

The role of imaging in Inflammatory arthritis

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Inflammatory arthropathies - main types:

- Rheumatoid Arthritis
- Spondyloarthritis
- Crystal deposition disease
 - gout,
 - pseudogout
 - others

Spondyloarthritis (SpA)

- chronic, inflammatory rheumatic disease
- mainly affects spine
- peripheral joints: asymmetrical oligoarthritis
- extraskeletal involvement (skin, eyes, mucosae, heart)
- rheumatoid factor is not present (seronegative)
- inflammatory back pain
- HLA B 27

Spondyloarthritis (Seronegative arthritis)

- Ankylosing spondylitis
- Reactive arthritis
- Psoriatic arthritis
- Enteropathic arthritis
- Juvenile spondyloarthritis
- Undifferentiated SpA

Spondyloarthritis

AXIAL SpA

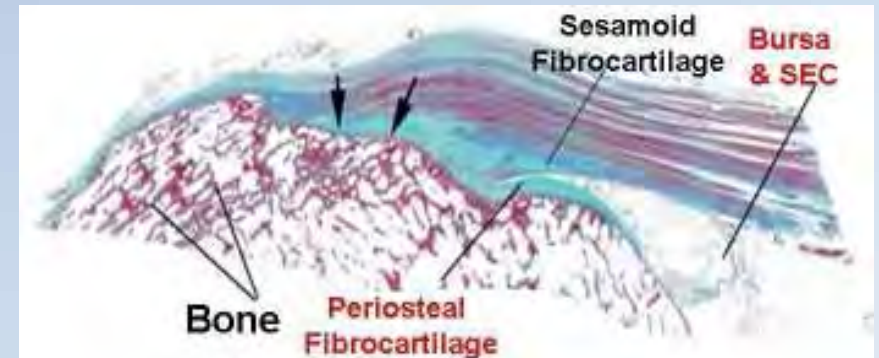
- affects sacroiliac joints: sacroiliitis
- spine: spondylitis

PERIPHERAL SpA

- peripheral enthesitis
- peripheral arthritis: asymmetric oligoarthritis of peripheral joints

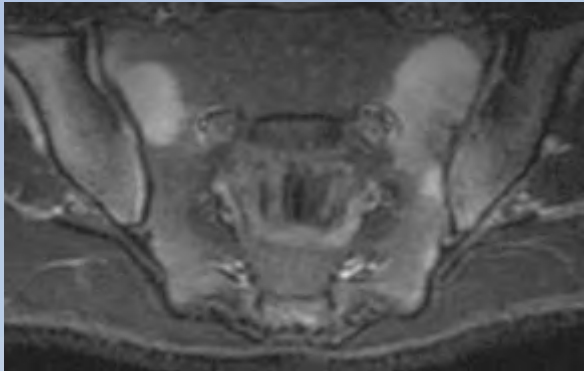
SpA - PATHOANATOMIC & RADIOLOGIC CHARACTERISTICS

- **enthesitis** - hallmark of SpA
- fibrocartilaginous joints - predilection
- productive changes - pronounced ("plus" arthritis, bony ankyloses)
- destructive & productive changes - simultaneously
- synovial joint - less pronounced inflammation

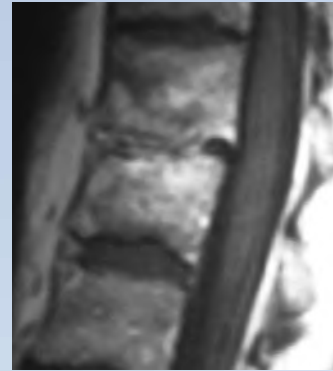


ENTHESIS - site, where lig, tendons, fascias, joint capsule attaches to bone

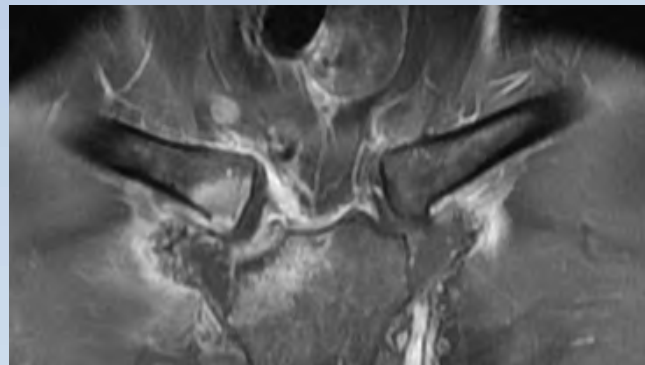
Fibrocartilaginous joints -predilection



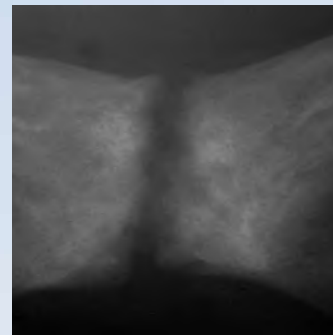
Sacroiliac joint



Intervertebral disc

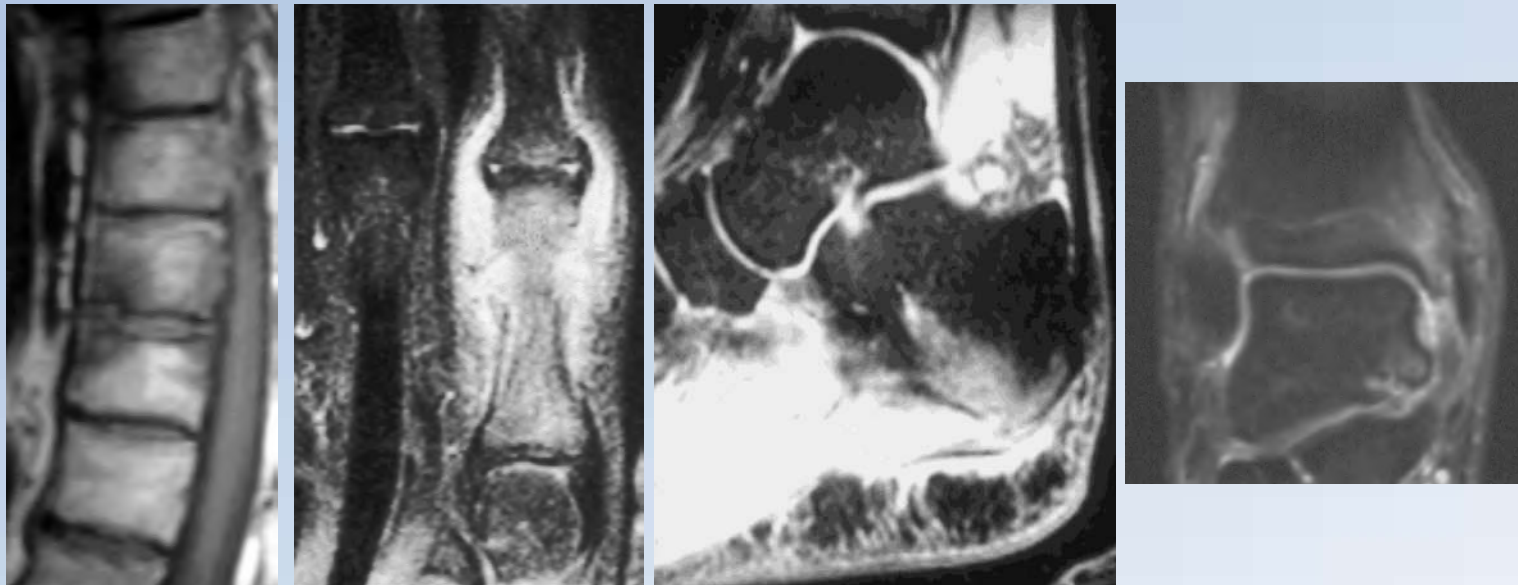


Sternoclavicular joint



Symphysis pubis

ENTHESITIS - HALLMARK OF SpA



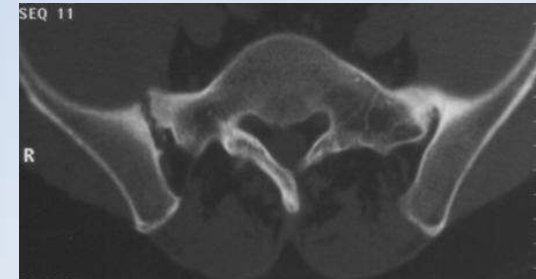
SpA - the radiologic hallmark: **SACROILIITIS**

- bilateral symmetric (**AS -99%**, EA - 15-20%)
- asymmetric or unilateral (PA - 20-30%, ReA - 20-40%)
- unilateral (infectious)



SAKROILIITIS - Imaging modalities

- radiography (Rtg)
- magnetic resonance imaging (MRI)
- computed tomography (CT)



RADIOGRAPHY - Plain film

ADVANTAGES

- simple
- available
- high specificity

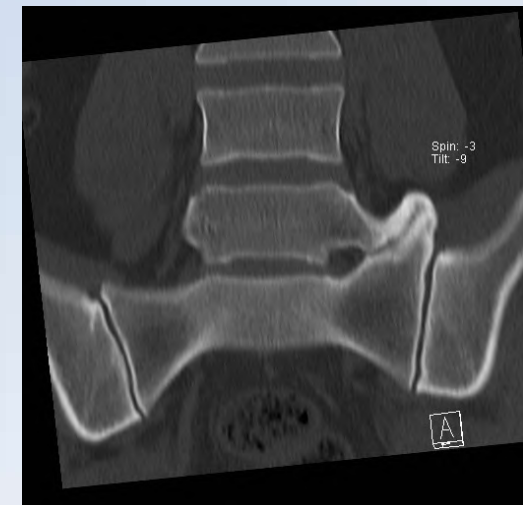
DISADVANTAGES

- low sensitivity
- radiation



SACROILIITIS - RADIOGRAPHY

- initial exam: Plain film SIJ
 - insensitive for early changes
 - baseline
 - to rule out other pathology
 - anatomic variants
-
- follow up
 - chronic structural damage lesions



COMPUTED TOMOGRAPHY - CT

ADVANTAGES

- simple
- available
- high specificity
- high sensitivity

DISADVANTAGES

- radiation

NOT ROUTINELY - RADIATION

- specific cases (early erosions can be better seen as on MRI)
- complications (trauma)

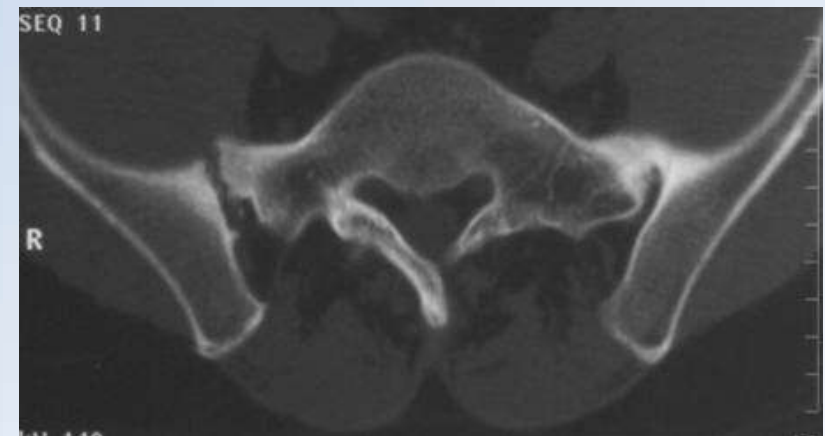
SACROILIITIS - RADIOGRAPHIC & CT SKELETAL CHANGES

DESTRUCTIVE SIGNS

- erosions
- widening of joint space

REPARATIVE SIGNS

- perifocal sklerosis
- narrowing
- bony bridging , ankylosis



SACROILIITIS - RADIOGRAPHY



Normal SI joint



Sacroiliitis L - Stage I.



Sacroiliitis L+R Stage II - III

SACROILIITIS - Radiography



Sacroiliitis Stage III

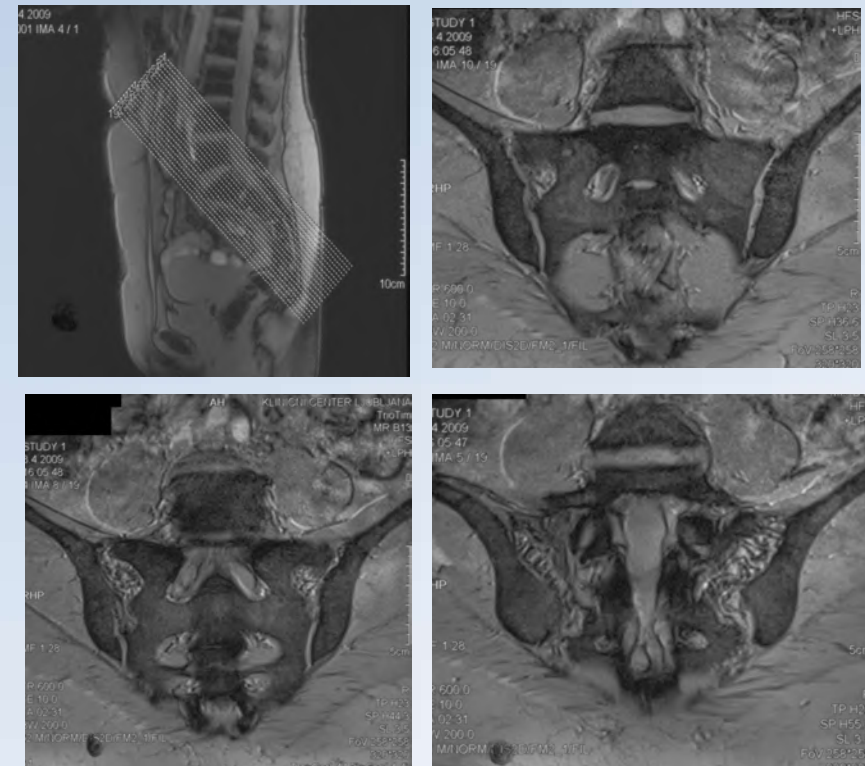


Sacroiliitis Stage IV - ankylosis of SIJs

SACROILIITIS - MRI

- excellent anatomic presentation
- no radiation
- high contrast resolution
- high sensitivity
- low specificity
- reflects inflammatory activity

(SIJ – bicompartmental anatomy)



MRI of sacroiliac joints – imaging protocol:

SEQUENCES

- **STIR or T2 FS** - bone marrow edema
- **T1** - structural damage and chronic lesions
- **T1 FS post Gad** – osteitis & other signs of active infl. (only in cases of doubt or high suspicion)
- **PD FS, (T2*)** - erosions

PLANES

- **Semicoronal**- along the long axis of the sacral bone
- **Semiaxial**- perpendicular to the former



MRI - METHOD OF CHOICE FOR EARLY DIAGNOSIS OF SACROILIITIS - DEMONSTRATION OF EARLY INFLAMMATORY PREDESTRUCTIVE CHANGES:

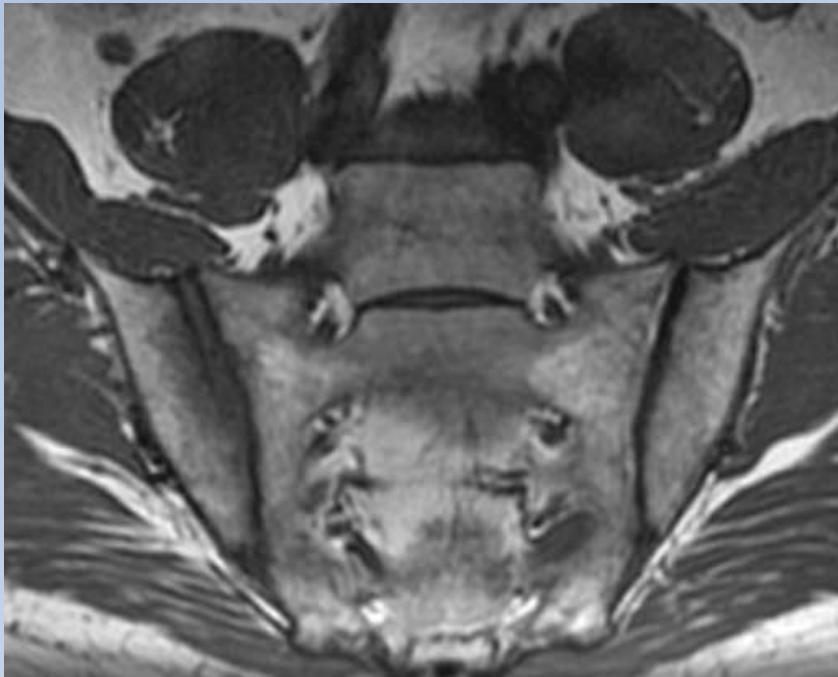
ACTIVE INFLAMMATORY LESIONS

- periarticular bone marrow changes - edema, osteitis
- synovitis, enthesitis, capsulitis

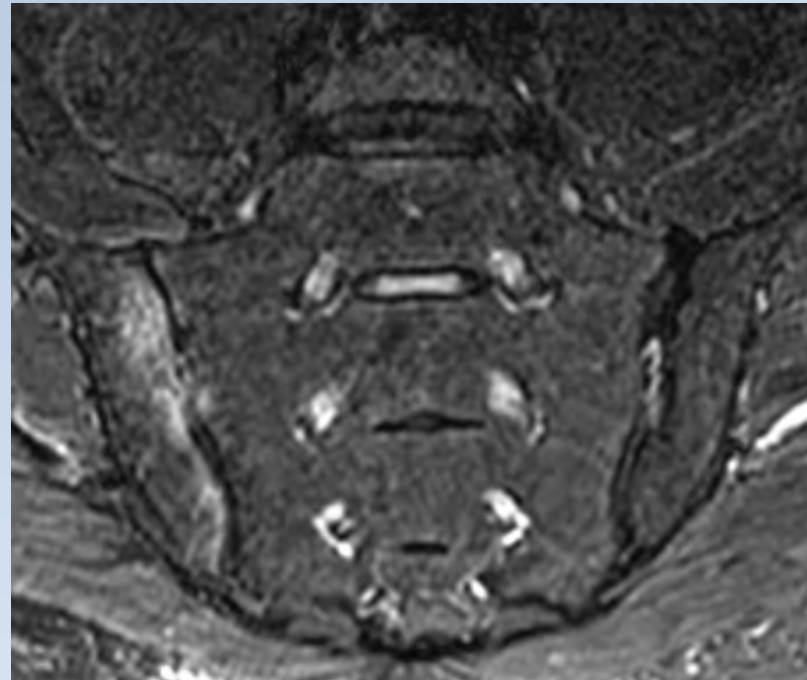
CHRONIC CHANGES - STRUCTURAL DAMAGE LESIONS:

- erosions, pseudodilatation
- sclerosis
- fat accumulation
- bone bridging, ankylosis

SACROILIITIS - MRI: periarticular bone marrow edema

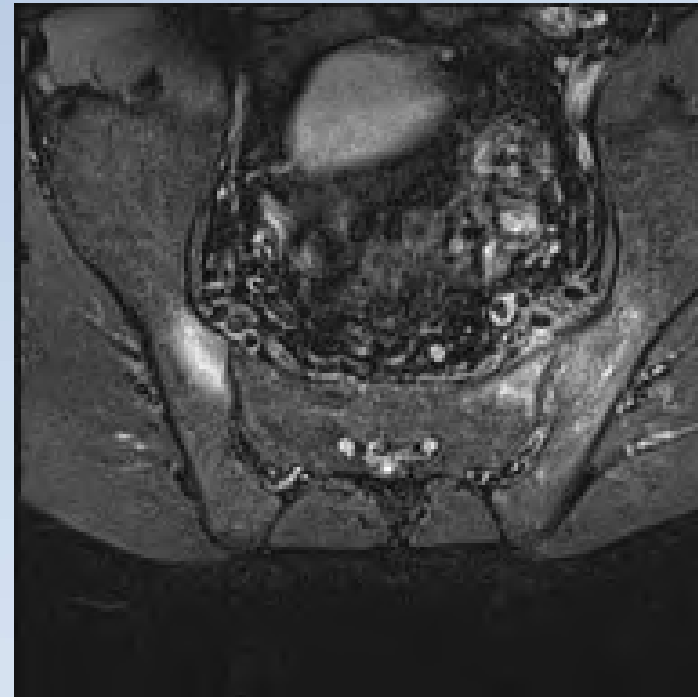


T1



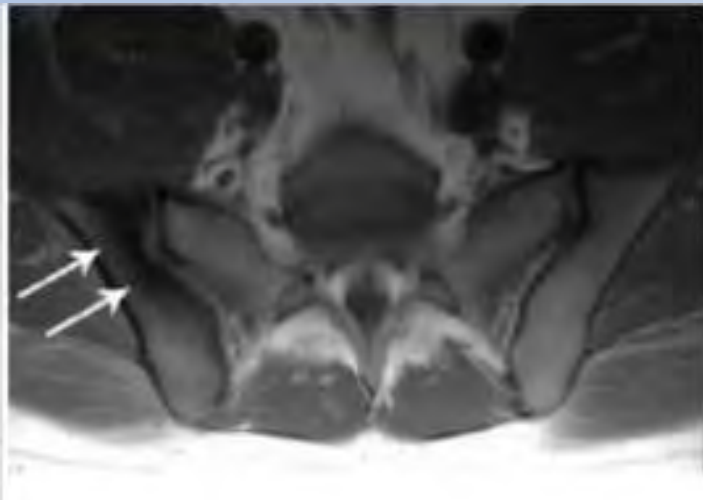
STIR

MRI SIJ – bilateral sacroiliitis (osteitis, synovitis, enthesitis)

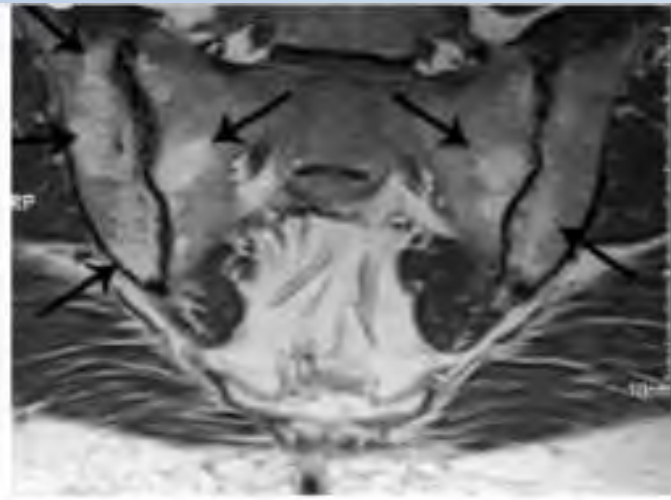


T1 FS post GAD - bilateral sacroiliitis

SACROILIITIS – MRI: structural damage lesions



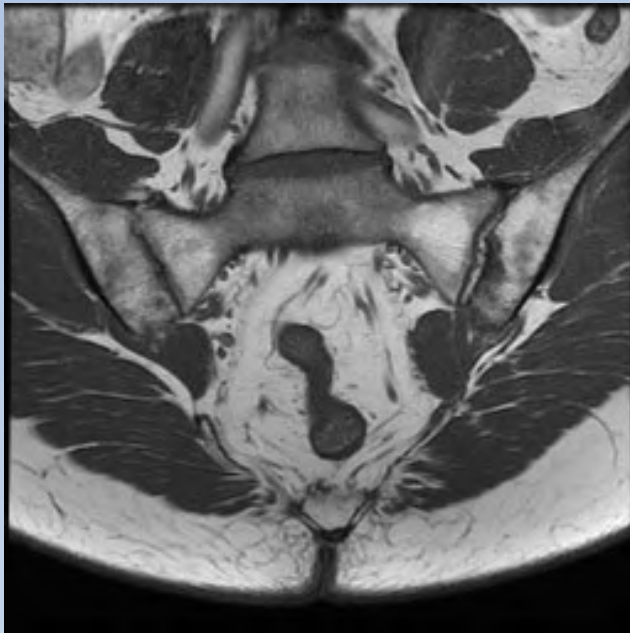
Subchondral sclerosis



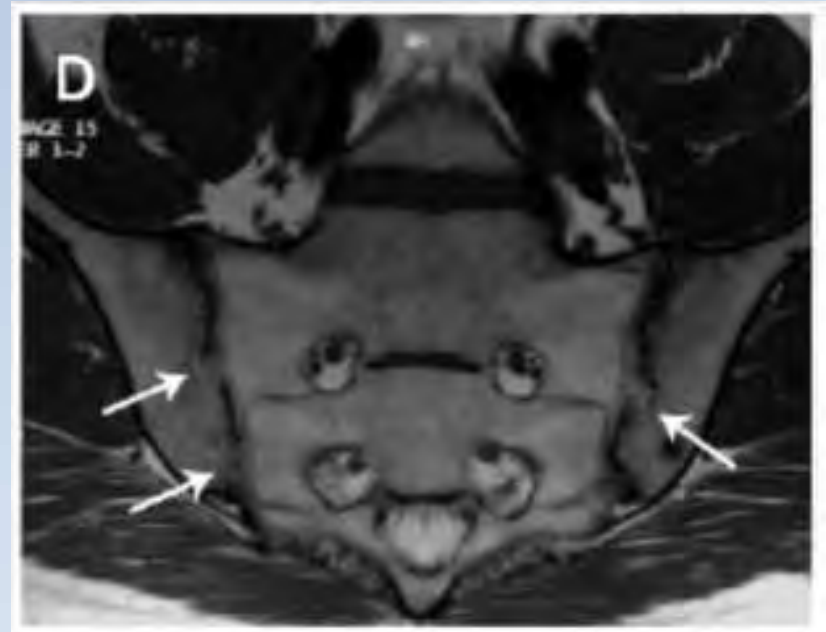
Fat accumulation, erosions

T1

SACROILIITIS – MRI: chronic damage lesions



Backfill



T1 SE ax, cor

Bony bridging

Spondyloarthritis - Active Inflammatory Lesions of the Spine

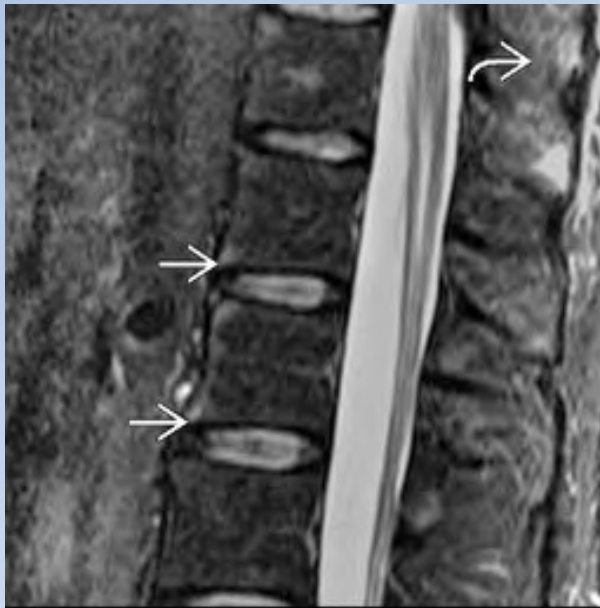
- **Spondylitis** - corner inflammatory lesion
- **Spondylodiscitis** - located within bone marrow at cortical plate adjacent to intervertebral disc, disc usually preserved
- **Arthritis of the facet, costovertebral and costotransversal joints** - associated with BME near joints
- **Enthesitis of spinal ligaments** - supraspinal lig, interspinal ligg, ligamenta flava

SPINAL INFLAMMATION -IMAGING MODALITIES

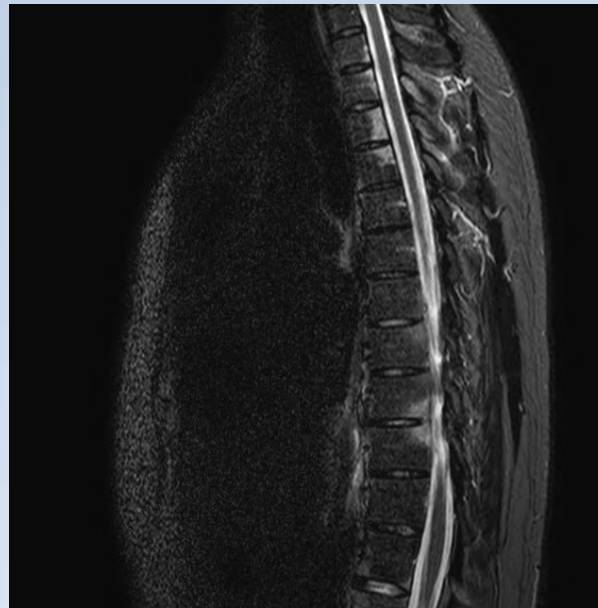
- RADIOGRAPHY
 - initial, baseline
 - follow up, chronic changes
- MRI
 - early changes, disease activity, monitoring -response to treatment
- CT
 - complications - unstable fractures of ankylosed spine, osteoporotic

SPINE MRI : Corner inflammatory lesion - SPONDYLITIS ANT & POST.

BONE MARROW EDEMA, OSTEITIS

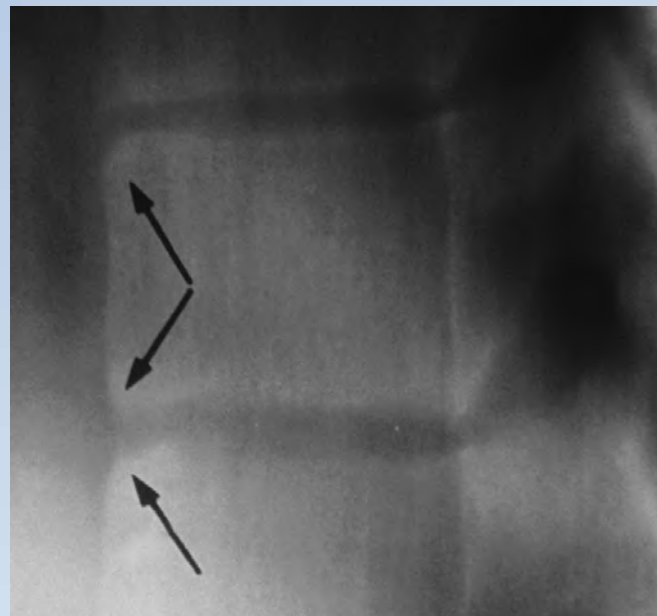
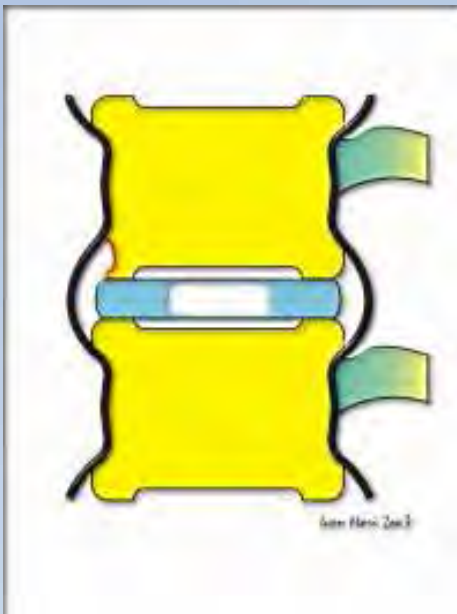


STIR

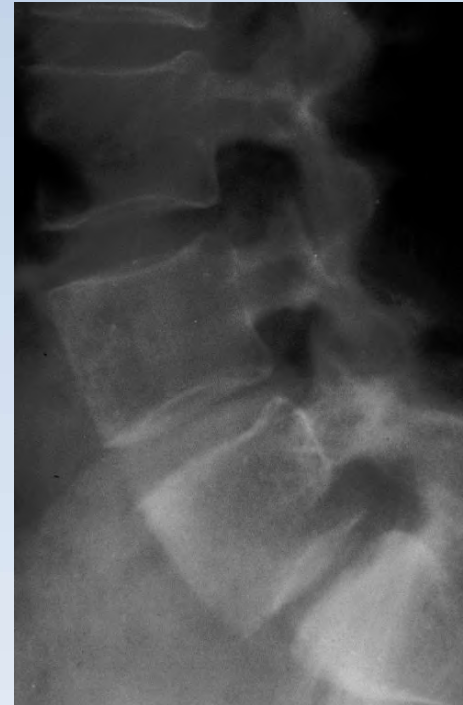
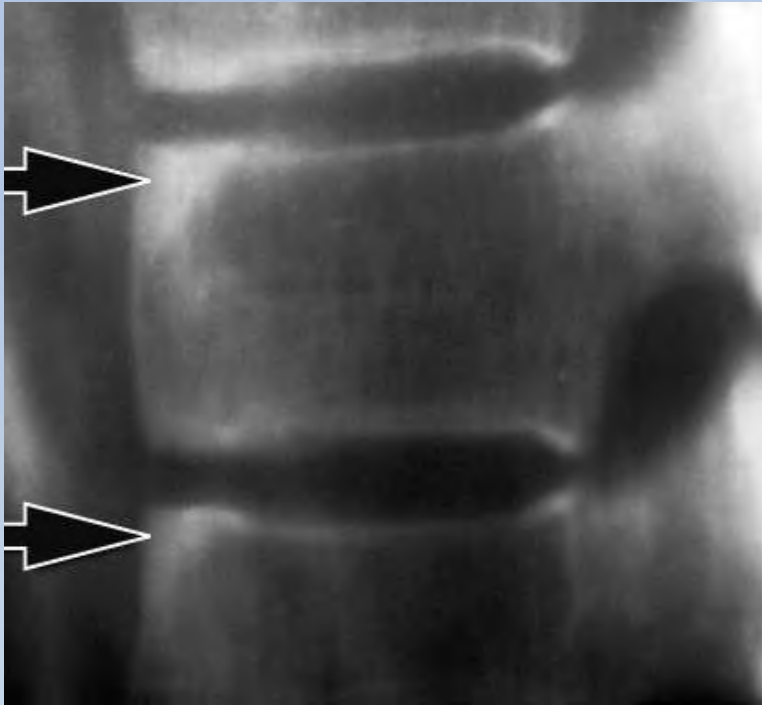


SPINAL INFLAMMATION

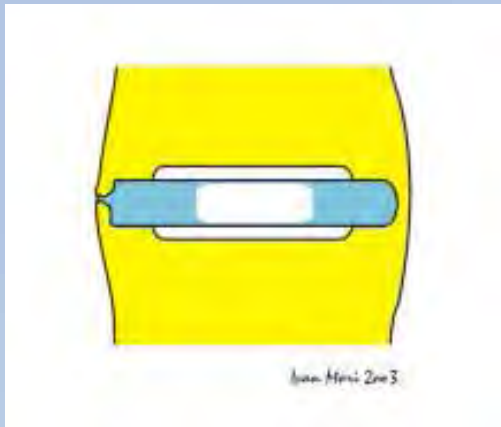
- SPONDYLITIS MARGINALIS (ANT. or POST.)



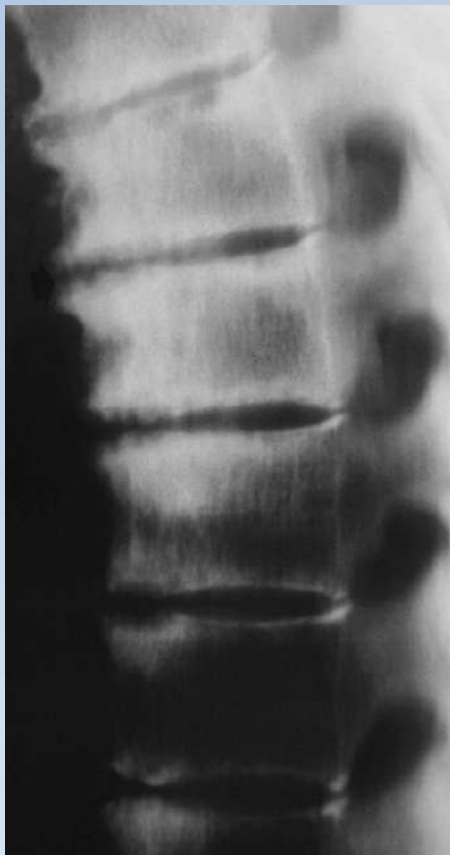
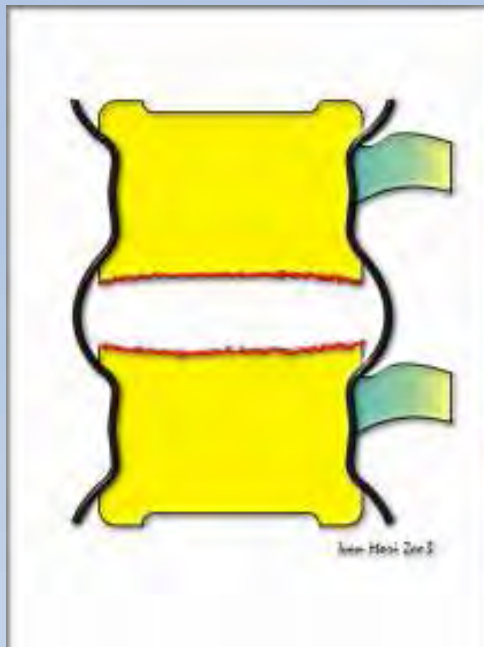
Spondylitis - shiny corners, squaring



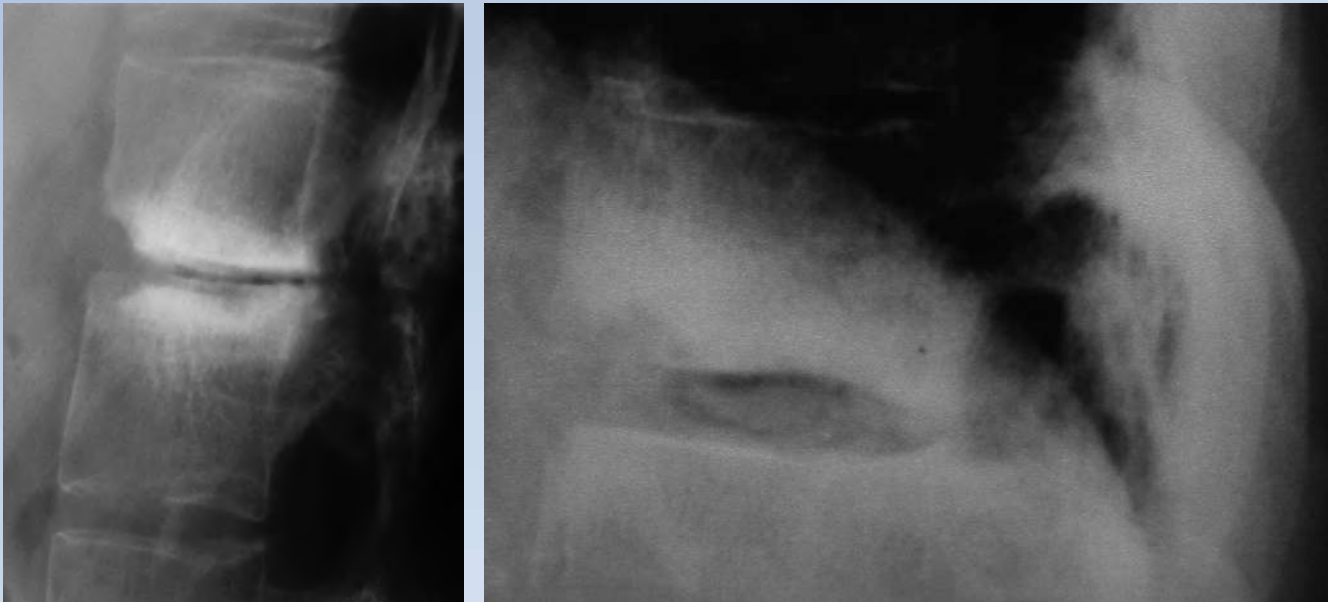
SPONDYLITIS - syndesmophytes, "bamboo spine"



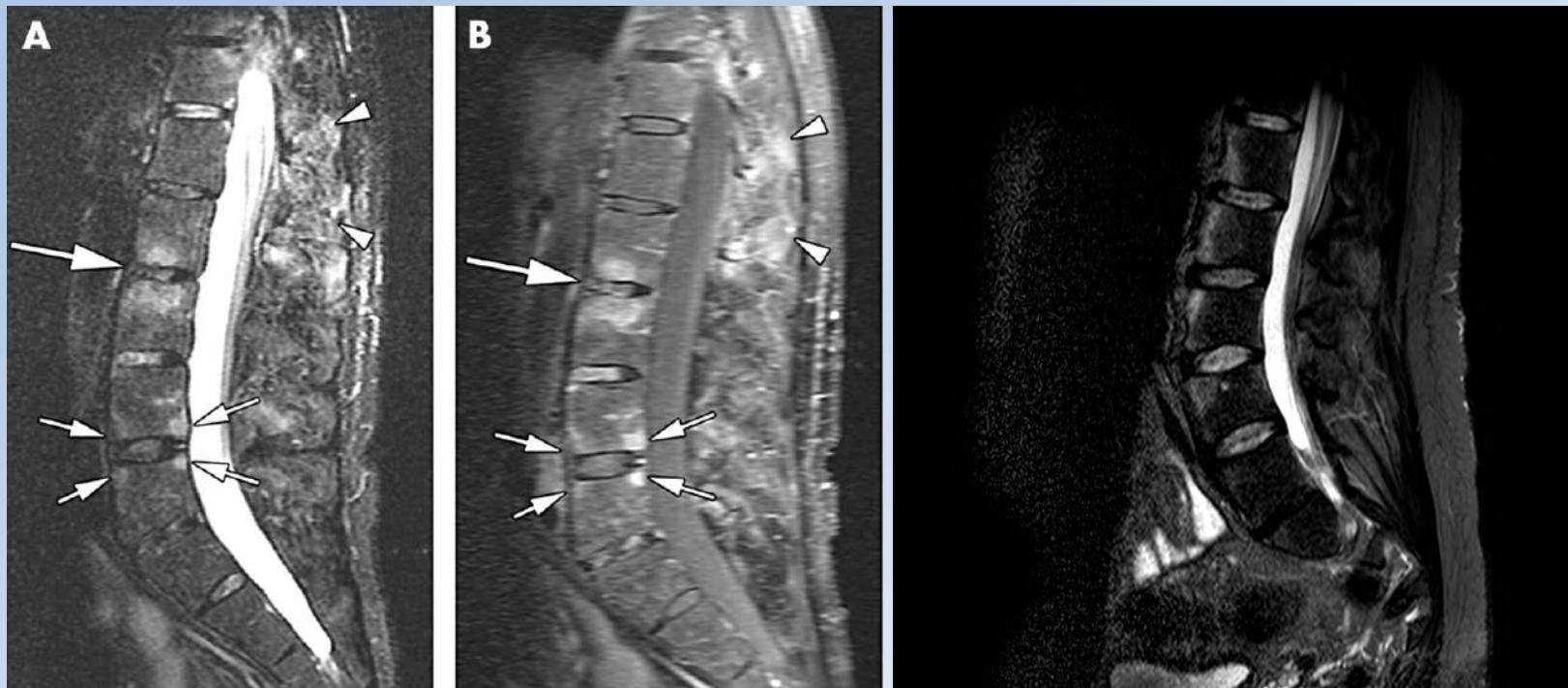
SpA - spondylodiscitis - inflammatory



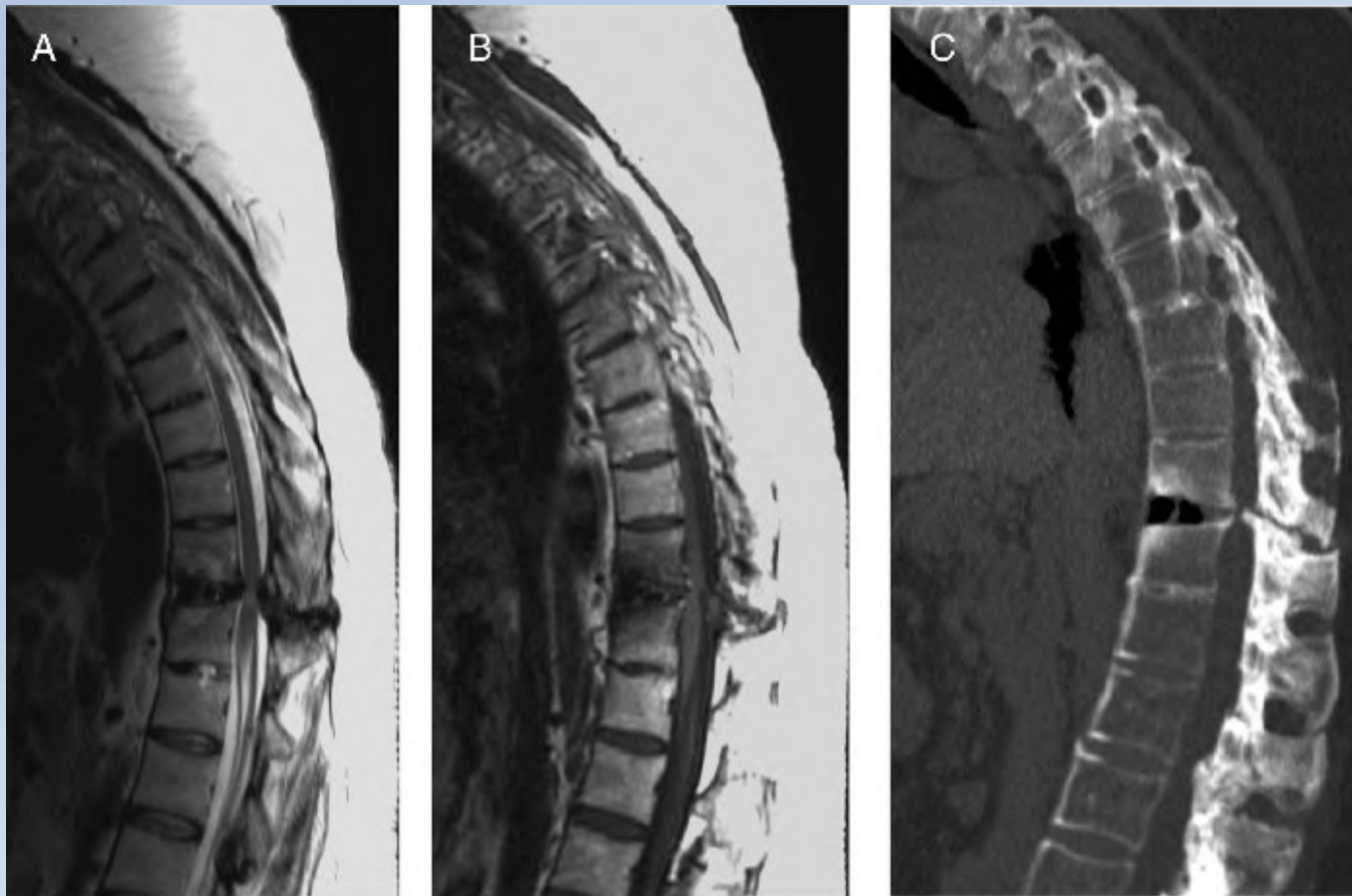
Noninflammatory Anderson Tip B lesion - PSEUDOARTHROSIS



Spine MRI – inflammatory spondylodiscitis, spondylitis, enthesitis



AS - transdiscal fracture, unstable



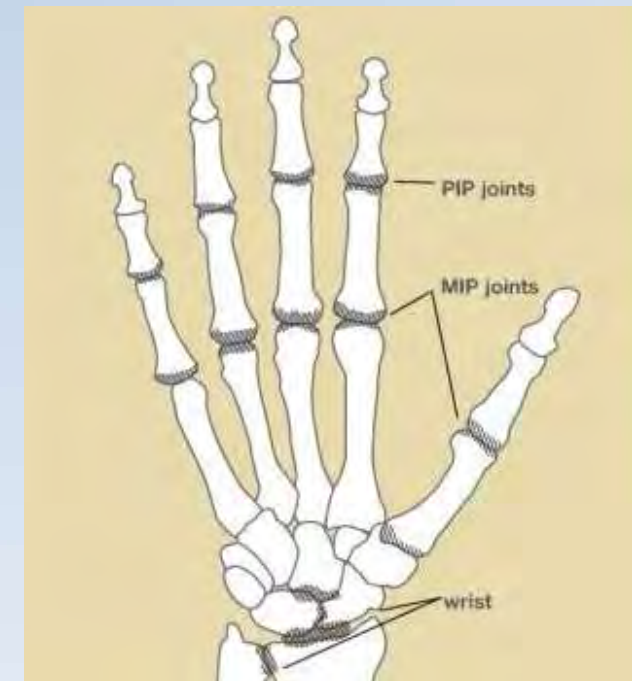
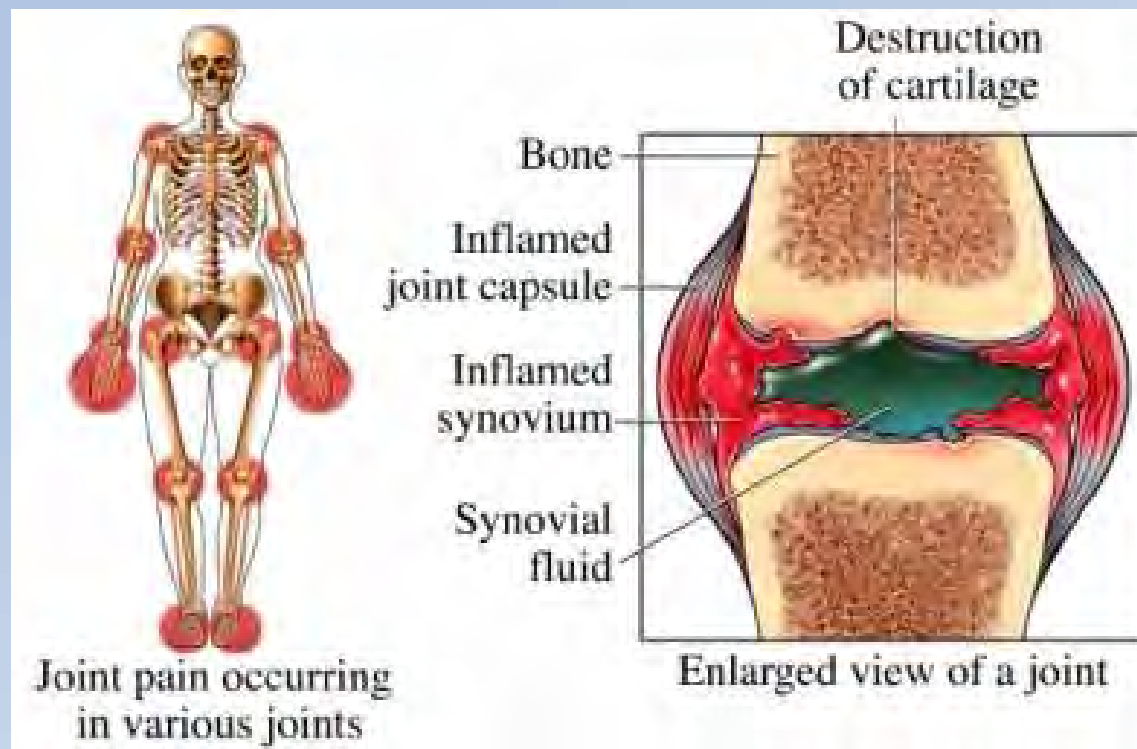
AXIAL SPONDYLOARTHRITIS - CONCLUSION

- **ENTHESITIS** - hallmark of SpA
- **FIBROCARTILAGINEOUS ARTICULATIONS** - SIJ, discovertebral joints
- **DESTRUCTIVE & PRODUCTIVE CHANGES** - "plus" arthritis
- **IMAGING MODALITIES**
 - **radiography** - baseline, follow up, chronic changes
 - **MRI** - early changes (bone marrow, soft tissue), reflects disease activity
 - **CT** - complications (fractures)

Rheumatoid arthritis - definition

- chronic, inflammatory, autoimmune, systemic disease
- etiology unknown
- mostly affects synovial joints - symmetric polyarthritis
- extraarticular manifestations in 20% - rheumatoid nodules, pulmonary fibrosis, renal amyloidosis, vasculitis, ocular, cardiac
- autoantibodies called Rheumatoid factor
- Pathoanatomic hallmark: **synovitis**

Rheumatoid arthritis - pathomorphology, distribution



RA - Imaging modalities

- radiography
- ultrasound
- magnetic resonance imaging (MRI)
- computed tomography (CT) - only as adjunct, not primary modality
- bone densitometry - evaluate drug induced osteoporosis
- (Whole body MRI)

RA - radiographic features: Plain Film

ADVANTAGES

- simple
- available
- high specificity

DISADVANTAGES

- low sensitivity
- radiation
- **mainstay of imaging and follow up in RA**

RA - Plain film



Normal



Rheumatoid arthritis

RA - radiographic features: Plain Film

- **soft tissue swelling** - combination of joint effusion, edema and tenosynovitis
- **osteoporosis** -initially juxta articular, later generalized
- **joint space narrowing** - symmetrical, concentric
- **marginal erosions** - 'bare areas'
- subcondral cysts
- joint malalignment
- joint destruction -
- bony ankylosis -wrist



RA - soft tissue swelling

Rheumatoid arthritis



Psoriatic arthritis



Gout



RA - hip joint: protrusio acetabuli



Normal



Protrusio acetabuli

RA & peripheral SpA : ULTRASOUND

ADVANTAGES

- noninvasive, quick scan time, no radiation
- real time dynamic examination, multiple joints, contralateral joints
- performed as an extension of clinical examination by rheumatologist
- disease activity

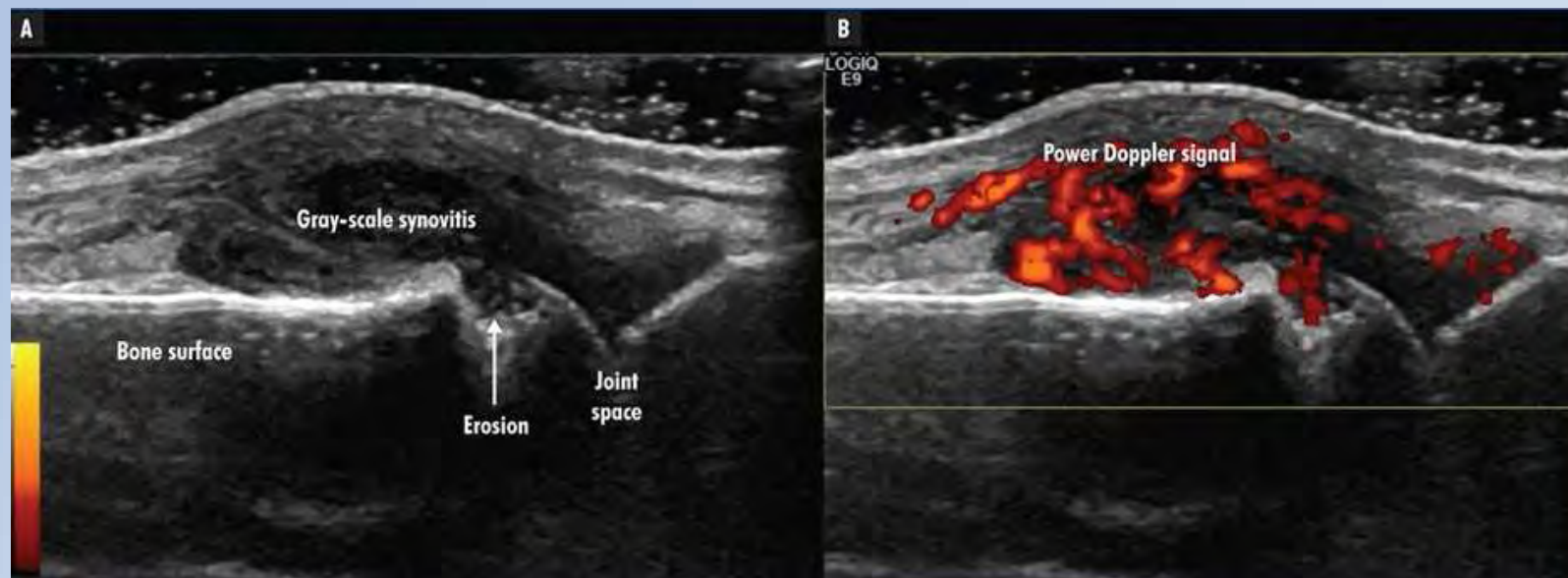
LIMITATIONS

- operator dependent
- deep structures, bone, joint space

RA - ULTRASOUND

- joint effusion
- synovial proliferation and hyperemia
- tenosynovitis (ECU - erosions ulnar styloid)
- bursitis
- superficial erosions of bone
- guiding intraarticular injection

RA - Ultrasound



RA - MRI

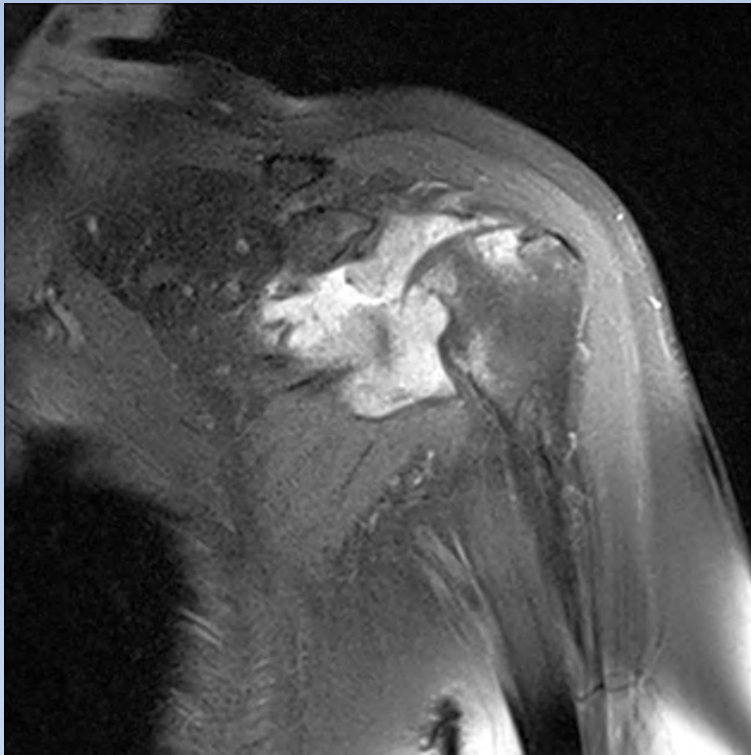
ADVANTAGES

- soft tissues
- bone marrow edema
- articular cartilage
- paramagnetic contrast agent - disease activity

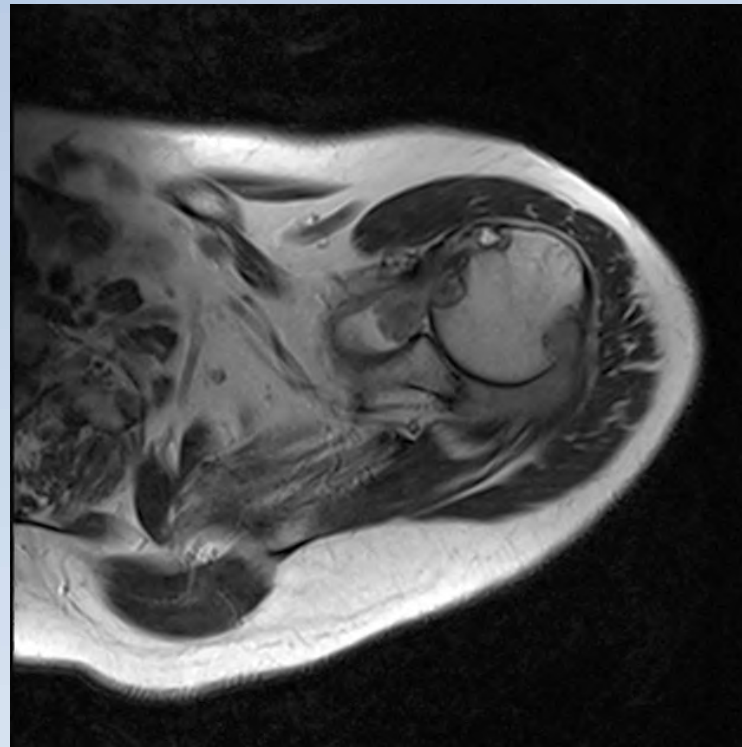
DISADVANTAGES

- time consuming
- cost, availability
- not for claustrofobic

RA - MRI shoulder joint: destructive changes - joint space narrowing, effusion, erosions



STIR



T1

CERVICAL SPINE AFFECTION

- usually in chronic RA & SpA (PA, AS)

CLINICAL SYMPTOMS

- pain
- disability
- neurological signs
(tetraplegia, death)



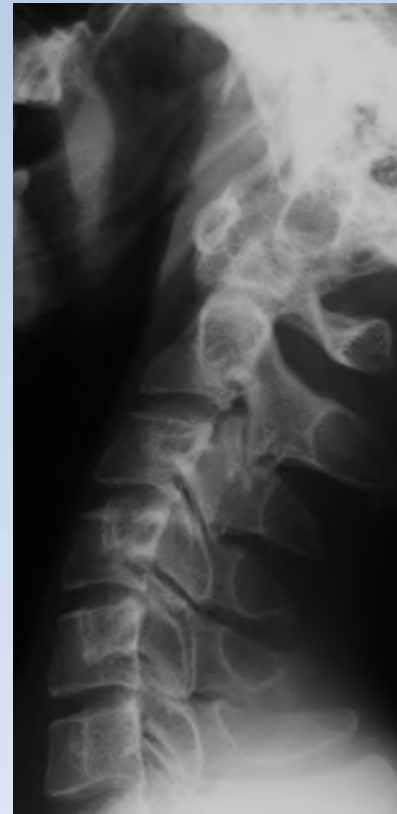
CERVICAL SPINE AFFECTION - RA & SpA

- NEURAL COMPROMISE
- spinal instability
- cord & vascular compression (pannus, skeletal elements)
- erosion of the dens
- atlantoaxial subluxation
- atlantoaxial impaction (cranial settling)

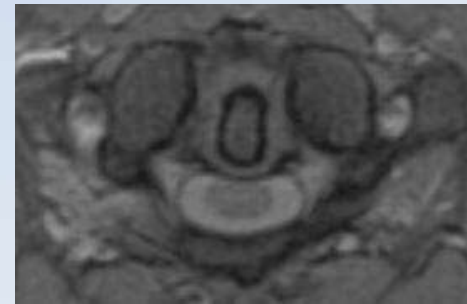
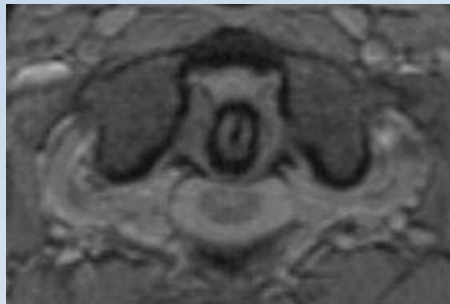
ATLANTOAXIAL SUBLUXATION - Rtg cervical spine: flexion, extension view



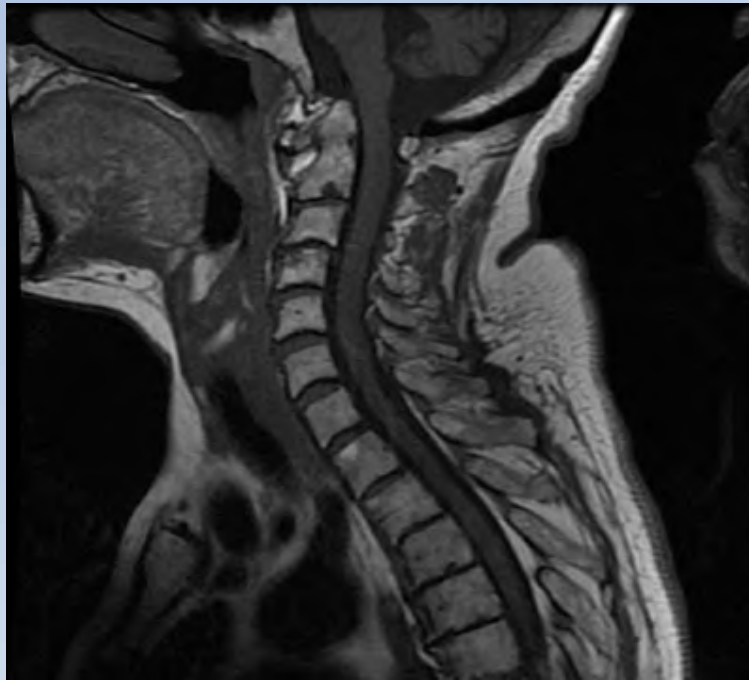
Anterior atlantoaxial subluxation



Atlantoaxial subluxation - MRI



RA - atlantoaxial impaction



T1

CONCLUSION

- RA - SYNOVITIS
 - symmetric poliartthritis (hands and feet)
 - early changes: US (MRI)
 - follow up: radiography
- SpA - ENTHESITIS
 - spine (early changes: MRI, chronic /follow up: radiography)
 - periferal asimmetrical oligoarthritis (early:US, late:radiography)

Hvala za pozornost!