

Νεότερες διαγνωστικές μέθοδοι και στρατηγικές απεικόνισης στις αξΣΠΑ

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Disclosures

None

X-Rays in AxSpA

- Plain radiographs of Sacroiliac joints (SIJ) as initial imaging method
- Radiographic features include sclerosis, erosion and ankylosis
- In lumbar and cervical spine → detect syndesmophytes-predictive of development of new
- For long-term monitoring of structural damage (particularly new bone formation)
- **BUT no sensitivity for inflammatory changes – often normal in nr-AxSpA**

But in clinical practice...

Young patient
Inflammatory back pain
Short term duration



MRI as preferred first choice

Detection of **early inflammatory lesions**



MRI in AxSpA

Bone marrow
edema(BME)/
osteitis

Bone erosions
Fat lesions
Sclerosis
Back fill

New bone
formation
Ankylosis

Enthesitis
Synovitis
Capsulitis

- T1-Weighted (T1W) : detect chronic structural lesions (e.g. bony erosions, ankylosis)
- Fluid sensitive (STIR, T2-Fat Saturated) : visualize active inflammation (e.g. bone marrow edema/ osteitis)

MRI characteristics of lesions in AxSpA

Lesion	Signal intensity	Sequence
BME	Hyperintense	STIR
Fat lesion	Hyperintense	T1
Erosion	Hypointense	T1
Sclerosis	Hypointense	T1
Ankylosis	Hypointense	T1

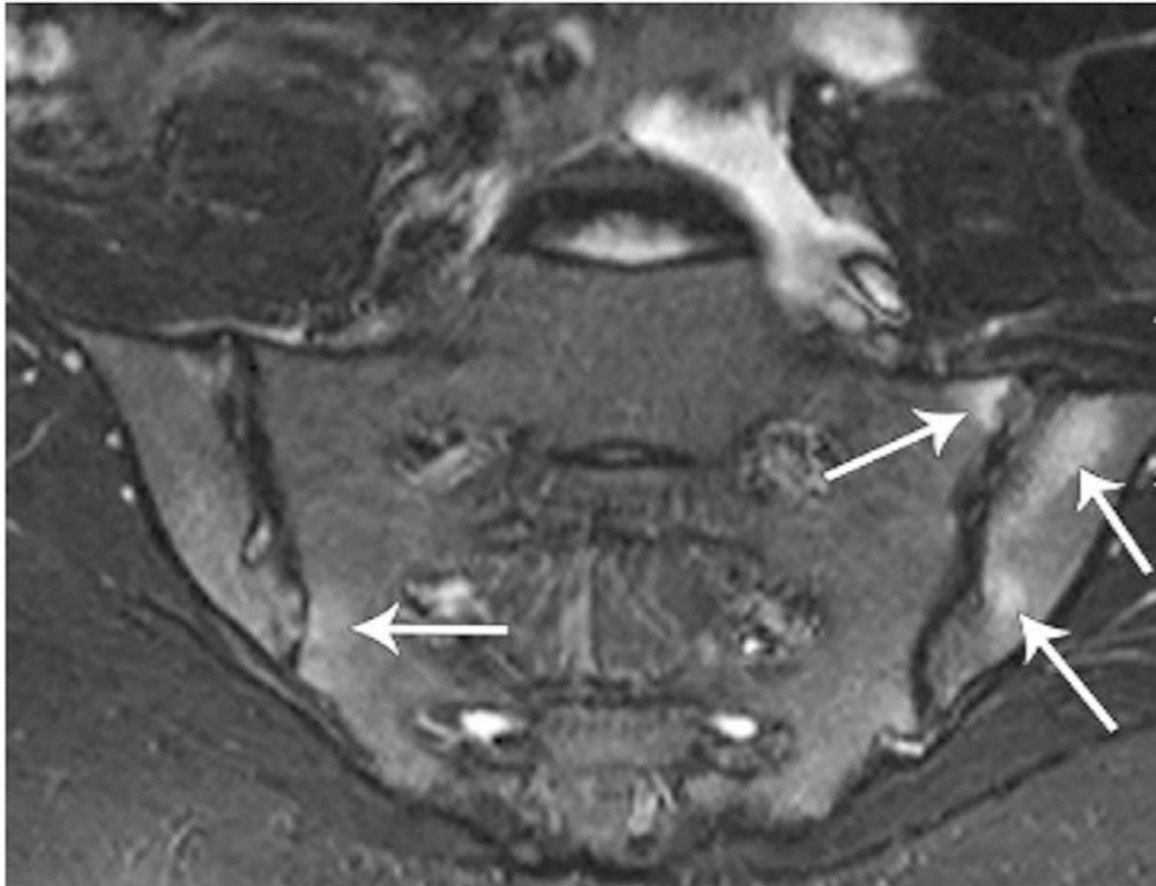


Development of international consensus on a standardised image acquisition protocol for diagnostic evaluation of the sacroiliac joints by MRI: an ASAS–SPARTAN collaboration

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John A Carrino ⁴, Torsten Diekhoff ⁵, Iris Eshed ⁶, Kay Geert A Hermann ⁵,
Nele Herregods ⁷, Jacob Jaremko ¹, Lennart BO Jans ⁷,
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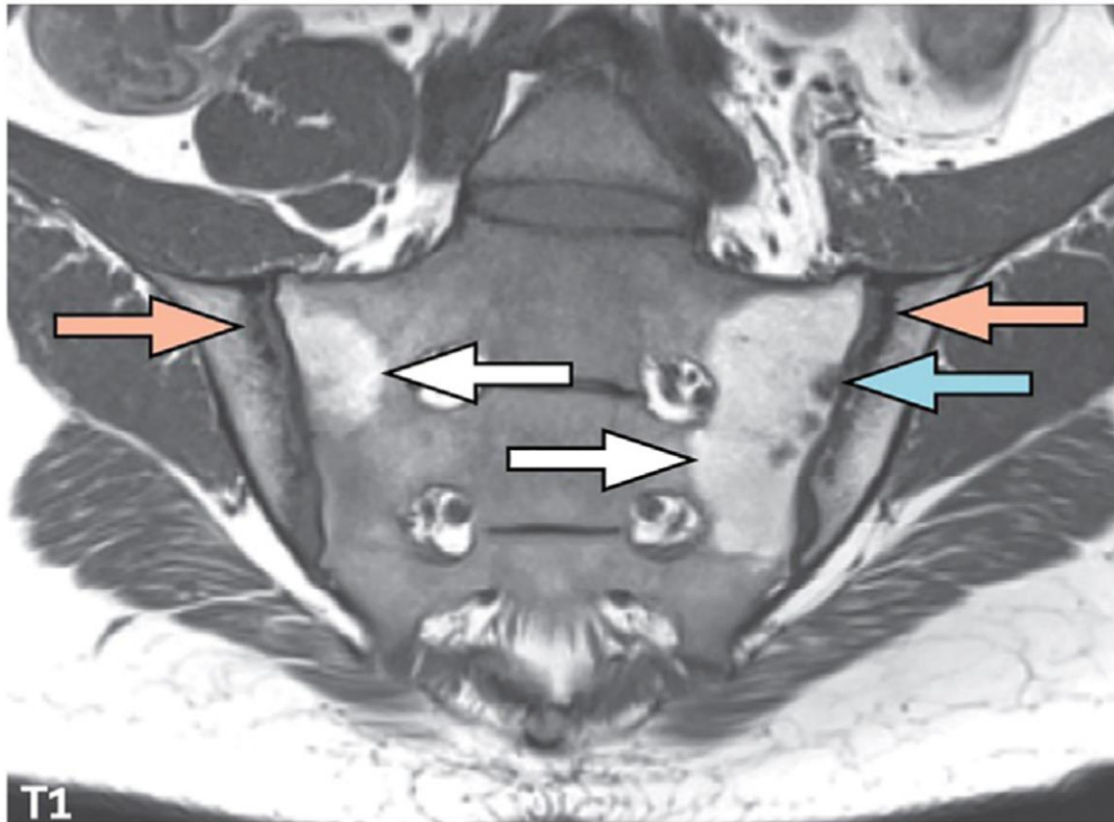
- Minimum four-sequence MRI image acquisition protocol
- Three semi-coronal (parallel to the dorsal cortex of the S2 vertebral body)
- One semi-axial sequence
- Detection of structural damage (T1W), active inflammation(T2FS), bone erosions (bone–cartilage interface)

MRI in AxSpA



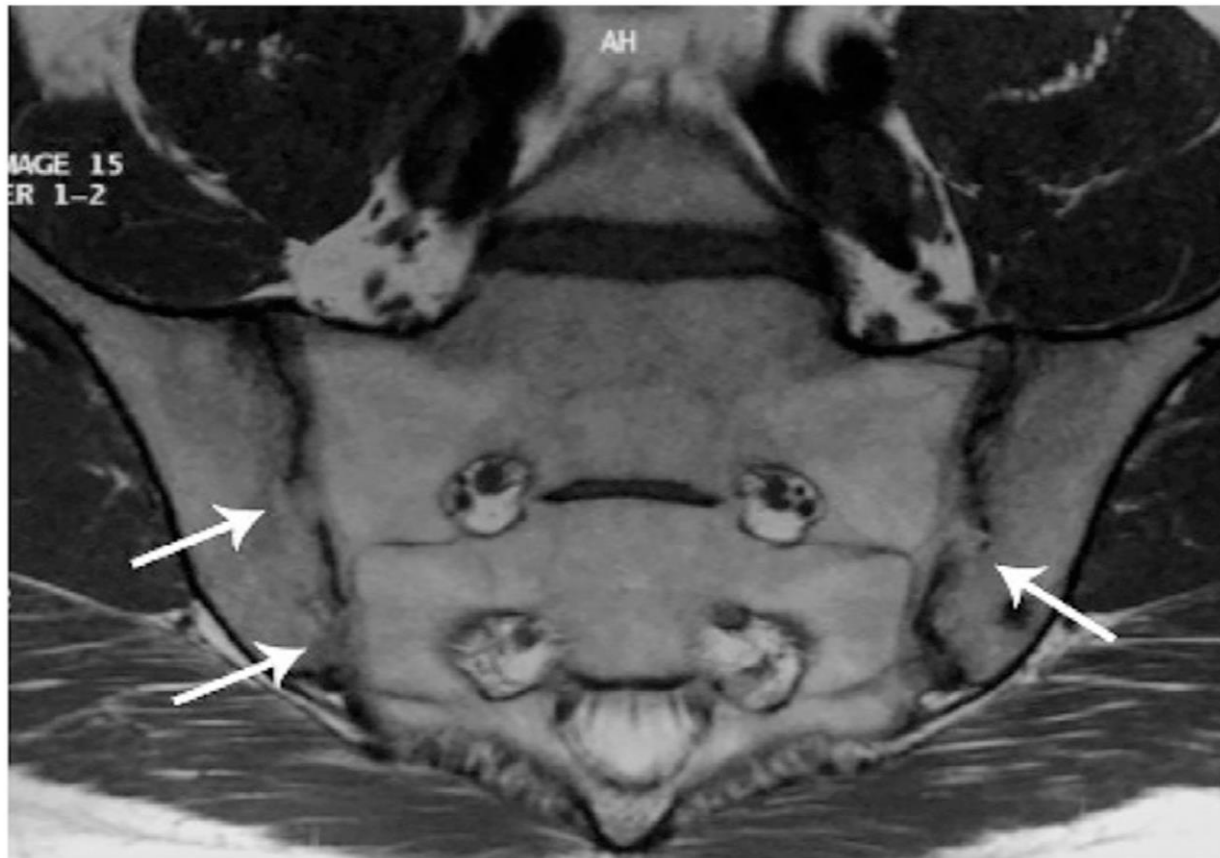
BME on STIR sequence

MRI in AxSpA



- Fat metaplasia
- Subchondral sclerosis
- Bone erosions

MRI in AxSpA



Ankylosis on T1

MRI in AxSpA



Ultrasound

- Detect ***inflammatory changes*** (entheseal thickening, hypoechoic areas and power Doppler signal) and ***structural damage*** (enthesophytes, calcifications and bone erosions)
- The Achilles tendon enthesis appears to be the most diagnostically informative site
- DEUS (Defining Enthesitis on Ultrasound in Spondyloarthritis) Enthesitis Index (DEI)



A novel tool that combines ultrasound and clinical examination findings, aim to enhance diagnostic precision

CT and low dose CT

- Best imaging modality for detecting SIJ erosions
- Radiation exposure → key limitation
- **Low-dose CT** of the SIJs can be done (exposure levels comparable or less than conventional radiography)



can detect subtle structural changes

- Can not assess osteitis disease activity (MRI remains the best)
- Not clear role of spinal IdCT

WHAT'S NEW?



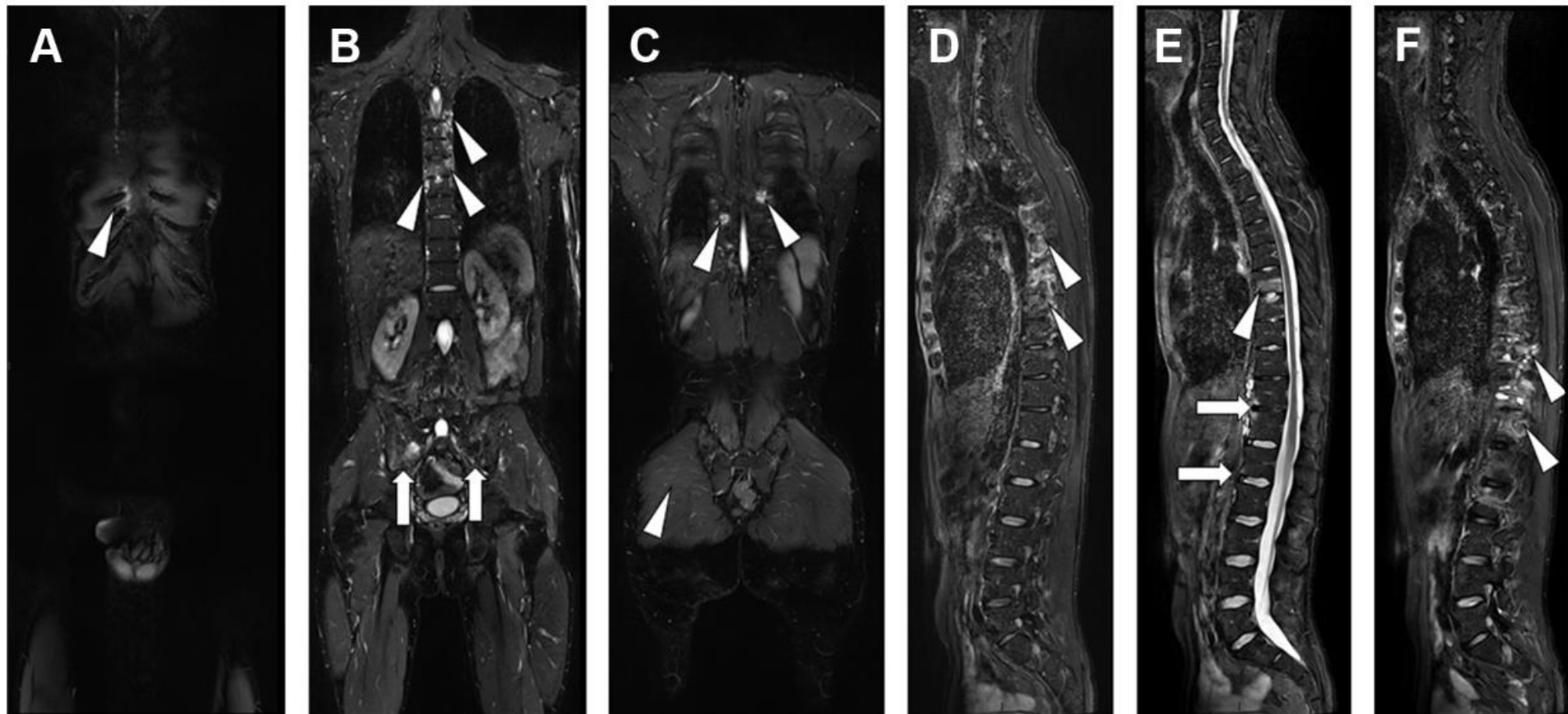
Whole body MRI (WBMRI)

- Assessment of both active and chronic lesions across the entire axial and peripheral skeleton
- Concurrent early detection of subclinical disease foci even in challenging sites
- Provide imaging of anterior-chest wall sites
- Extra-axial lesions are found in half of the patients (peripheral synovitis and enthesitis)

Barakat E, et al. Magn Reson Imaging Clin N Am. 2018

Zecca F, et al. Skeletal Radiol. 2025

WBMRI



Emerging techniques in axSpA imaging

Fibroblast-activating protein inhibitor (FAPI) positron emission tomography (PET) scan

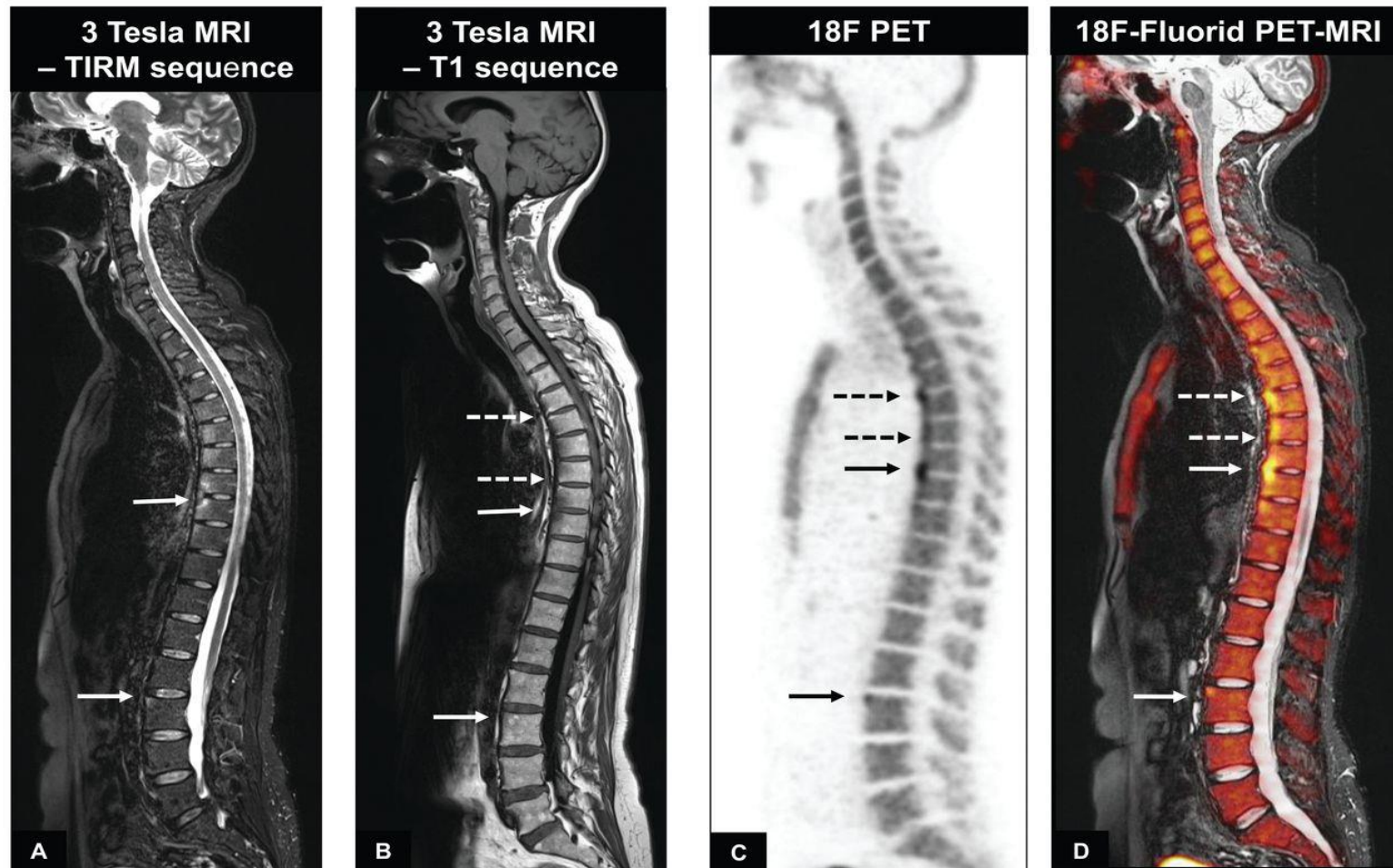
- in vivo visualisation of fibroblast activity
- correlates with clinical disease activity and MRI findings (may detect early disease)
- Promising for assessing treatment response

Emerging techniques in axSpA imaging

PET/MRI

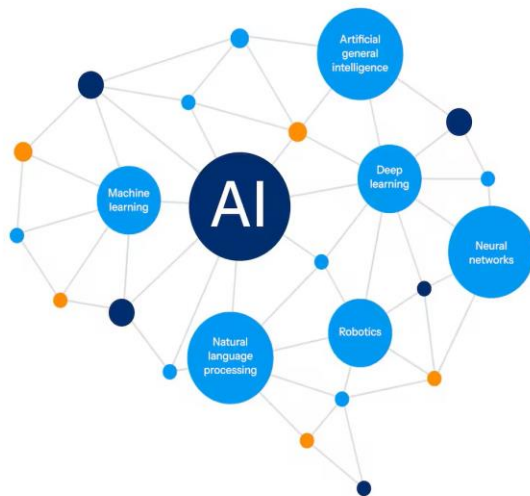
- depiction of osteoblastic activity with ^{18}F -labeled fluoride(^{18}F -F)
- BME is associated with osteoblastic activity
- Areas of BME and post-inflammatory fat deposition show the highest ^{18}F -F uptake

18 F-F PET/MRI

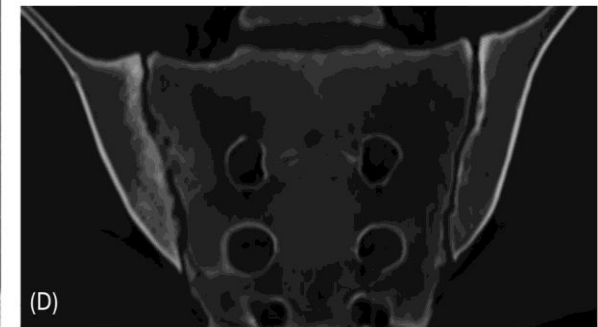
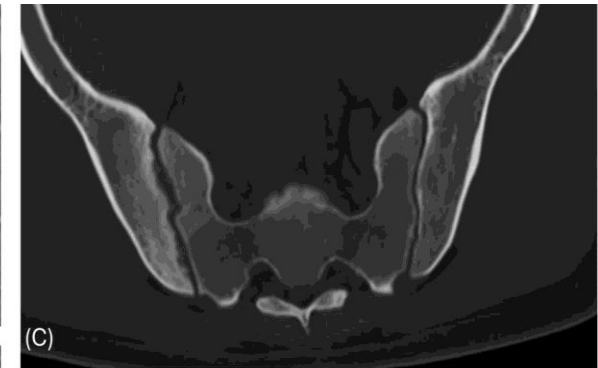
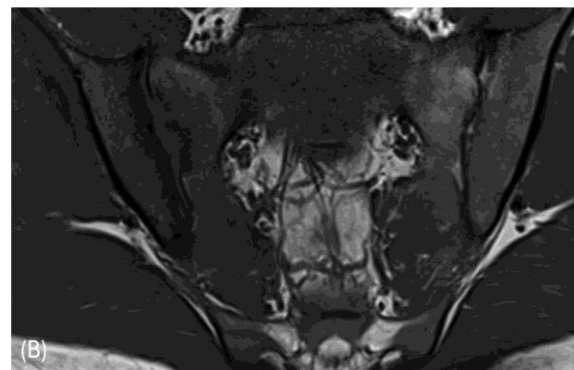
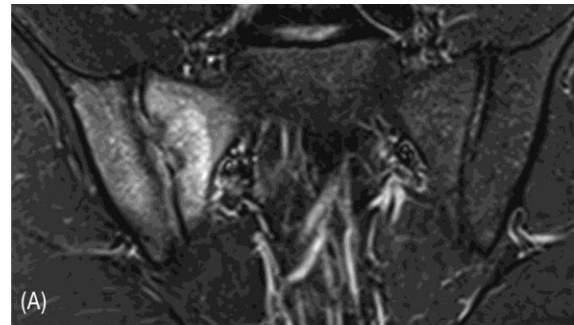


And...

AI of course



- Transformative tool in axSpA research and care
- Image interpretation+ reconstruction (based on deep learning)
- **Synthetic CT :**
 - novel MRI technique that enables the creation of “CT-like” images- superior visualization of osseous structural lesions compared to conventional MRI



And more AI...

- Can be used to reduce noise in MRI and CT images
- Can enhance the resolution of MRI by learning relationships between different coordinates in the image
- There is evidence that AI model show high discriminatory ability in distinguishing axSpA from non-axSpA patients
- Are now being applied to predict structural outcomes !
- In the future may facilitate earlier recognition

Dorfner FJ, et al.RMD Open 2024

Meng X, et al.Quant Imaging Med Surg. 2025

Thank you

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