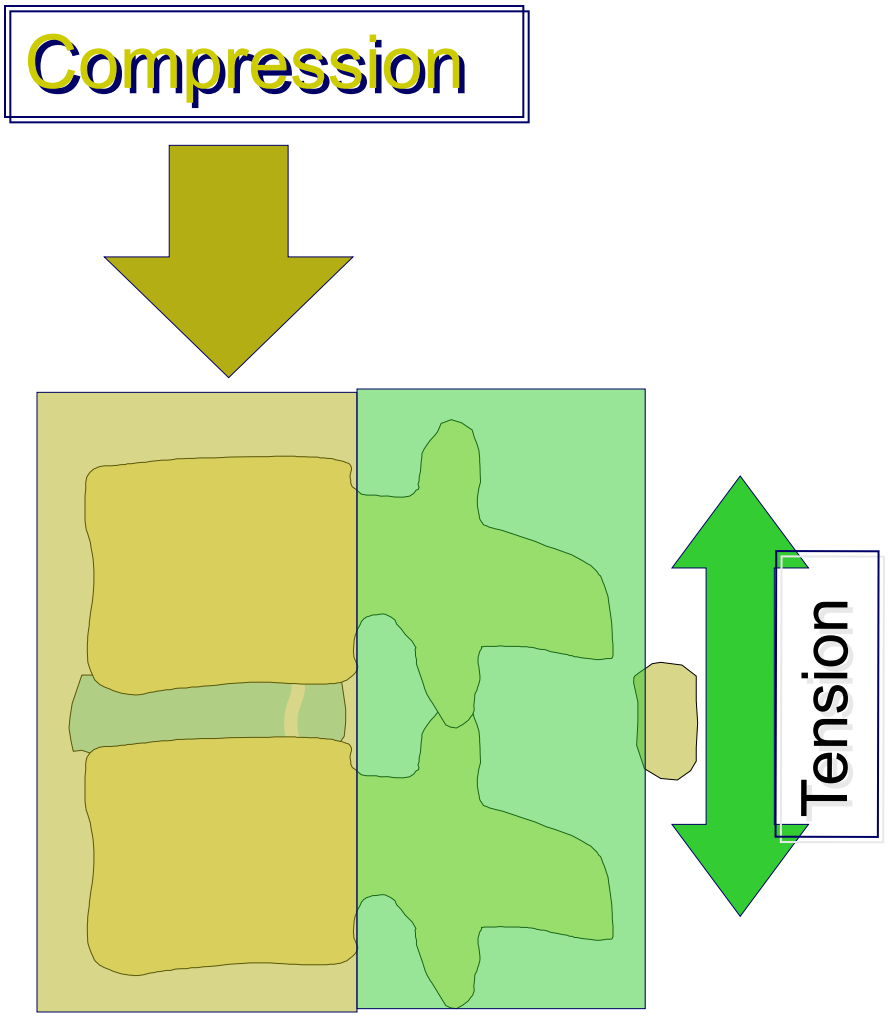

0
5
10

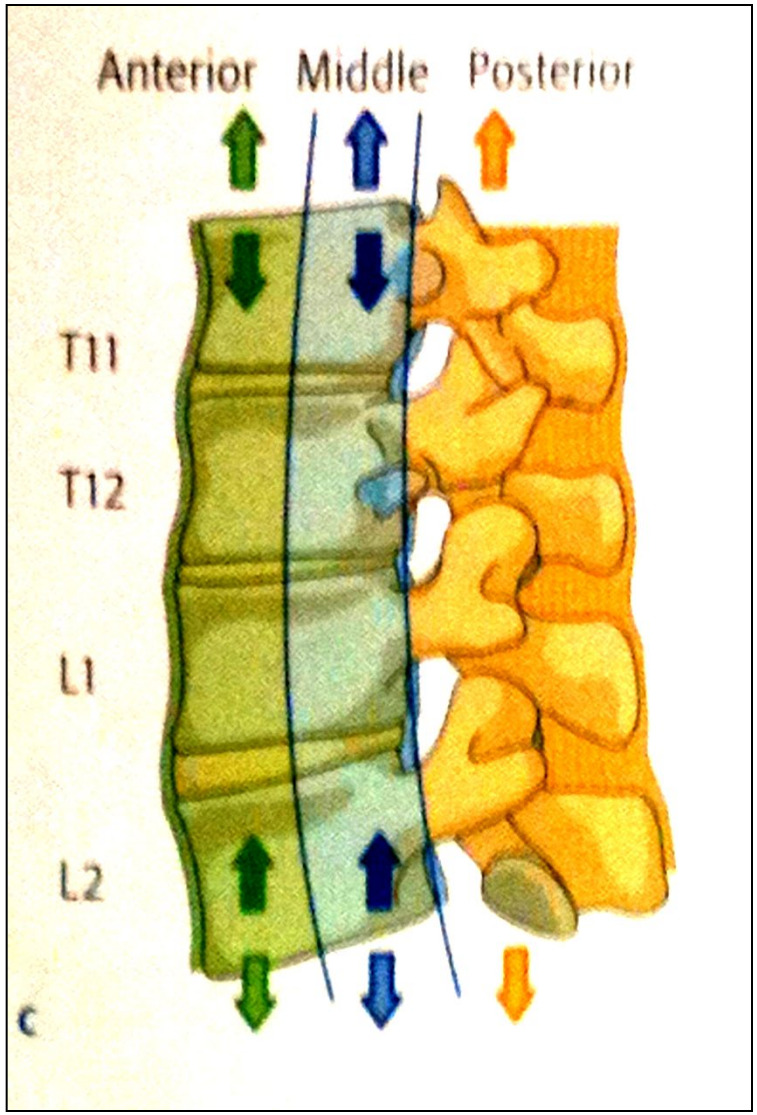
Biomechanical Gravity

- Compression
- Tension
- Torsion




AMIS AL-YAHYAEI
20.6mm/rot
/0.6sp
0
5
10


Compression
Tension


Anterior
Middle
Posterior
T11
T12
L1
L2
c


5
10
15


0
5
10
r Spine CT
F

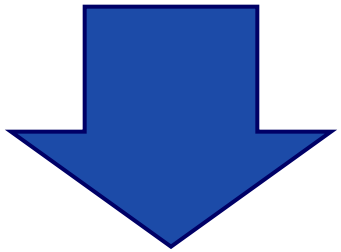

5
10

A Comprehensive Classification of Thoracic and Lumbar Injuries

F. Magerl, M. Aebi, S. Gertzbein, J. Harms, S. Nazarian

European Spine Journal 3, 1994

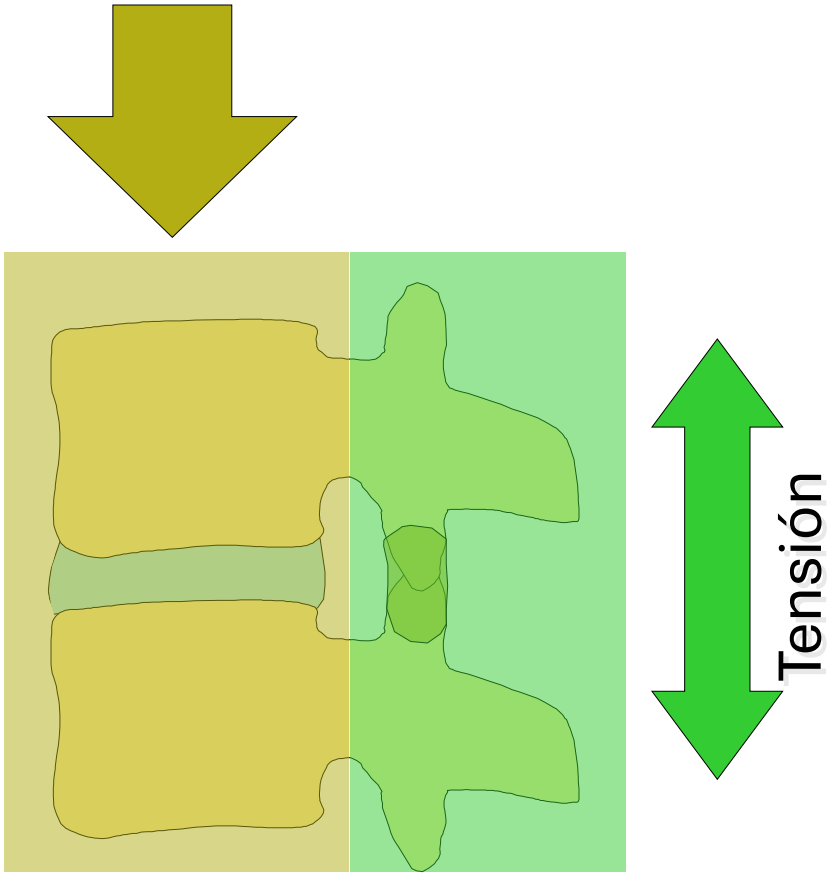
1,545 cases

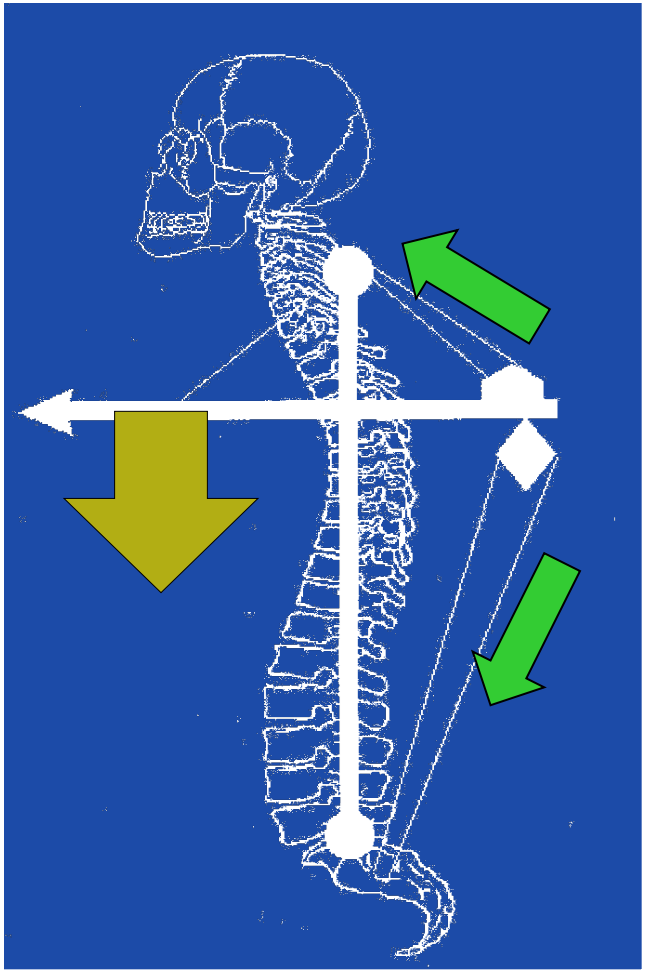


AO Classification
of thoracolumbar fractures

Bio-mechanical:
Two column concept of the spine

Compression

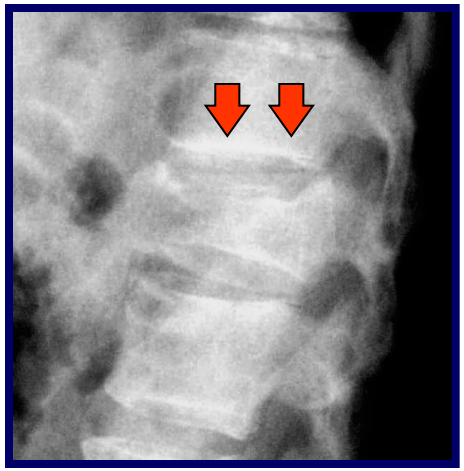




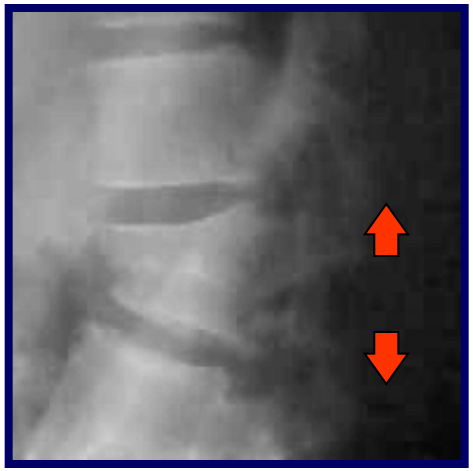
Injury patterns Types

Compressive forces	→	compression & burst injuries
Tensile forces	→	transverse disruption injuries
Axial torque	→	rotational injuries

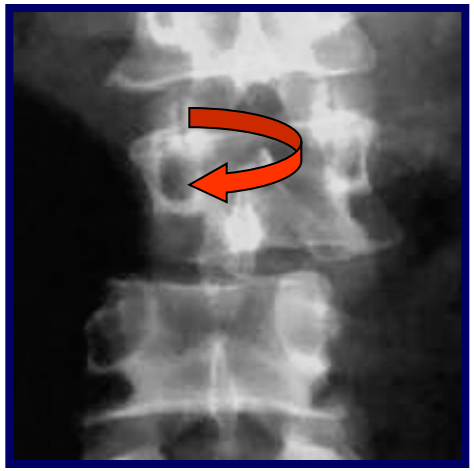
Type A
Compression



Type B
Disruption

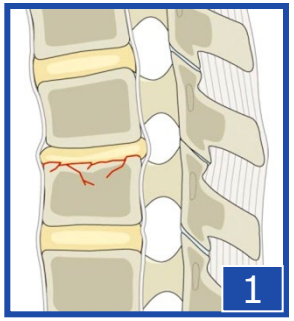


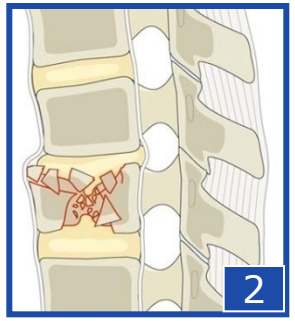
Type C
Rotation

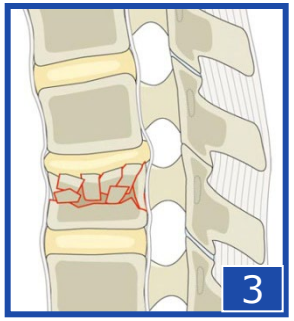


AO Classification of thoracolumbar fractures

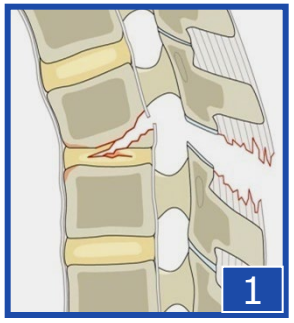
Type A Compression

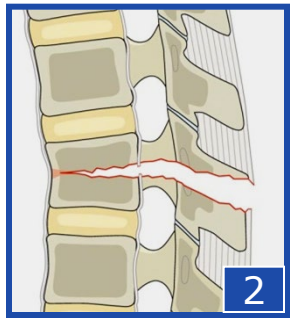


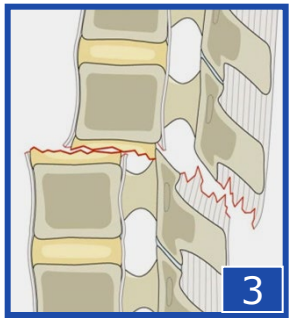




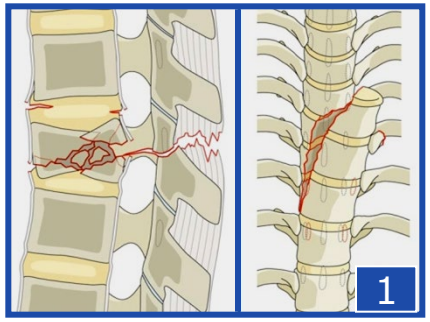
Type B Distraction

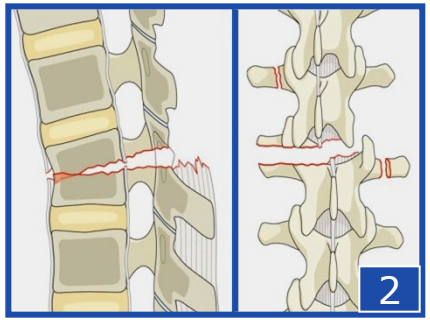


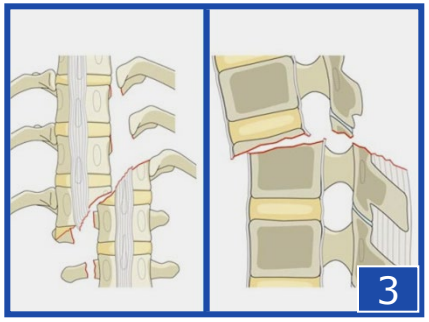




Type C Rotation



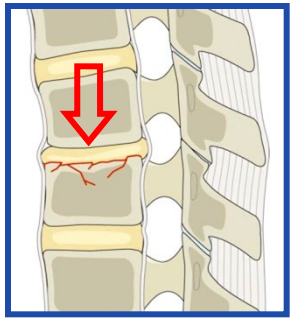




Type A

Vertebral body compression

1 Impaction

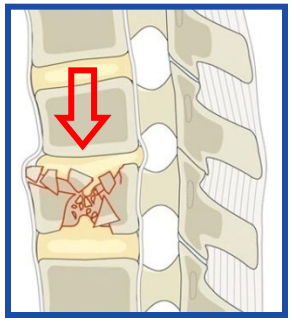


.1 end plate impaction

.2 wedge impaction feature

.3 vertebral body collapse

2 Split

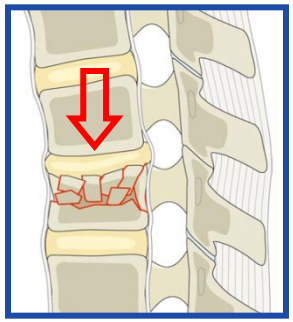


.1 sagital split fracture

.2 coronal split fracture

.3 pincer fracture

3 Burst

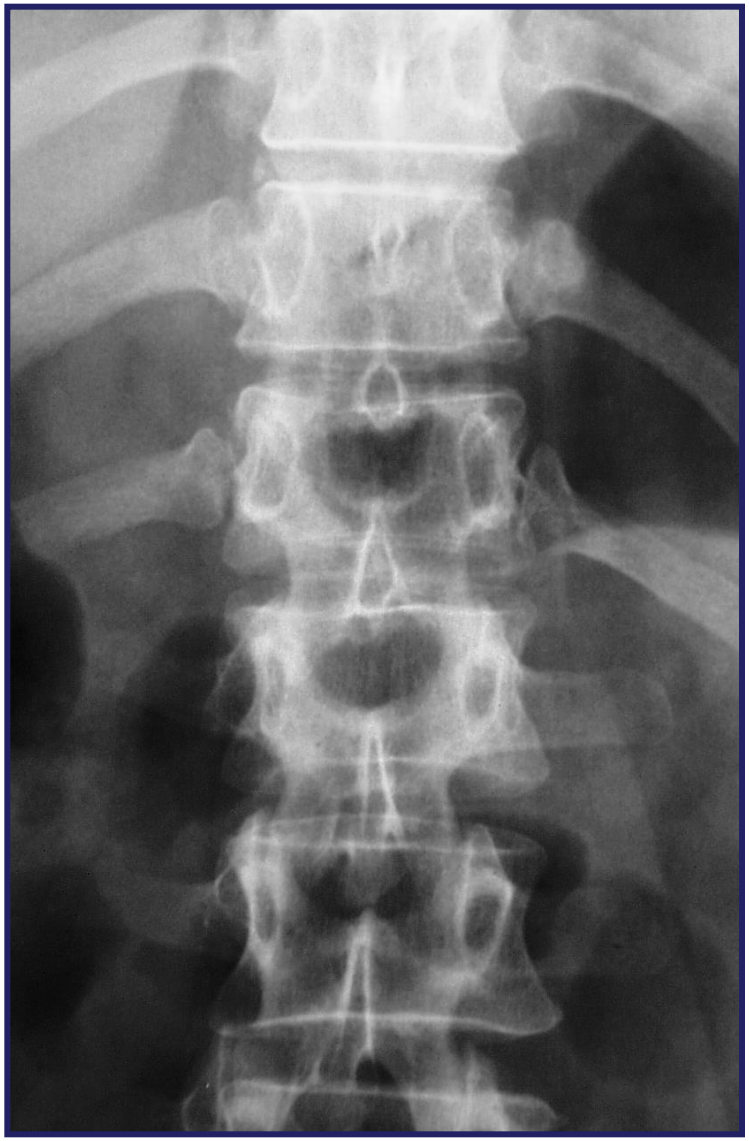


.1 incomplete burst

.2 burst split fracture

.3 complete split fracture

Type A 1



Type A 2

Type A 3

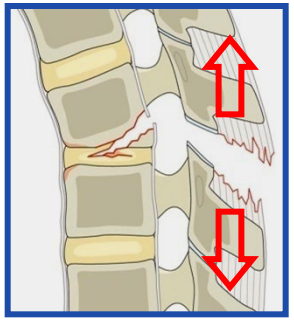

COMBINE
CAROLINA
HOSP. DEL TR
Philips Bril
140kV
SC
SW
15:49:33.6
P


Philips Brill
140kV,
SC 2
SW


CAROLINA
HOSP. DEL
Philips B
14
15:47:17.0

Type B
Anterior and posterior elements injury with distraction

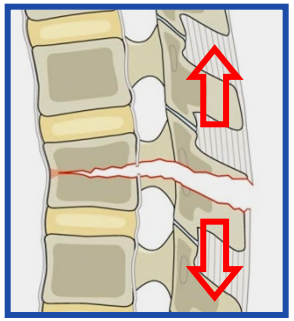
1 Posterior ligamentous



.1 transverse disc disruption

.2 with type A fracture

2 Posterior osseous

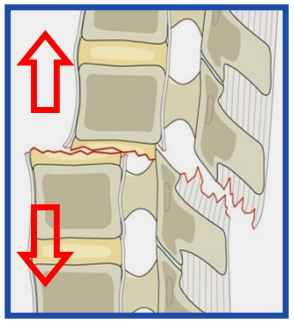


.1 transverse bicolumn fracture

.2 with disc disruption

.3 with type A fracture

3 Anterior disc

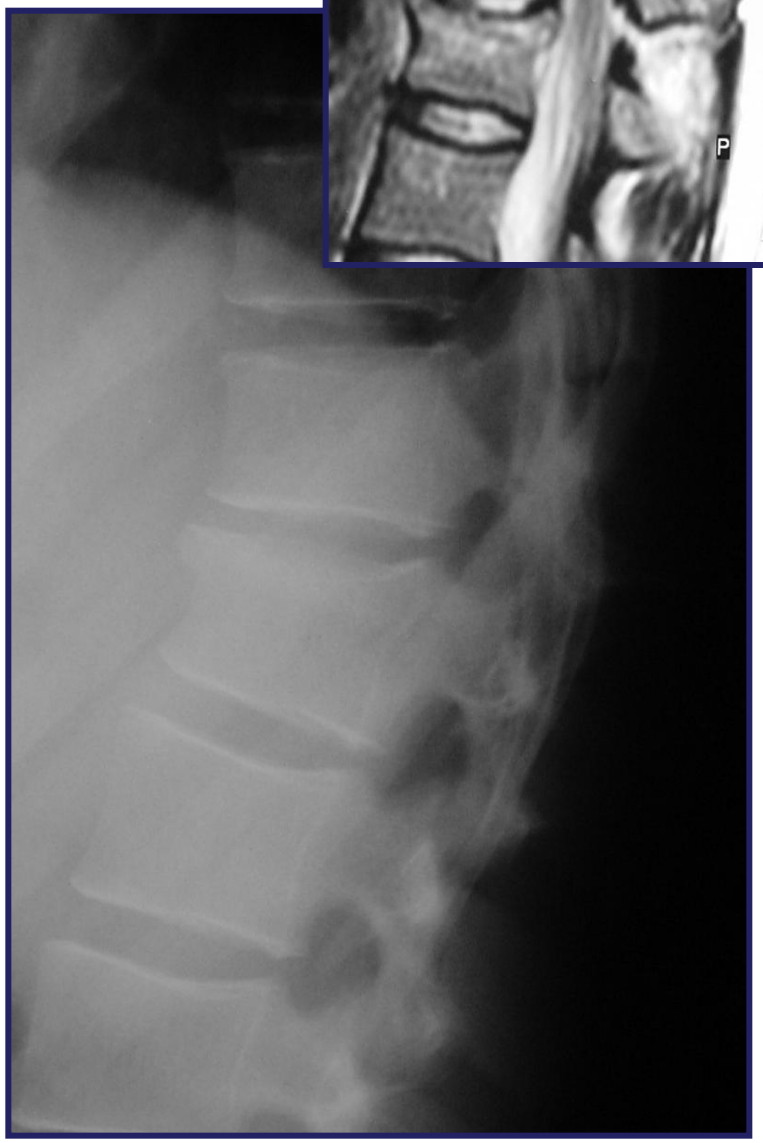


.1 hyperextension-subluxations

.2 hyperextension-spondylolysis

.3 posterior dislocation

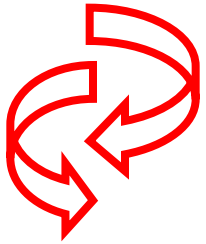
Type B 1



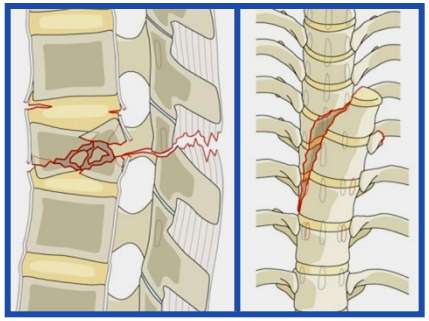
Type B 2

Type B 3

Type C
Anterior and posterior elements injury with rotation



1 Type A + rotation

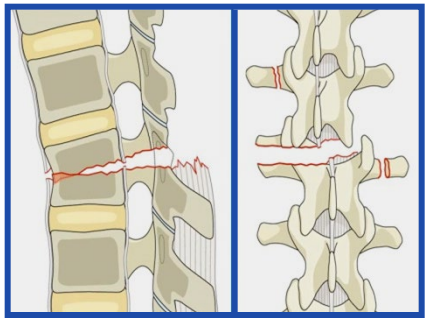


.1 rotational wedge fracture

.2 rotational split fracture

.3 rotational burst fracture

2 Type B + rotation

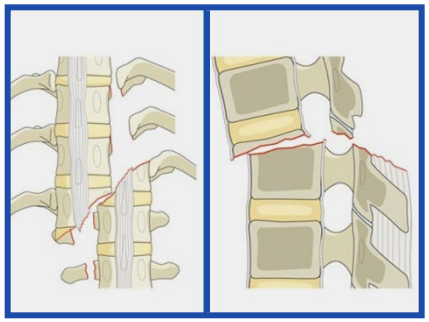


.1 B1 + rotation

.2 B2 + rotation

.3 B3 + rotation

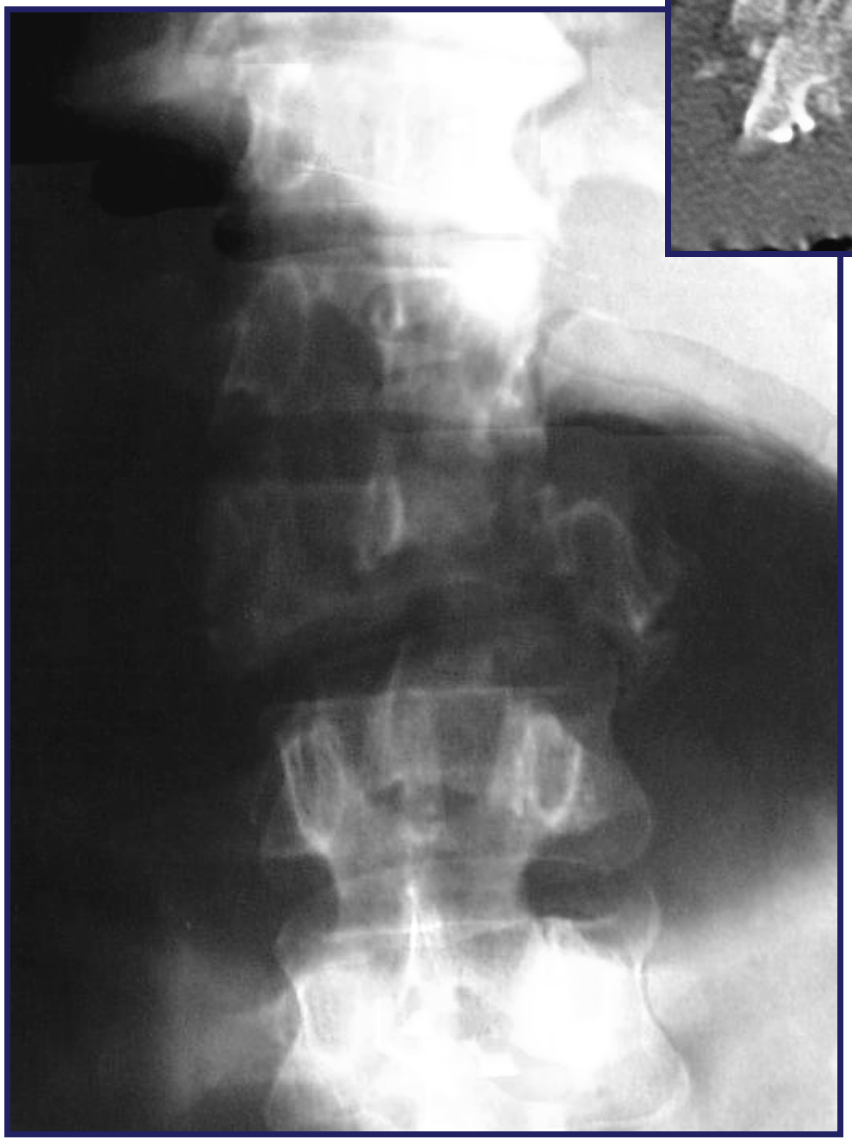
3 Rotational shear

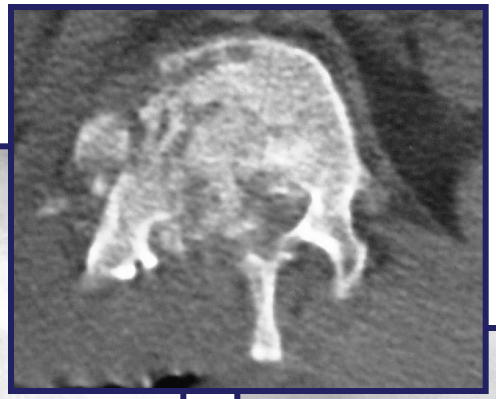


.1 slice fracture

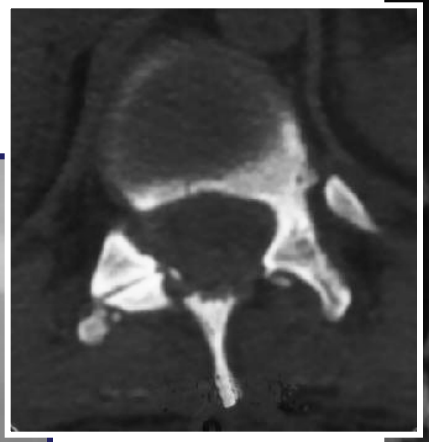
.2 oblique fracture

Type C 1



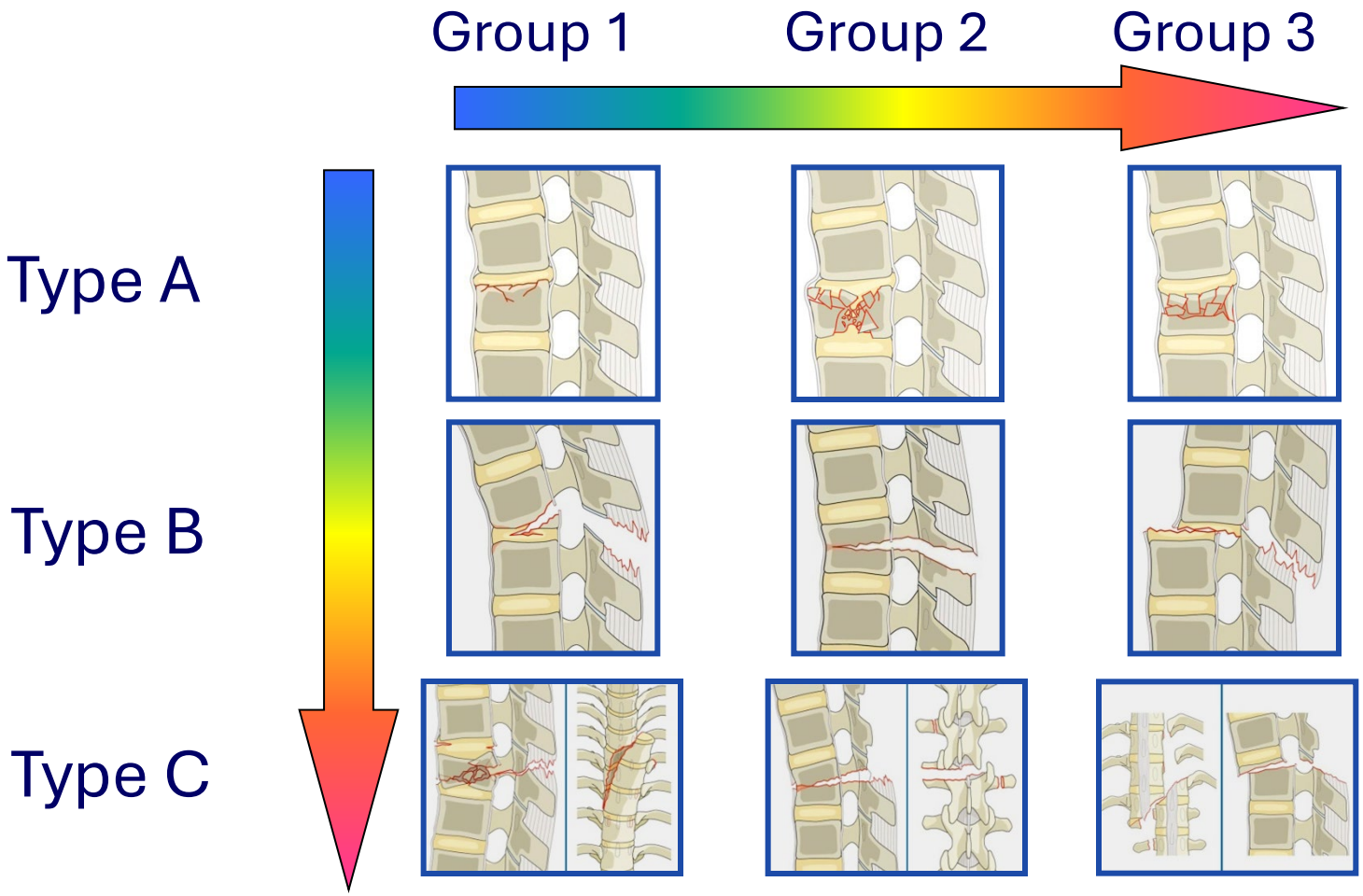


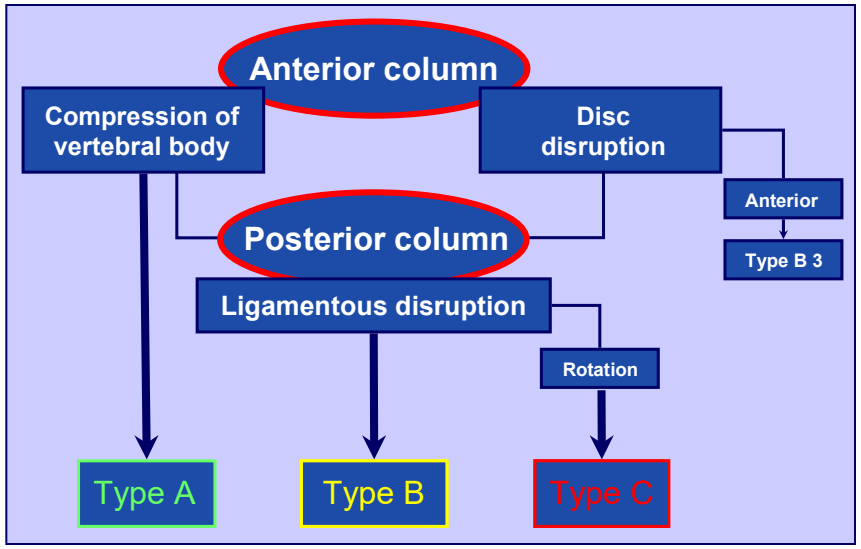
Type C 2

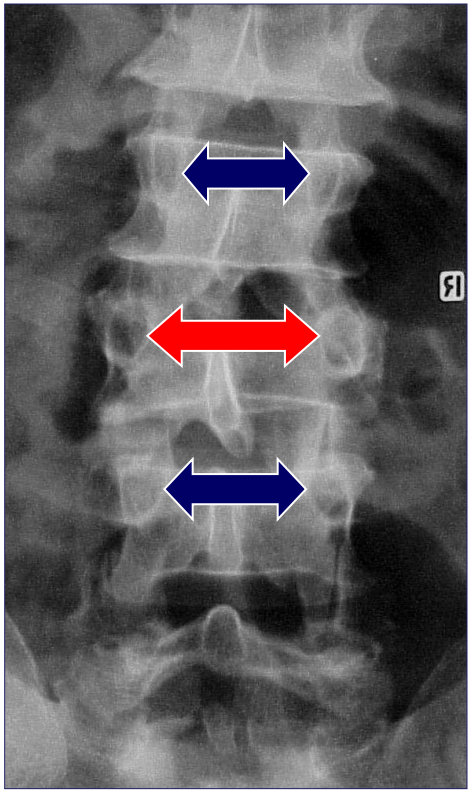


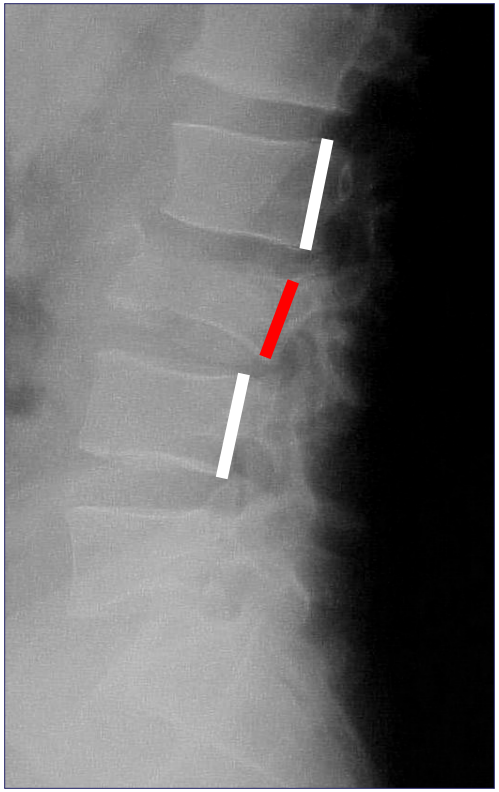
Type C 3

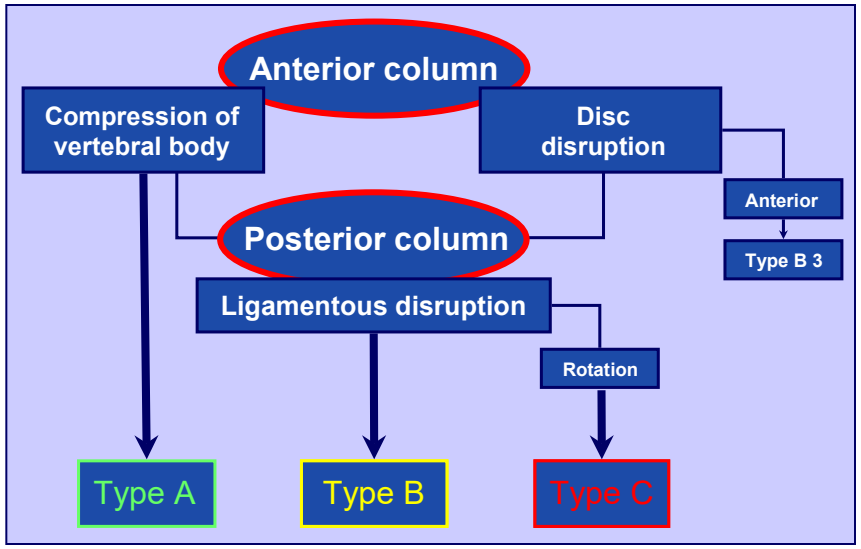
Progressive severity → Prognosis




Anterior column
Compression of vertebral body
Disc disruption
Anterior
Type B 3
Posterior column
Ligamentous disruption
Rotation
Type A
Type B
Type C



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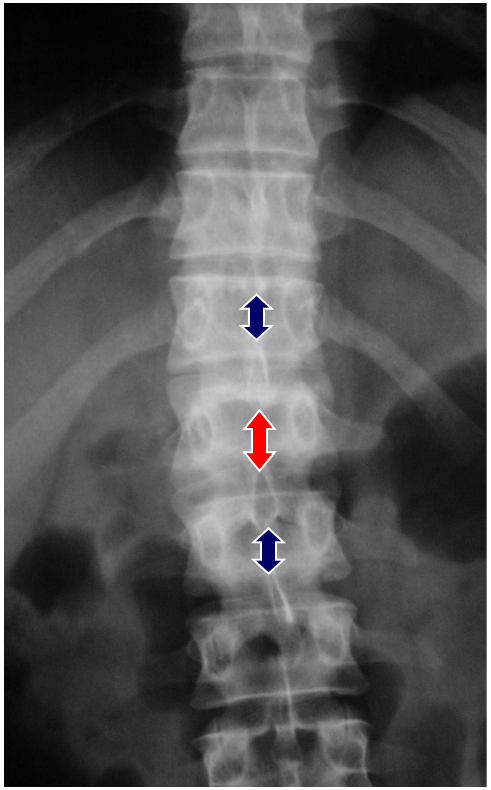
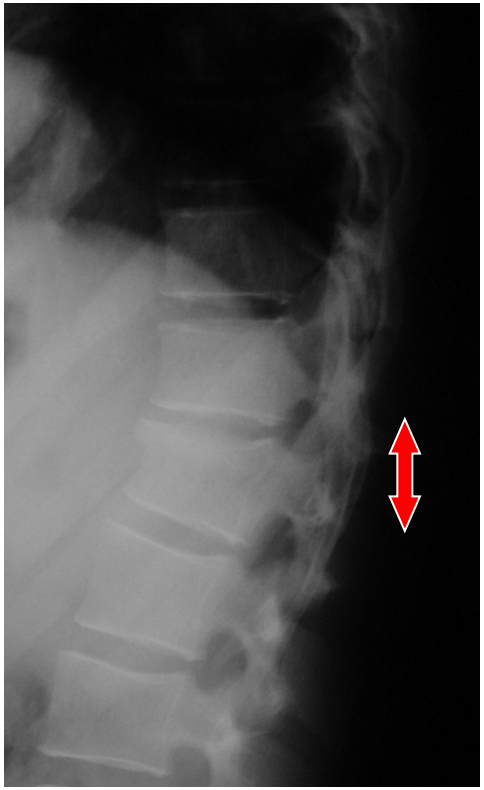
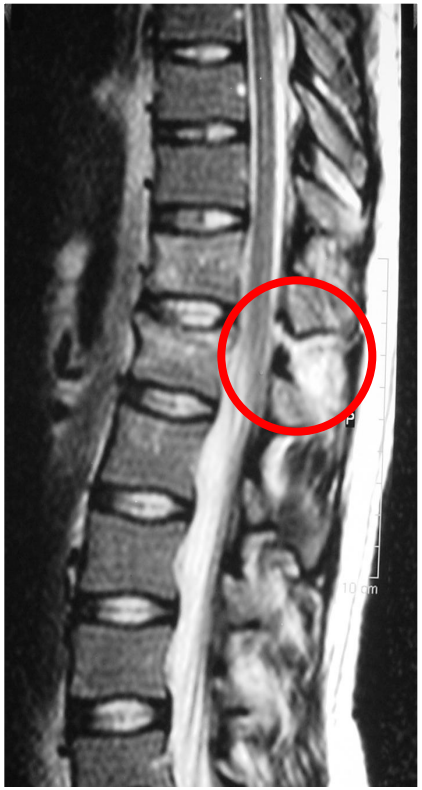
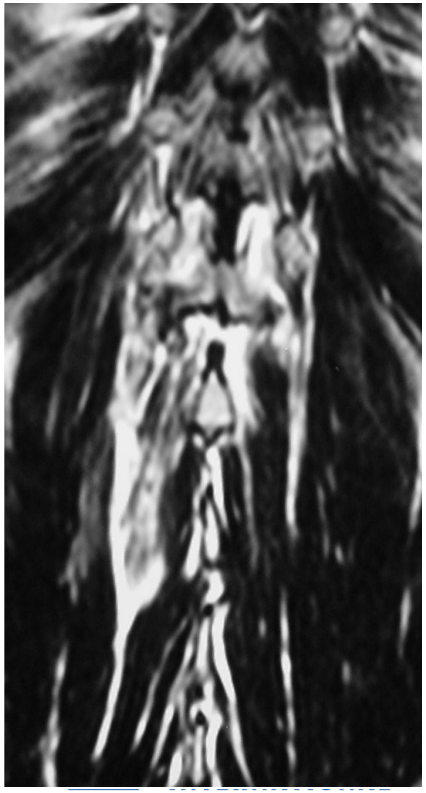
Type B
Type C

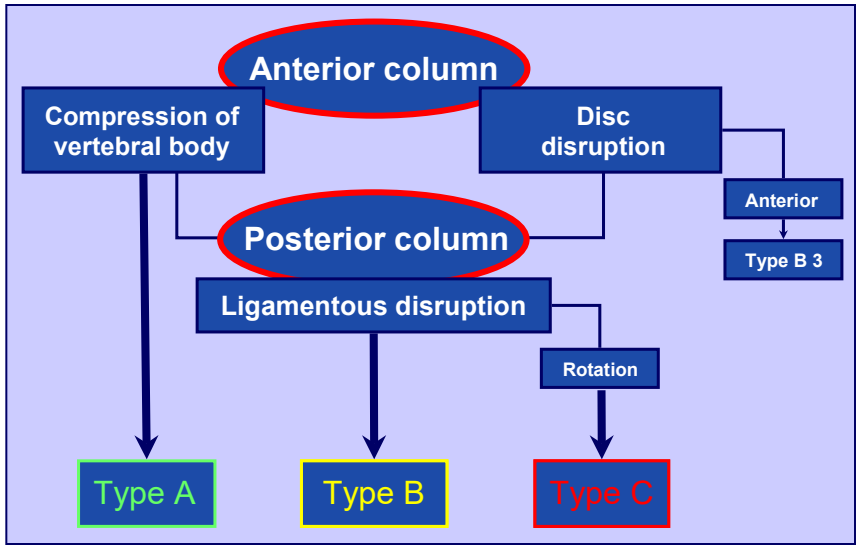

L1







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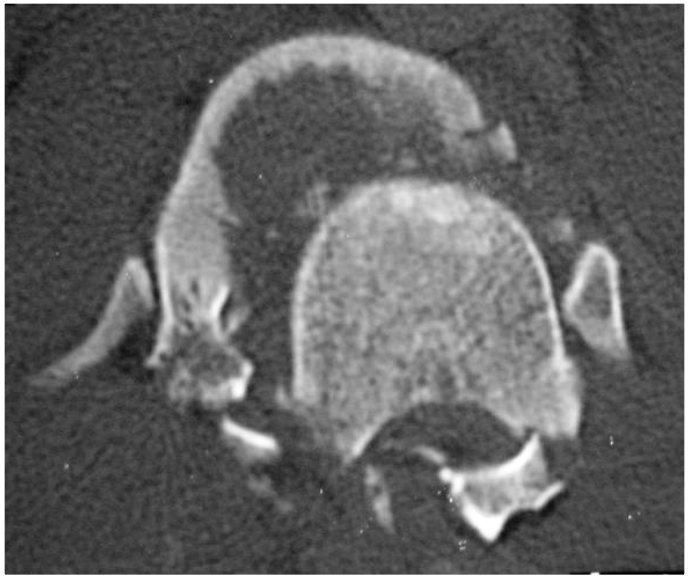
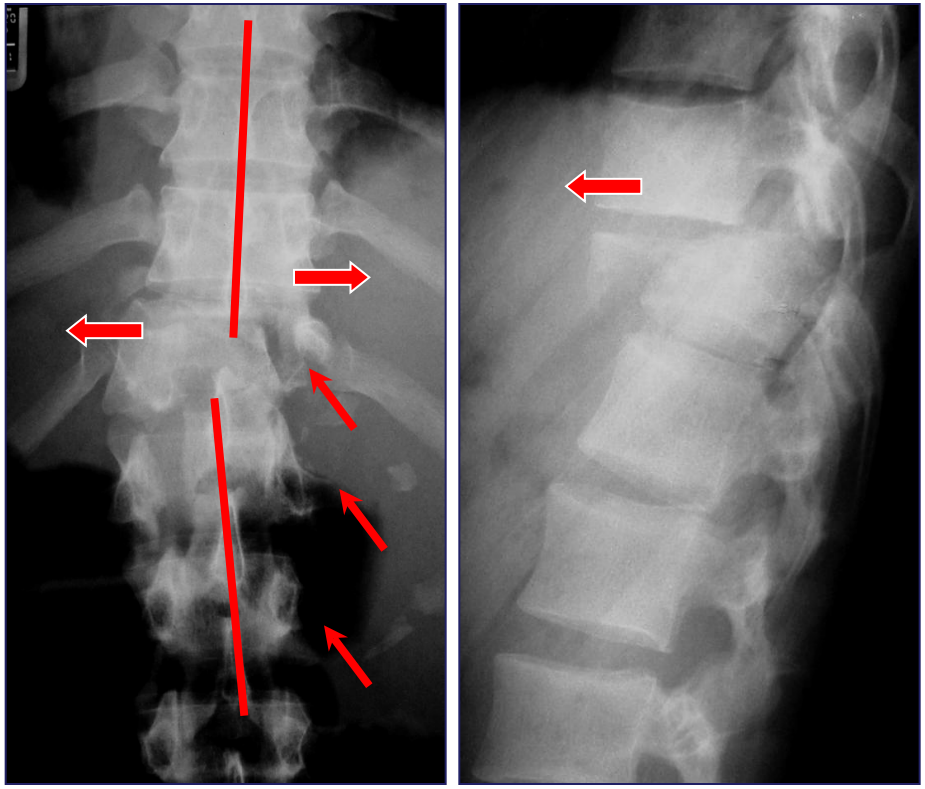




- The 3-column classification system of spinal injuries is applied to the whole spine!
- Why the 2-column concept of stability excluded cervical spine?
- There is, actually, more difference in structure and alignment among upper dorsal and lower lumbar spine to thoracolumbar junction than the difference in between cervical spine and thoracolumbar spine!

- -The applicability and reliability of AO Two-Column classification for upper dorsal and lower lumbar injuries?

Upper Dorsal injuries:

- The role of sternum and ribs as stabilizing brace and surgical decision-making.

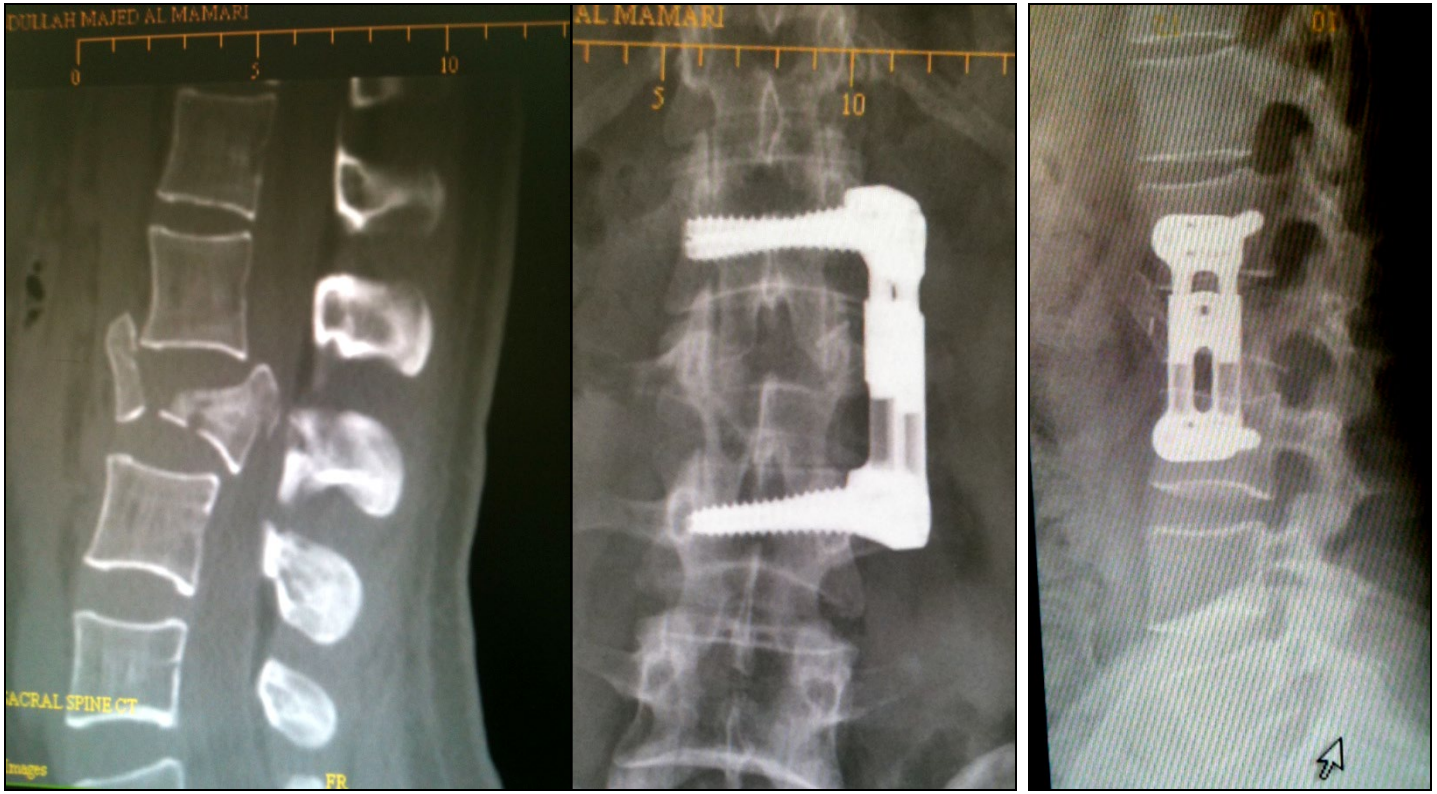
Lower Lumbar Injuries:

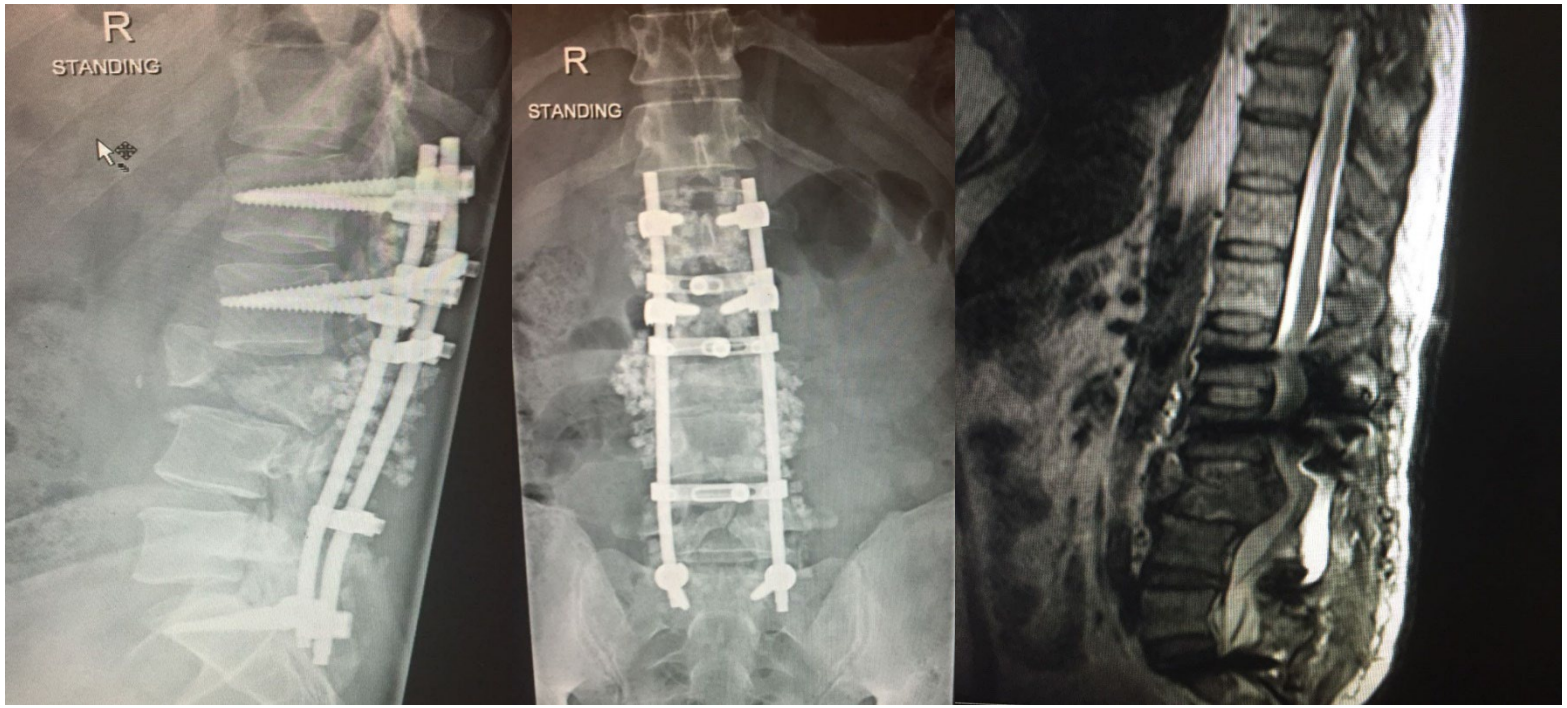
- Size and strength of intervertebral disc?
- Tough facet joints on the side?
- Are we having one column concept for stability?

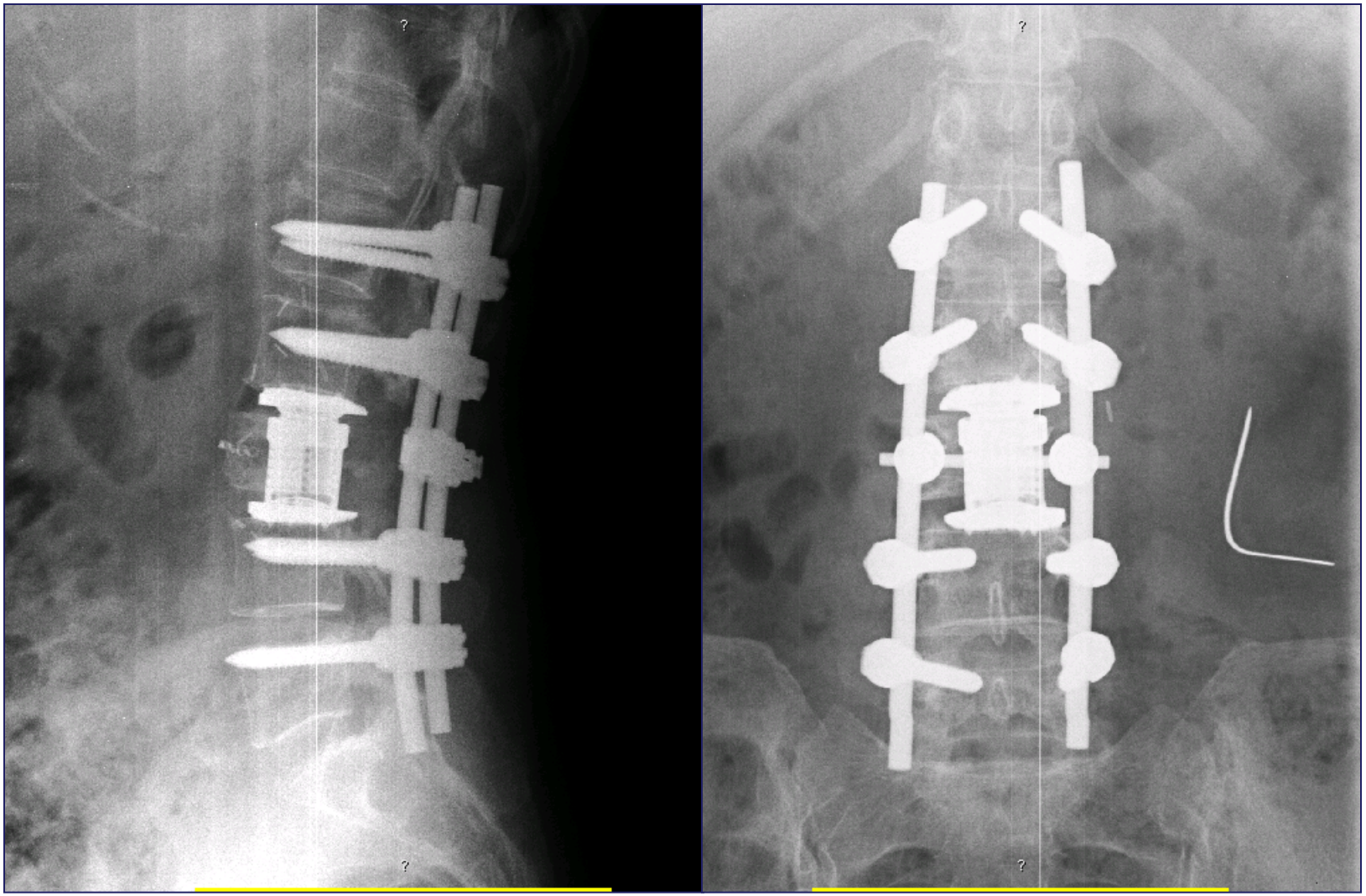
No Views
Rotation

5
10
15
CROSS TABLE

0
5
10


DULLAH MAJED AL MAMARI
0
5
10
SACRAL SPINE CT
Images
FR
AL MAMARI
5
10


R
STANDING
R
STANDING



Conclusion

- The more widely accepted AO two column classification system is applied to thoracolumbar junction injuries
- The two column AO classification system is less applicable to more distal injuries at the upper dorsal and lower lumbar locations
- At the upper dorsal injuries, the critical role of intact ribs and sternum is equally important to the spinal stability factor
- In lower lumbar injuries probably intact compression or tension side of the spine is enough to keep the spine stable. Are we having one column concept at this anatomic level of the spine?!

Thank You