NATIONAL HOMECOMING 2022

PRESENTATION

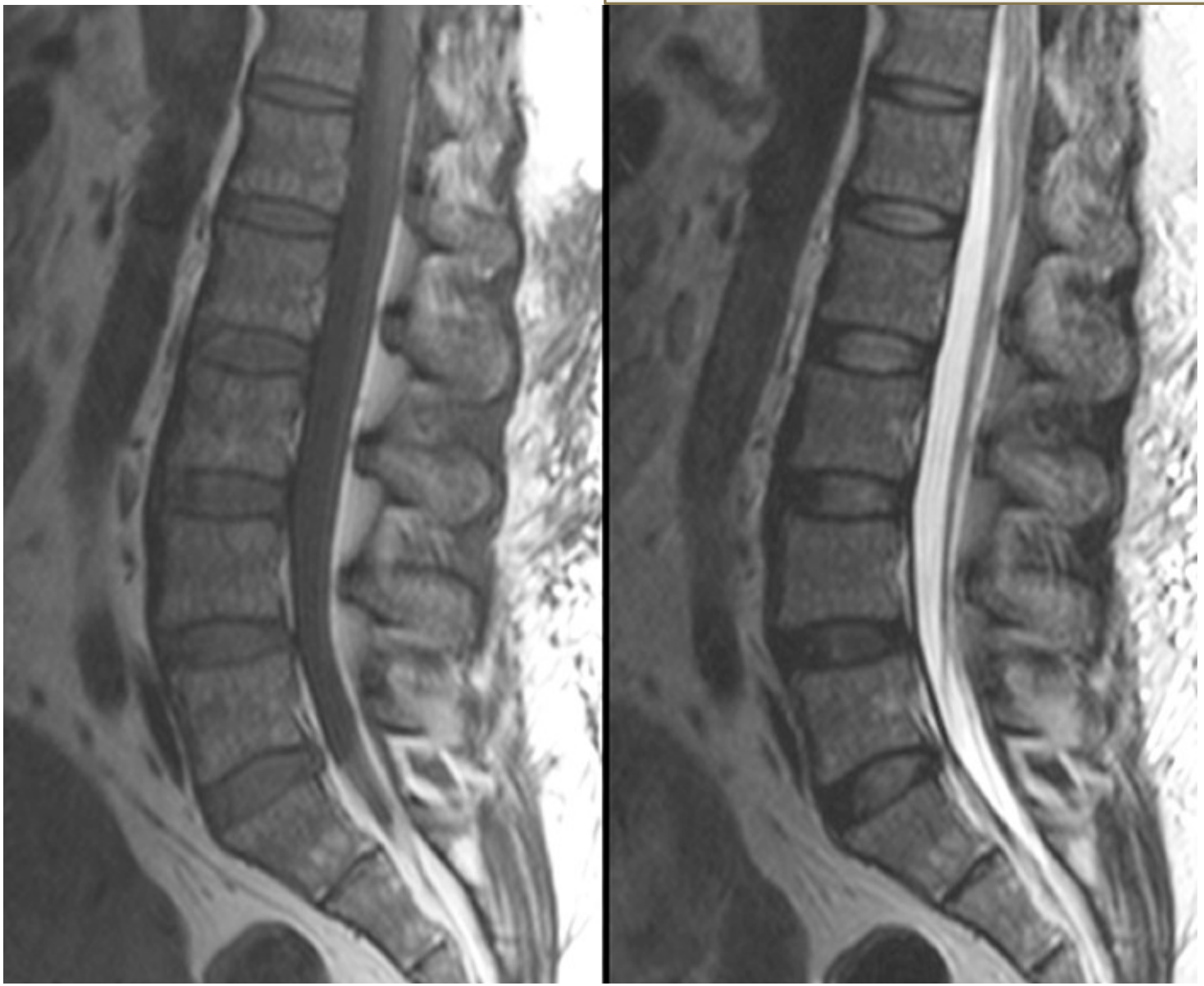
MRI BONE MARROW ABNORMALITES

BONE MARROW

- BONE MARROW MANIFESTS NUMEROUS SYSTEMIC DISEASES
- MRI CAN MANIFEST FOCAL OR DIFFUSE ALTERATIONS
- BENIGN CAN MIMIC MALIGNANT AND VICE VERSA

BONE MARROW

- MOST SENSITIVE SEQUENCE IS T1-WEIGHTED IMAGES
- DUE FATTY COMPONENTS NORMAL ADULT NARROW IS SLIGHTLY HYPERINTENSE COMPARED WITH DISCS



BONE MARROW

- **HELPFUL ASSOCIATED FINDINGS**
- INTERVERTEBRAL DISC INVOLVEMENT
- VERTEBRAL BODY FRACTURE

BONE MARROW

- **BONE MARROW ABNORMALITY WITHOUT DISC ABNORMALITY AND WITHOUT VERTEBRAL BODY FRACTURE**

BONE MARROW

- **BONE MARROW ABNORMALITY WITH DISC INVOLVEMENT**

BONE MARROW

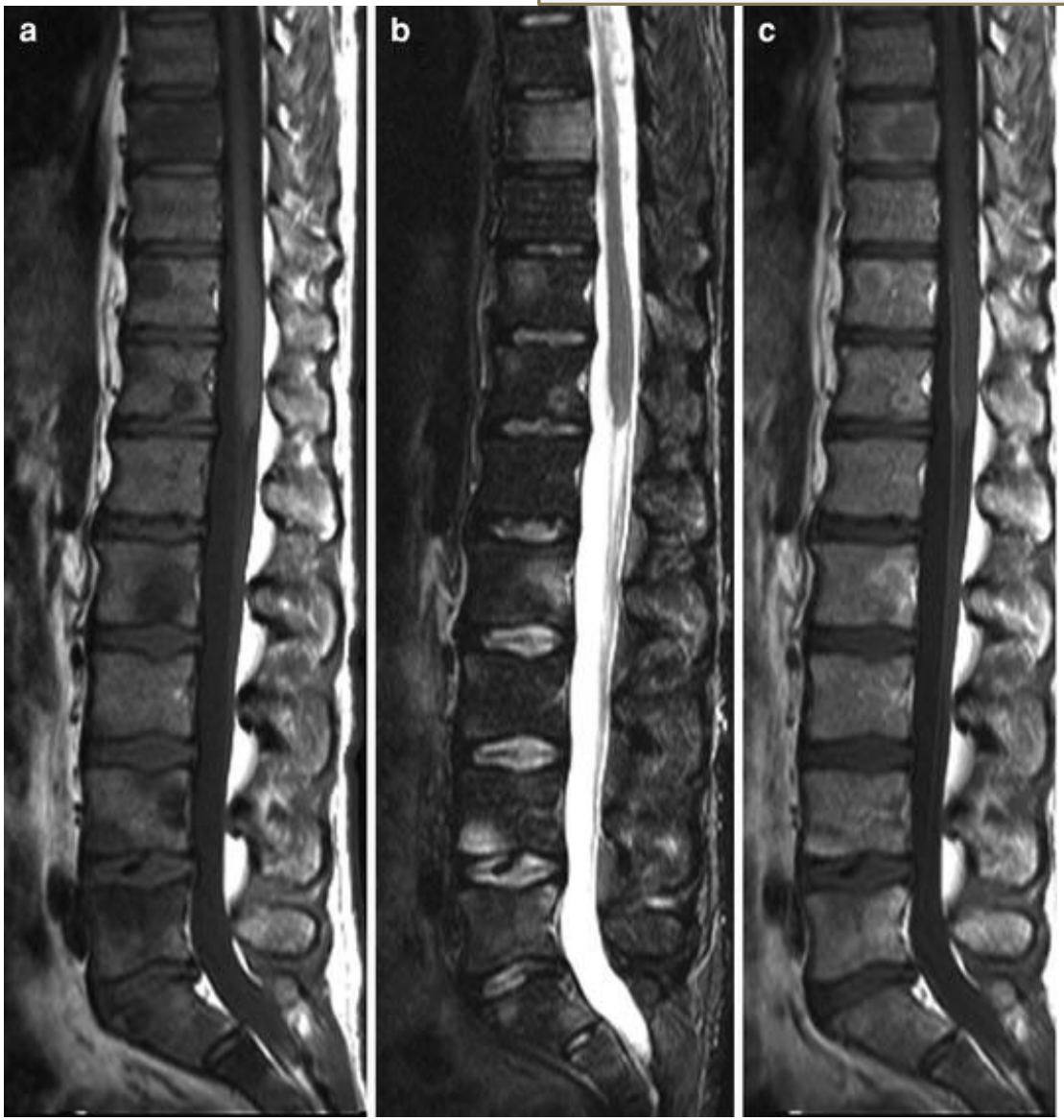
- **FRACTURE OF THE VERTEBRAL BODY**
- DIFFERENTIATE BENIGN FROM MALIGNANT

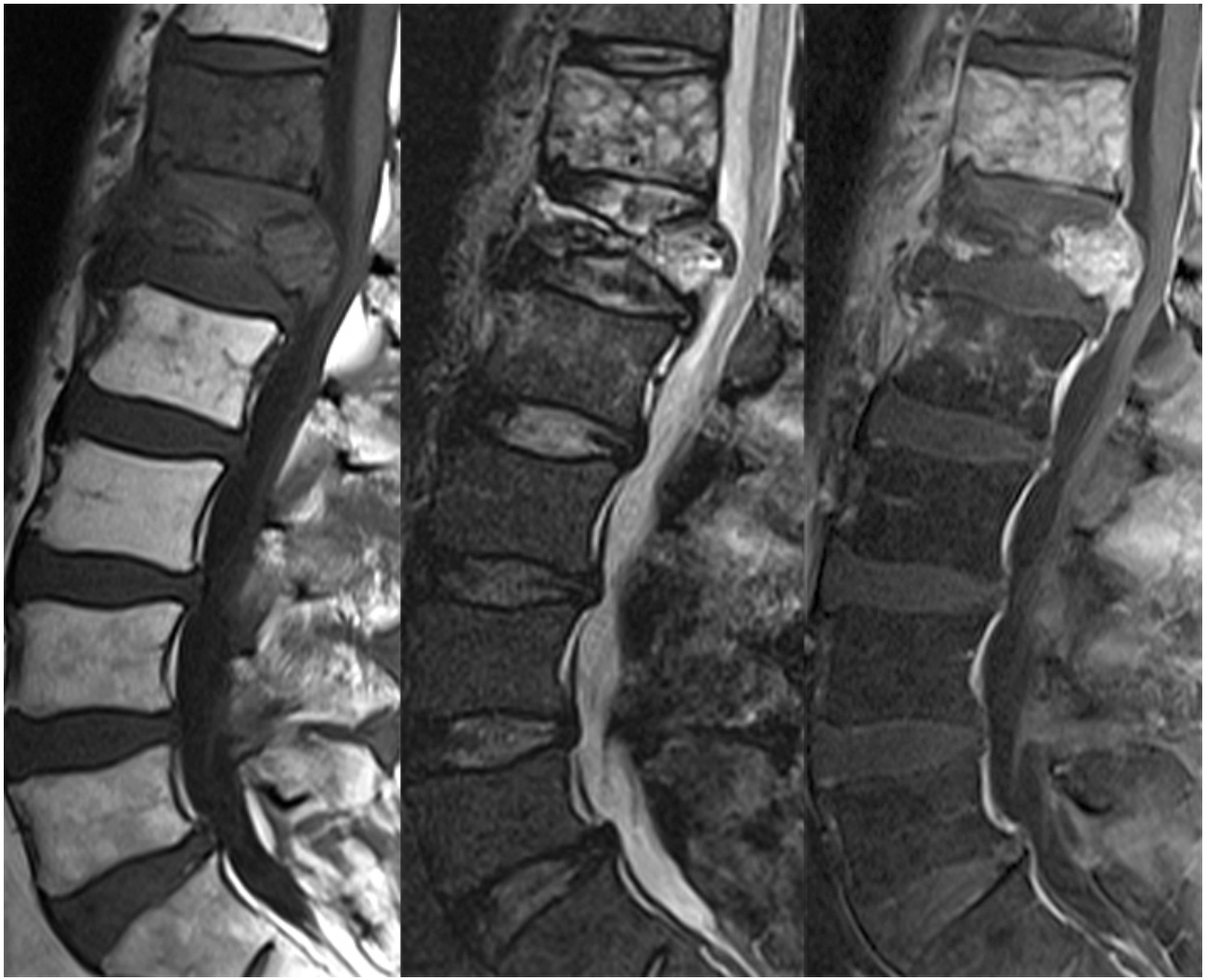
BONE MARROW

- **BONE MARROW ABNORMALITY WITHOUT DISC ABNORMALITY AND WITHOUT VERTEBRAL BODY FRACTURE**
- DIFFERENTIATE BETWEEN ABNORMAL LOW AND ABNORMAL HIGH
- FOCAL AND DIFFUSE

BONE MARROW

- **BONE MARROW ABNORMALITY WITHOUT DISC ABNORMALITY AND WITHOUT VERTEBRAL BODY FRACTURE**
- FOCAL LESIONS LOW INTENSITY T1- AND HIGH INTENSITY ON T2-WEIGHTED
- SUGGESTIVE OF METASTASIS
- LYMPHOPROLIFERATIVE DISEASE (LYMPHOMA, MULTIPLE MYELOMA OR PLASMOCYTOMA)

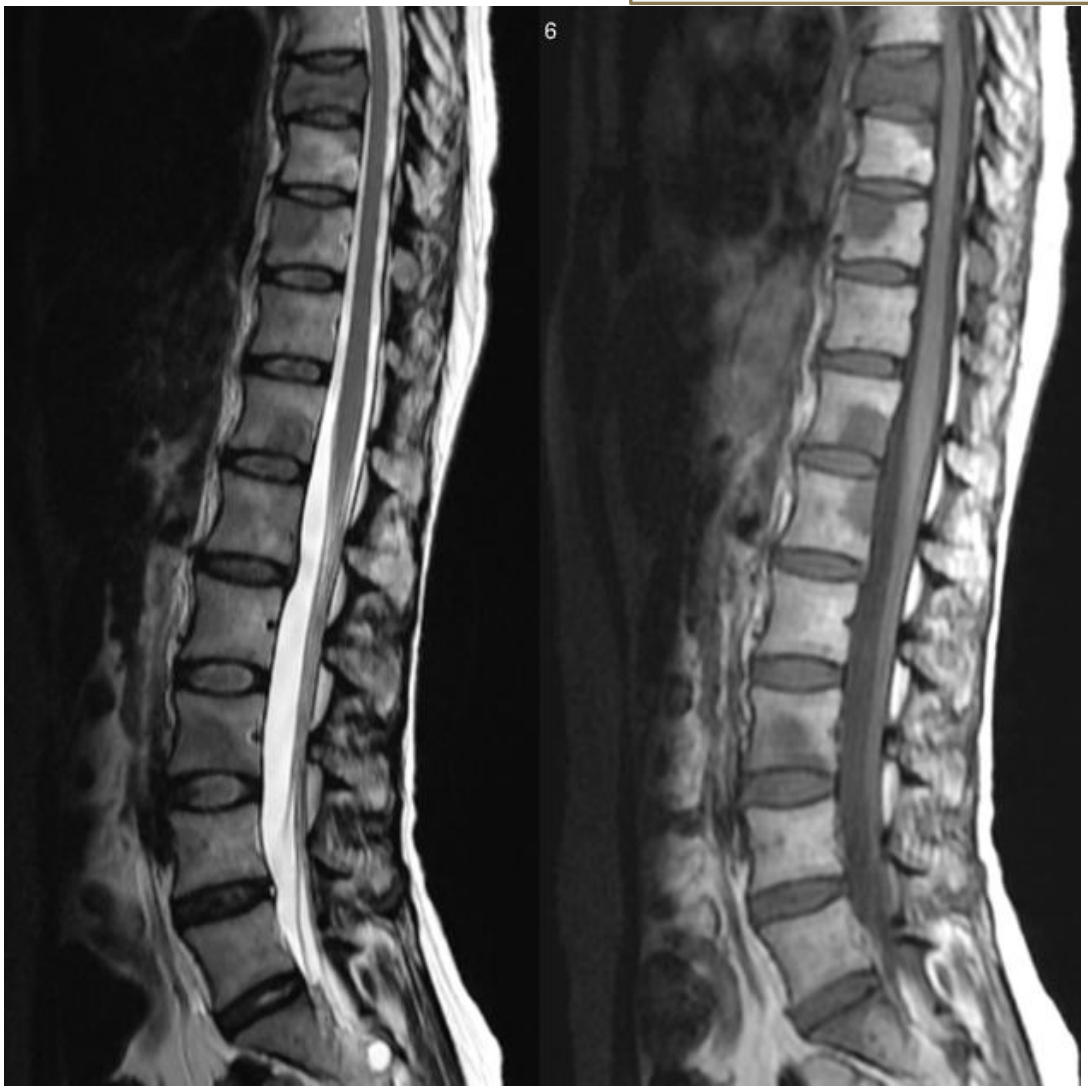

a
b
c



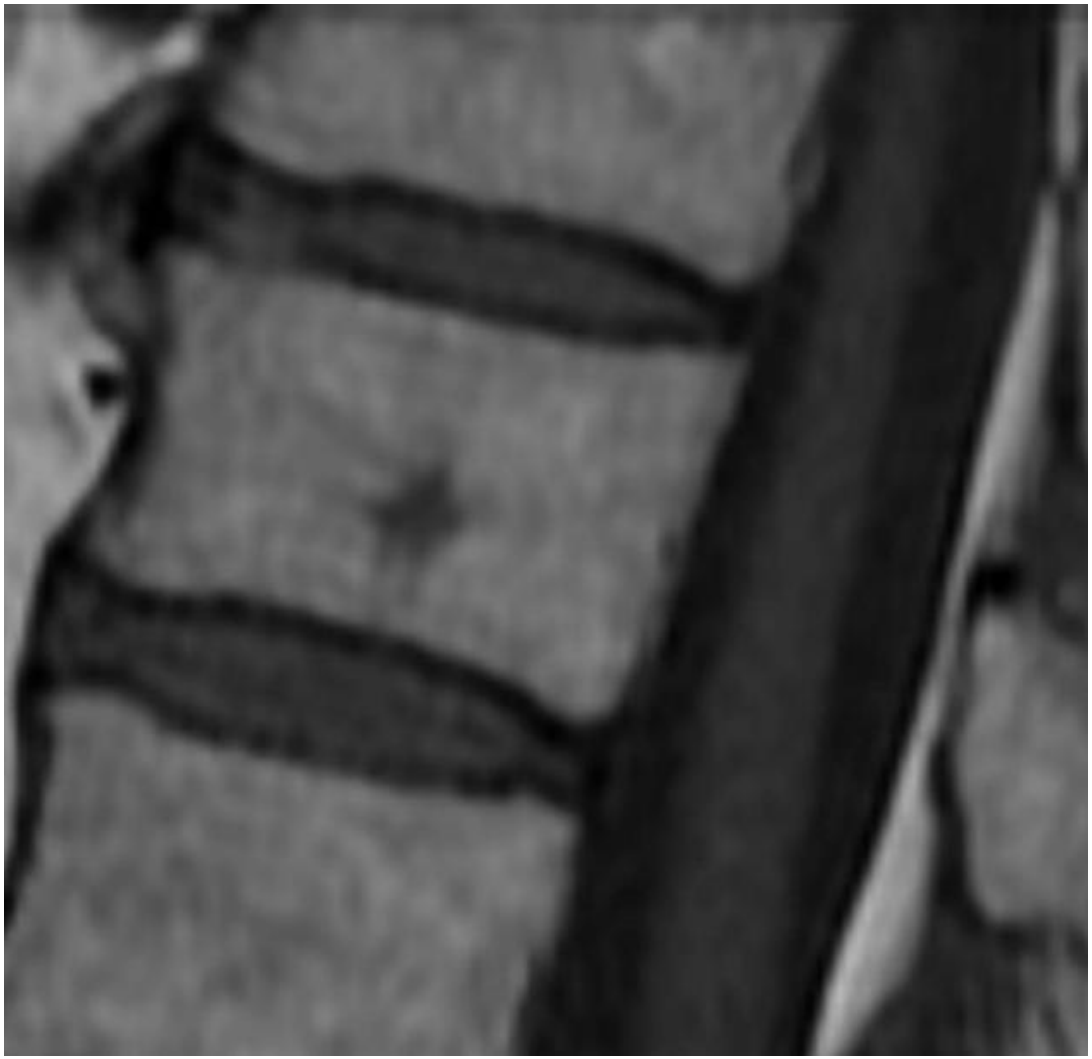

B

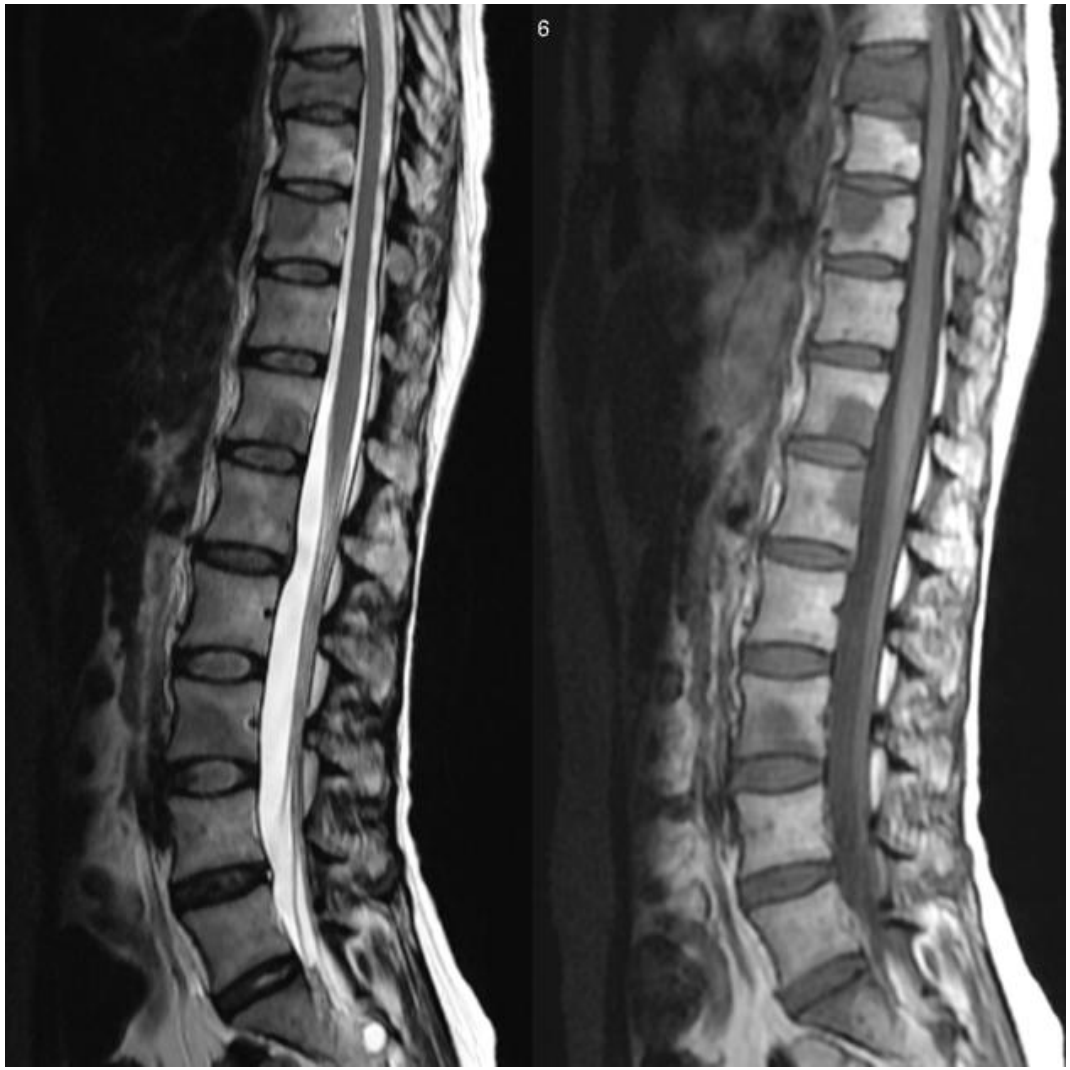
BONE MARROW

- **BONE MARROW ABNORMALITY WITHOUT DISC ABNORMALITY AND WITHOUT VERTEBRAL BODY FRACTURE**
- FOCAL LESIONS LOW T1- AND T2-WEIGHTED
- SUGGEST SCLEROTIC METASTASIS
- COMMON BREAST OR PROSTATE


6

- **BONE MARROW ABNORMALITY WITHOUT DISC ABNORMALITY AND WITHOUT VERTEBRAL BODY FRACTURE**
- BENIGN FOCAL HYPOINTENSE OF T1- AND T2- WEIGHTED IMAGES
- ENOSTOSIS (BONE ISLAND)
- BENIGN -TRABECULATED MARGINS
- METASTASIS- ROUND AND SMOOTH

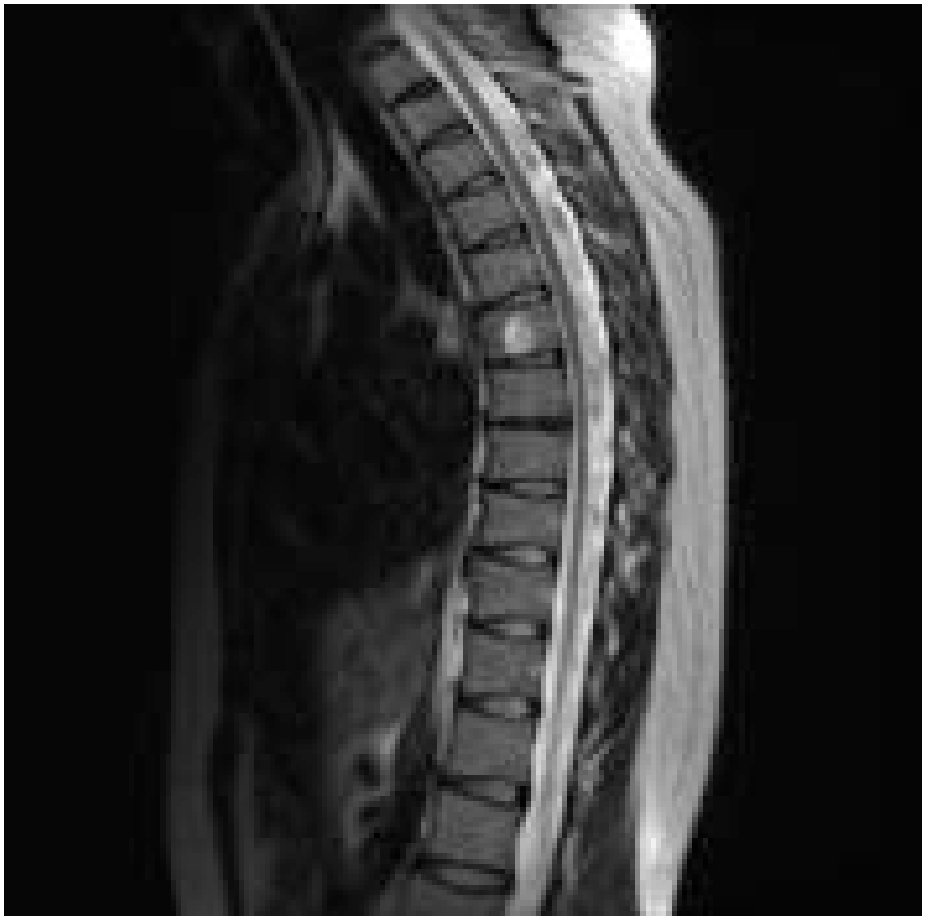



6

- **BONE MARROW ABNORMALITY WITHOUT DISC ABNORMALITY AND WITHOUT VERTEBRAL BODY FRACTURE**

- DIFFUSE HYPOINTENSITIES T1- AND INCREASE IN INTENSITY T2-
- MULTIPLE MYELOMA, LYMPHOMA, EVEN DIFFUSE METASTATIC
- HEMATOPOIETIC HYPERPLASIA (ANEMIA, GAUCHER'S, AND MYELOFIBROSIS

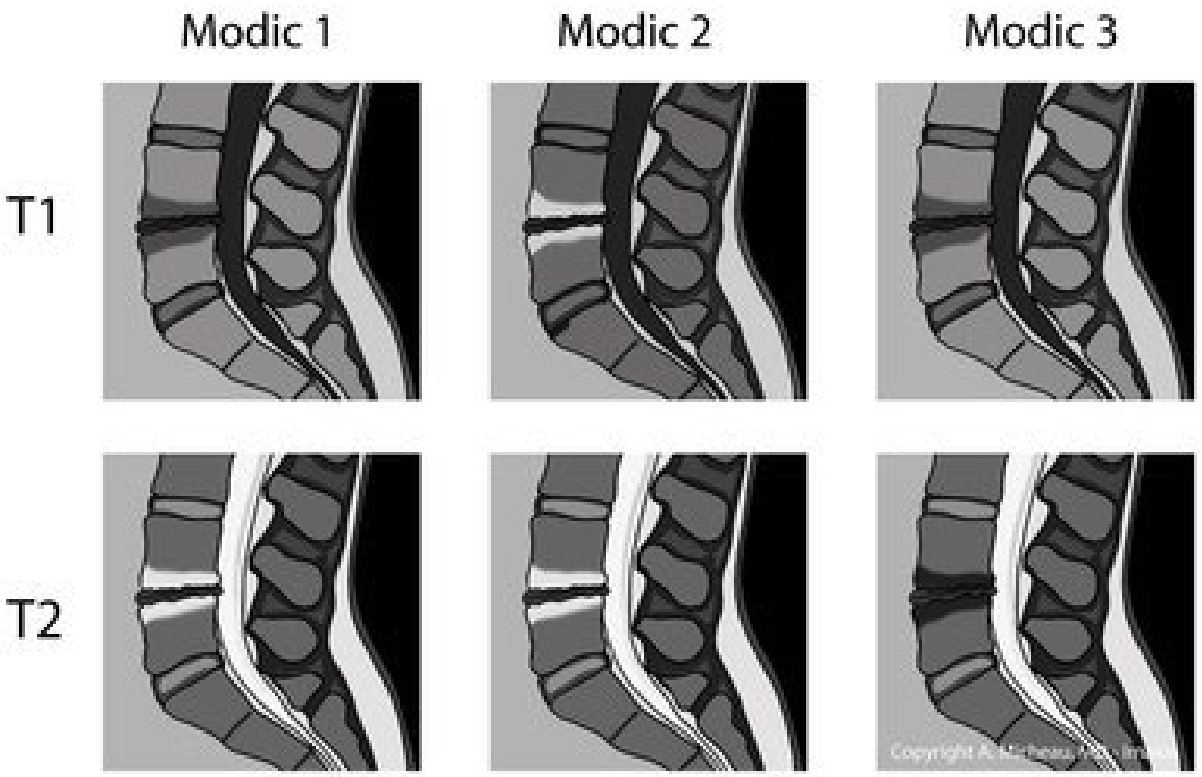
- **BONE MARROW ABNORMALITY WITHOUT DISC ABNORMALITY AND WITHOUT VERTEBRAL BODY FRACTURE**
- HYPERINTENSE CHANGE ON T1- WEIGHTED IMAGES WITHOUT DISC INVOLVEMENT ARE USUALLY BENIGN
- FOCAL: HEMANGIOMA, FATTY CHANGE OR LIPOMA
- DIFFUSE: RADIATION THERAPY

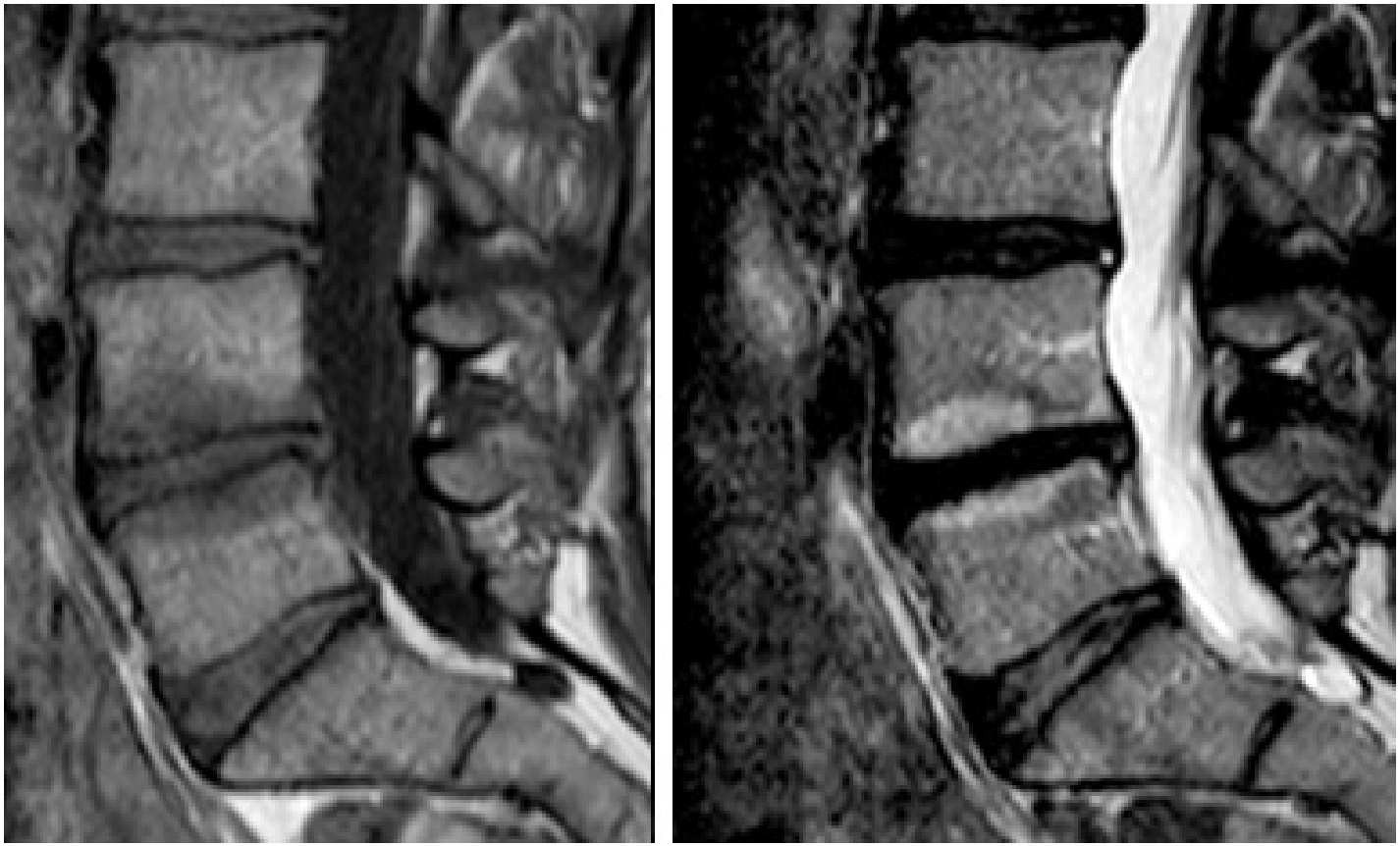


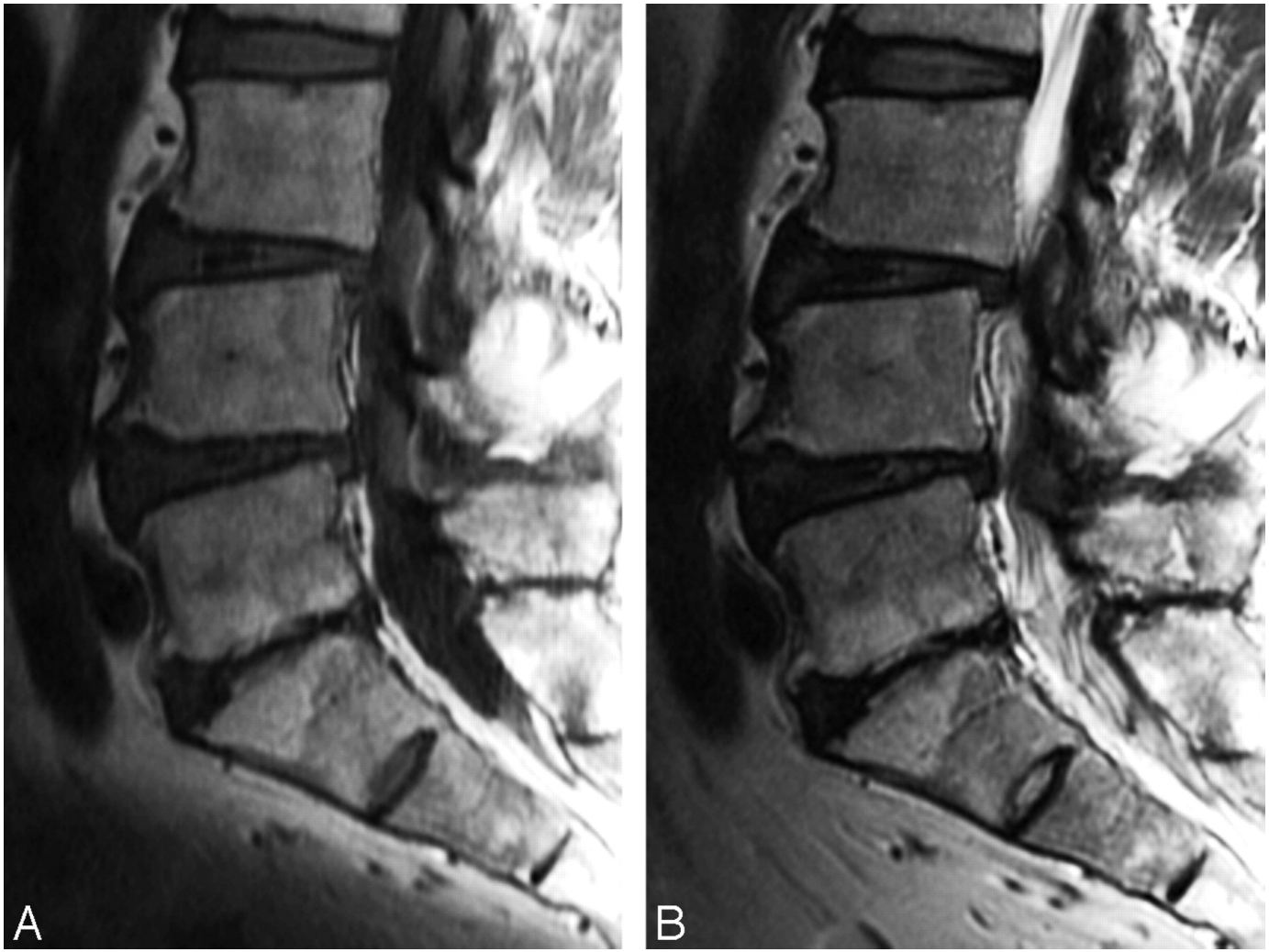
- **BONE MARROW ABNORMALITY WITH DISC INVOLVEMENT**
- ABNORMAL CONFIGURATION OR LOSS OF DISC HEIGHT
- SPONDYLODISCITIS VS DEGENERATIVE CHANGE (MODIC)

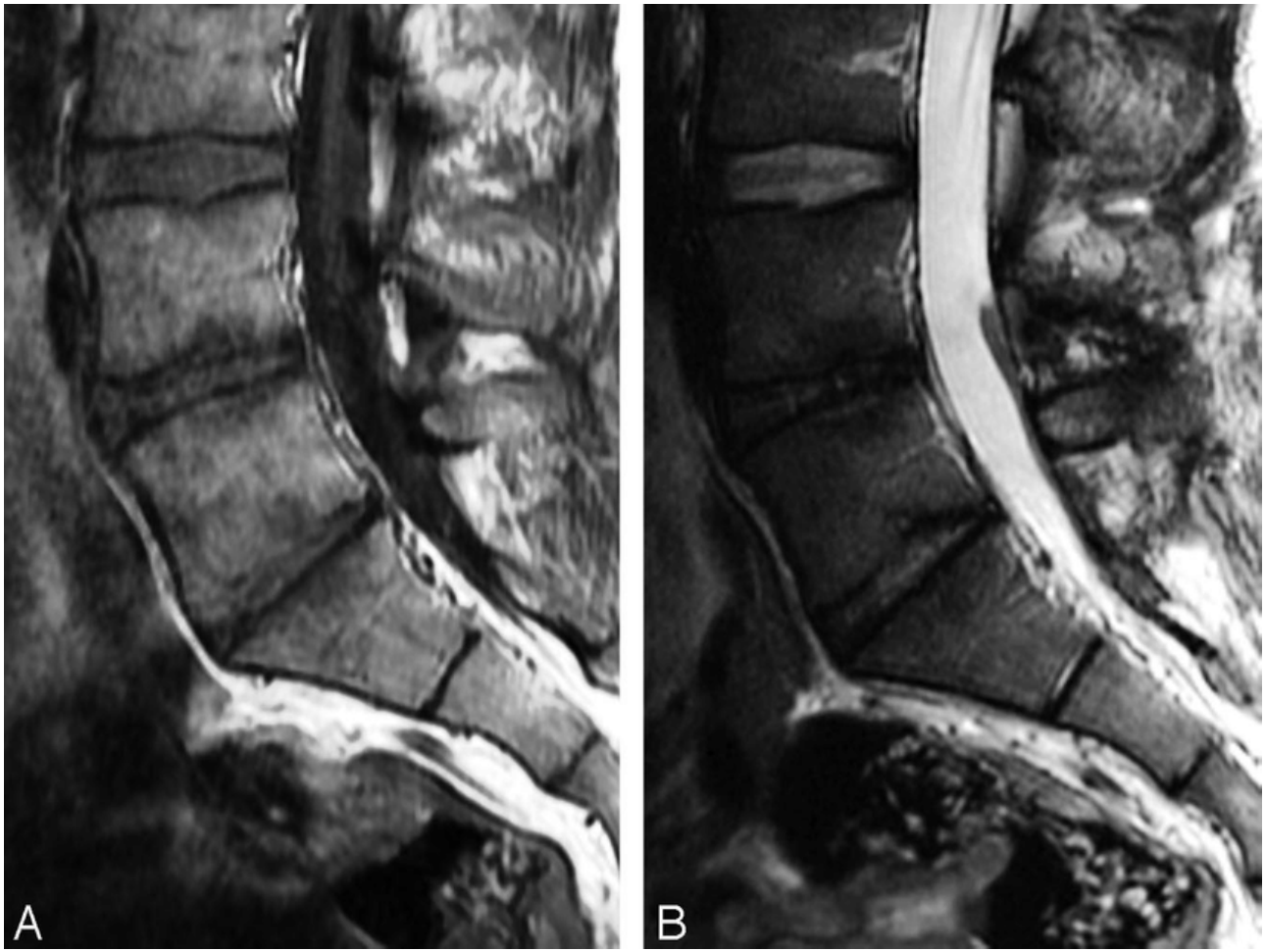
- **BONE MARROW ABNORMALITY WITH DISC INVOLVEMENT**
- **MODIC CHANGE**
- CLOSELY RELATED TO NORMAL DEGENERATIVE PROCESS.
- TYPE 1 CHANGE: HYPOINTENSE T1 AND HYPERINTENSE T2
- TYPE 2 CHANGE: HYPERINTENSE T1 AND ISO- OR HYPERINTENSE T2
- TYPE 3 CHANGE: HYPOINTENSE T1 AND T2, SUBCHONDRAL SCLEROSIS

Modic changes






A
B


A
B

- **BONE MARROW ABNORMALITY WITH DISC INVOLVEMENT**
- **MODIC CHANGE**
- MODIC CHANGES IN THE LUMBAR SPINE VARIES BETWEEN 19% AND 59%
- TYPE 1 AND 2 MOST COMMON
- TYPE 3 AND MIXED ARE RARE

- **BONE MARROW ABNORMALITY WITH DISC INVOLVEMENT**
- **MODIC CHANGE**
- MODIC STUDY TYPE 2 ARE MOST FREQUENT AND MAY ACCOUNT FOR UP TO 90% OF CHANGE
- MOST COMMON AT L4-L5 AND L5-S1
- SEEN IN INCREASEING AGE
- USUALLY OCCUR ADJACENT TO DEGENERATIVE OR HERNIATED DISCS

- **BONE MARROW ABNORMALITY WITH DISC INVOLVEMENT**
- **MODIC CHANGE**
- TYPE 1 INFLAMMATORY STAGE OF DISC DISEASE INDICATIVE OF ONGOING PROCESS
- TYPE 2 STABLE AND MORE CHRONIC PROCESS
- TYPE 3 SCLEROTIC STAGE OF DISC DISEASE

- **BONE MARROW ABNORMALITY WITH DISC INVOLVEMENT**
- SPONDYLODISCITIS
- LOW SIGNAL T1 AND HIGH SIGNAL T2
- DISC SIGNAL INTENSITY IS INCREASED
- ENDPLATES ERODED OR DESTROYED
- PARASPINAL AND EPIDURAL INFLAMMATION
- ESR AND CRP

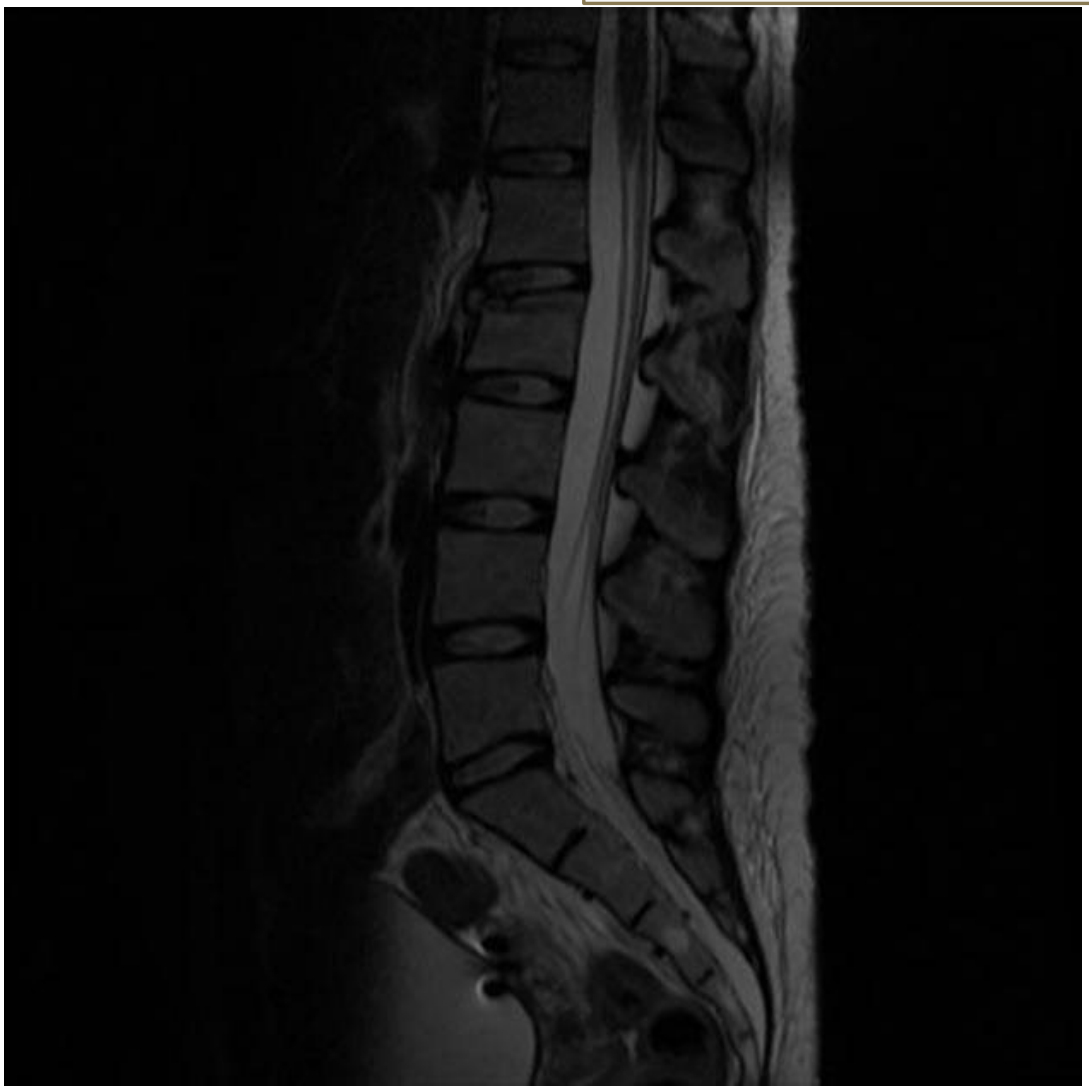
- **VERTEBRAL BODY FRACTURE**
- WITH COMPRESSION NEED TO DIFFERENTIATE BETWEEN BENIGN AND MALIGNANT
- SIGNAL CHANGE CAN INDICATE THE DIFFERENTIAL DIAGNOSIS

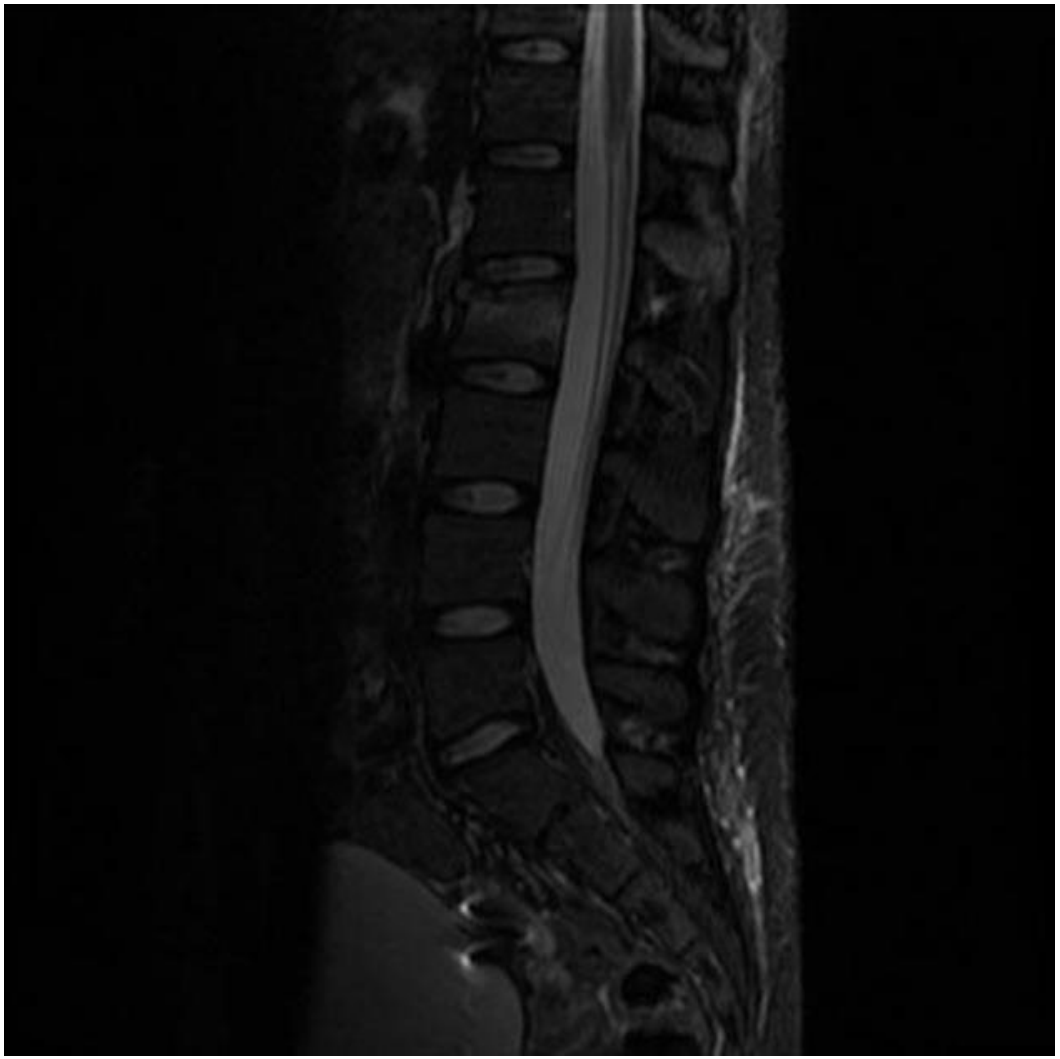
- **VERTEBRAL BODY FRACTURE**
- COMPLETE REPLACEMENT OF NORMAL MARROW WITH DIFFUSE HYPOINTENSITY ON T1 MALIGNANT SHOULD BE A STRONG CONSIDERATION
- SPINAL PROCESS INVOLVEMENT AND NO MAJOR TRAUMA HELP WITH COMFIRMATION

- **VERTEBRAL BODY FRACTURE**
- INCOMPLETE REPLACEMENT RANDOM SIGNAL WITH VERTEBRAL BODY IRREGULAR SHAPE

- **VERTEBRAL BODY FRACTURE**
- BENIGN FRACTURES HYPOINTENSE AREAS WITH HYPERINTENSE T2 IMAGES
- ALIGNMENT PARALLEL FRACTURE LINE

- OLDER FRACTURES DO NOT SHOW SIGNAL ABNORMALITIES





- PATIENT PRESENTS WITH LOW BACK PAIN


H
MRI L-SPINE W/O DX:LOWER BACK PAIN
256*256
MR
0
20
40
60
A
80
100
120
140
P
4.35 : 1
wav 1.27 : 1
100%
F
8/15
Z T2 DEQ FSE SAG


H
MRI L-SPINE W/O DX:LOWER BACK PAIN
256*256
MR
0
20
40
60
A
80
P
100
120
140
4.35 : 1
wav 1.32 : 1
100%
F
7/15
Z T1 FSE SAG

- Patient presents with low back pain


H
MRI LUMBAR SPINE WITHOUT CONTRAST
256*256
MR
0
20
40
60
80
100
120
A
P
4.35 : 1
wav 1.25 : 1
100%
F
9/13
T2 FSE DQ SAG


StudyDate 02/21/2018
MR, Lumbar Spine s/ Contrast
512*512
MRI
H
A
P
F
2.17 : 1
wav 1.90 : 1
100%
6/14
FL06/SAG T1 SE

- Patient presents with low back pain


MRI LUMBAR SPINE WITHOUT CONTRAST
256*256
MR
H
F
A
P
0
20
40
60
80
100
120
140
4.35 : 1
wav 1.25 : 1
100%
6/11
FSE T2 Sag


H
MRI LUMBAR SPINE WITHOUT CONTRAST
256*256
MR
0
20
40
60
80
100
120
140
A
P
F
4.35 : 1
wav 1.42 : 1
100%
6/11
SE T1 Sag


H
MRI LUMBAR SPINE WITHOUT CONTRAST
256*256
MR
0
20
40
60
A
80
P
100
120
140
4.35 : 1
wav 1.23 : 1
100%
F
10/13
Z STIR SAG

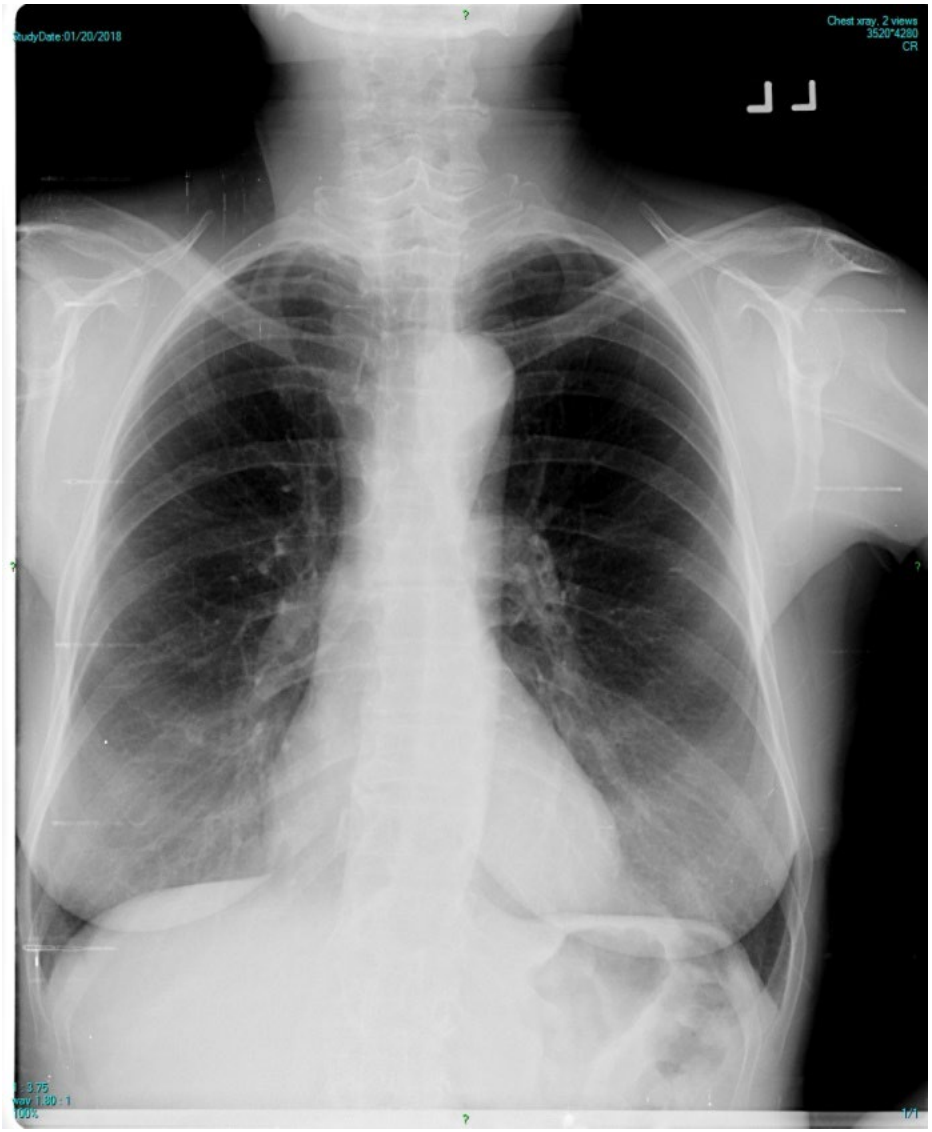
- Patient presents with 6 mos low back pain and 12 weeks of PT


1.5T RADMRI
Ex: 0
SAG T1 FS POST
C: 9ML MULTIHANCE
Se: 4/2
Im: 8/18
Sag: L12.7 (COI)
Mag: 1.0x
A
ET: 3
TR: 444.0
TE: 10.3
HNS CTL456
4.0thk/0.4sp
Id:DCM / Lin:DCM / Id:ID
W:1544 L:772
H
R
DCR-RADNOR
[redacted]
Mar 01 1940 F 1001339201
Acc: 30307087
2018 Aug 22
Acq Tm: 14:57:37
320 x 224
P
F
L
DFOV: 26.0 x 26.0cm

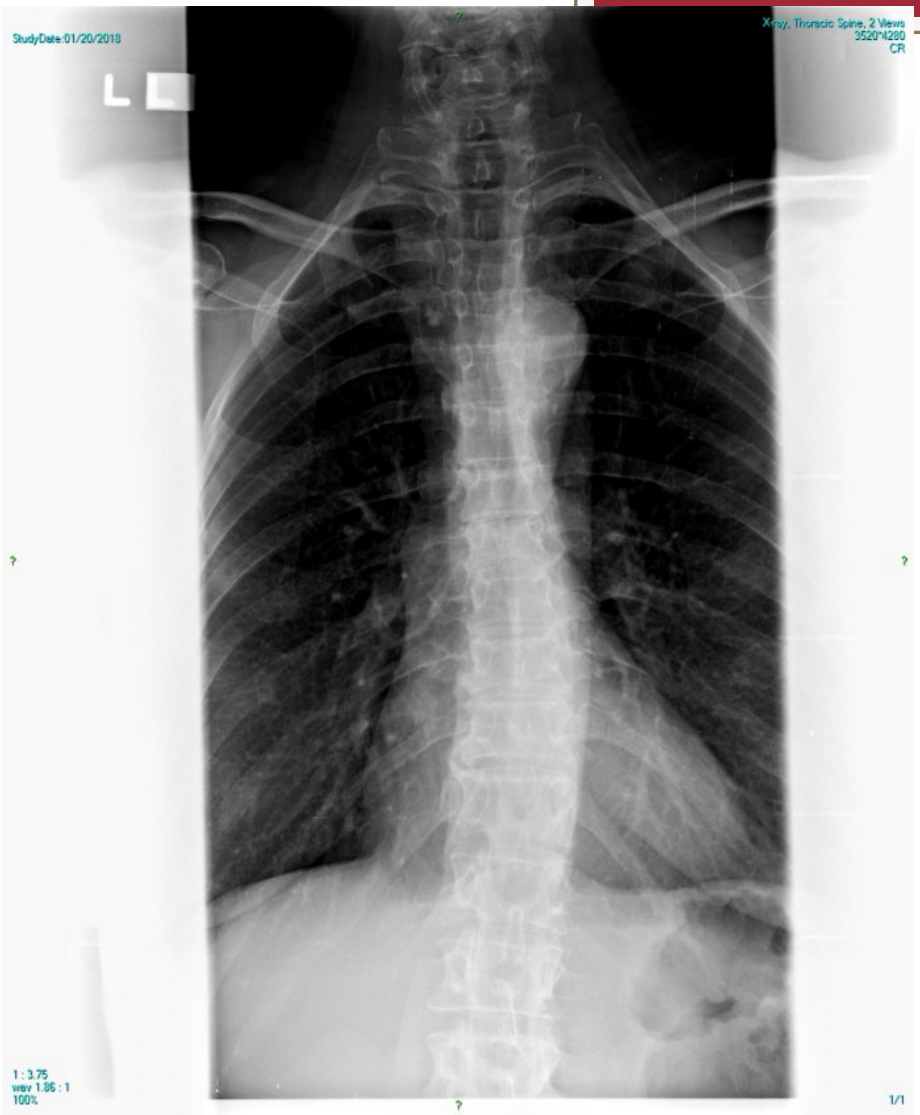

1.5T DCR_VF_MR
Ex: 0
Sag T1
C:
Se: 3/12
Im: 8/16
Sag: L5.8 (COI)
Mag: 1.0x
A
ET: 4
TR: 526.0
TE: 20.5
HNS CTL456
4.0thk/1.0sp
Id:DCM / Lin:DCM / Id:ID
W:987 L:493
DCR-VF
Mar 01 1940 F 1001339201
Acc: 30273249
2018 Aug 07
Acq Tm: 10:00:34
416 x 224
P
DFOV: 25.0 x 25.0cm


1.5T DCR_VF_MR
Ex: 0
Sag T2
C:
Se: 4/12
Im: 7/16
Sag: L11.2 (COI)
Mag: 1.0x
A
ET: 21
TR: 3895.0
TE: 100.6
HNS CTL456
4.0thk/1.0sp
Id:DCM / Lin:DCM / Id:ID
W:913 L:456
DCR-VF
Mar 01 1940 F 1001339201
Acc: 30273249
2018 Aug 07
Acq Tm: 10:03:04
416 x 224
P
DFOV: 26.0 x 26.0cm

- Mid back pain with shortness of breath


StudyDate:01/20/2018
Chest xray, 2 views
3520*4280
CR


StudyDate:01/20/2018
Chest xray, 2 views
1 : 3.75
wav 2.10 : 1
100%


Study Date: 01/20/2018
X-ray, Thoracic Spine, 2 Views
3520*4280
CR
L
1 : 3.75
wav 1.86 : 1
100%
1/1

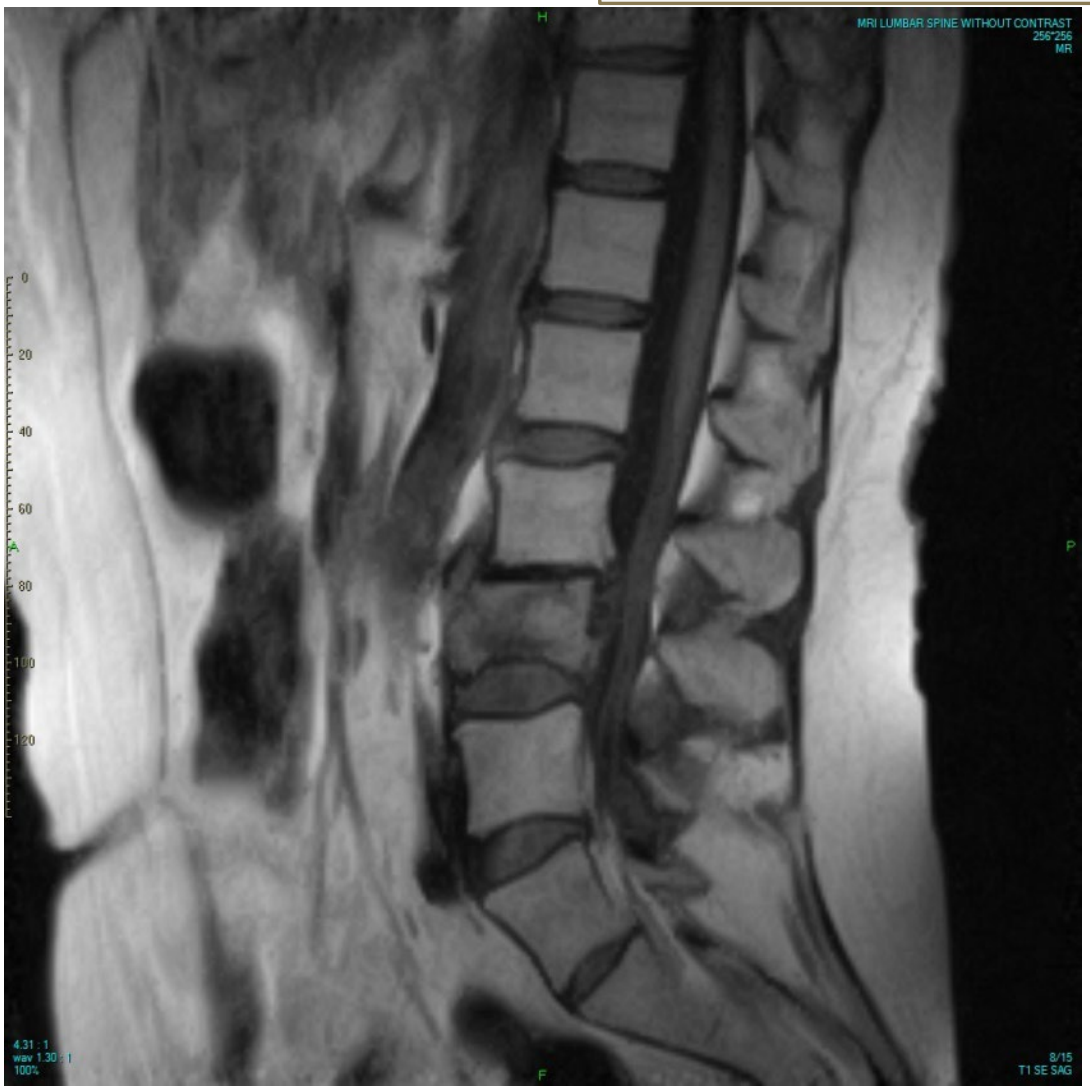

StudyDate:01/20/2018
L L


H
StudyDate:01/27/2018
MRI, Thoracic Spine s/ Contrast
256*256
MRI
A
P
4.38 : 1
wav 1.44 : 1
100%
F
7/13
T1 SAG


H
StudyDate:01/27/2018
MRI, Thoracic Spine s/ Contrast
256*256
MRI
A
P
4.38 : 1
wav 1.41 : 1
100%
F
7/13
T2 DEQ SAG


H
StudyDate:01/27/2018
MRI, Thoracic Spine s/ Contrast
256*256
MRI
A
P
4.38 : 1
wav 1.37 : 1
100%
F
8/13
FIR DE SAG

- Patient has low back pain after work injury


H
MRI LUMBAR SPINE WITHOUT CONTRAST
256*256
MR
0
20
40
60
A
80
100
120
P
4.31 : 1
wav 1.30 : 1
100%
F
8/15
T1 SE SAG

- 1. Bone marrow change can show manifestations of systemic disease.
- 2. T1 weighted images are the most sensitive images for abnormal signal.
- 3. Common Sclerotic mets – breast and prostate
- 4. Focal lesions of mets are smooth bordered

- 5. Modic I is during the inflammatory stage of the degenerative disc process.
- 6. MRI can help differentiate chronic versus acute/subacute compression fractures.