

# ПОЗВОНОЧНИК: ВОСПАЛЕНИЕ + ИНФЕКЦИЯ

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# SPINE: INFLAMMATION + INFECTION


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## Objectives


- Basic MRI sequences, terminology
- Spectrum of findings in AS
- MRI findings of spinal infection
- Advantages of MRI



## T1-w

**Water: dark**  
**Fat: bright**

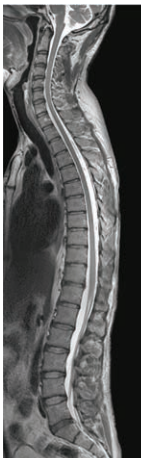
Bone marrow SI > discs



## T2-w

*mainly orthopaedic/neurosurgery use*  
*Spinal cord, roots, discs*

**CSF: bright**  
**Bone marrow: limited value**



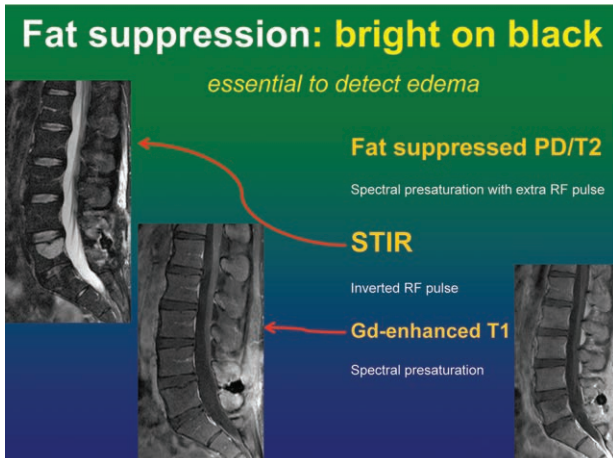
## Fat suppression: bright on black

*essential to detect edema*

**Fat suppressed PD/T2**  
*Spectral presaturation with extra RF pulse*

**STIR**  
*Inverted RF pulse*

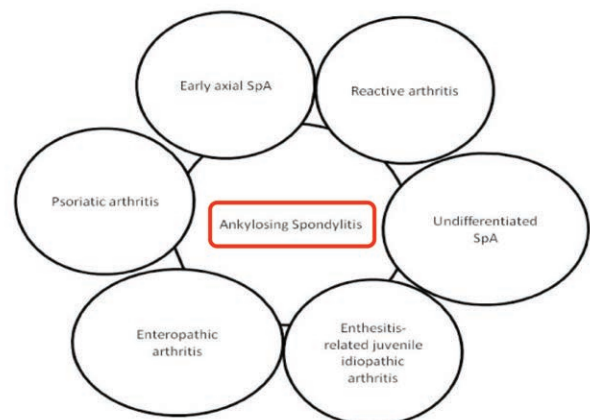
**Gd-enhanced T1**  
*Spectral presaturation*



## Spondyloarthritis

- Axial SpA → 7-9y delay in diagnosis
  - stage I, non radiographic
  - stage II, structural changes SIJ
  - stage III, structural changes spine
- Ro changes develop >5y from symptom onset

*Chary-Valckenaers I, et al. Joint Bone Spine 11*



## Enthesitis

- Seronegative spondyloarthropathies principally involve the enthesis
- **Enthesis: insertion of tendons, ligaments and articular capsule**

## Enthesitis

- Initial inflammatory lesions result in
- **Erosions** in the subchondral bone, filled with subacute or chronic inflammatory tissue and exhibit edema
- Healed by **new bone formation** → new enthesis

Lai-Shan 2010

## AS: Early disease

- **Sacroiliitis**: hallmark of AS, especially in early stage
- Radiographs are normal, Sens. Scintigraphy: 50-70%
- **MRI**: method of choice (fat suppressed PD/T2-w, STIR)

• **Subchondral BME**

## Sacroiliitis

17 y/o, m

FS T2-w

### MRI findings of early active AS

1. Sub-articular BME – enhancing  
*Symmetric, lower/posterior thirds*
2. Enhancement of joint space  
*Synovitis/capsulitis*
3. Enthesitis
4. Predict Ro structural changes 3y earlier  
*(PPV 60%)*

BME: observed within a few weeks of IBP presentation

FS Gd T1-w

## SIJ: Chronic inflammatory lesions

- **Ankylosis**

## MRI: Sacroiliitis overview

**Active** inflammatory lesions (fs PD/T2-STIR, fs T1 Gd)

- Bone marrow edema (osteitis)
- Capsulitis
- Synovitis
- Enthesitis

**Chronic (structural)** inflammatory lesions (T1-w)

- Sclerosis
- Erosions
- Fat deposition
- Bone bridges / ankylosis

## Spine: acute disease

- T-spine: 2<sup>nd</sup> after SIJ, 1/3 simultaneously with SIJ, 5-27% before SIJ
- **Spine**: MRI findings of early active AS

1. Spondylitis
2. Spondylodiscitis
3. Arthritis: facet joint, costovertebral, costotransverse
4. Enthesitis: interspinal, supraspinal, interosseous ligaments

## Early disease

- **Spondylitis**: Osteitis and erosions anterior/posterior superior and inferior bodies (“shiny corner” on STIR/T2)
- Predict syndesmophytes 24m earlier
- **MRI**: method of choice (fat suppressed T2-w, STIR)

*Makymovych WP, et al. Arthritis Rheum 09  
Weber U, et al. Ann Rheum Dis 10*



**T1 T2** Low signal T1, High signal T2  
 Enhancement T1  
*Jevtic et al Skelet Radiol 2000*

**Romanus lesion**  
 67% of pts with SPa

Erosion of vertebral corner: result of enthesitis at the annulus fibrosus insertion  
**Early:** BME, **Late changes:** squaring of v. bodies, syndesmophytes, "shiny corners" X-R

**Andersson lesions:**  
 Erosions within intervertebral spaces

2 adjacent levels is characteristic of AS  
 33% of pts with Spa  
 Specificity 59%

**Dd AS/BME from MODIC I:**  
 ≥3 lesions, young patient, no significant disc degeneration

**Combined inflammatory lesions Romanus and Andersson**

**T1 STIR**

**Chronic inflammatory lesions of the spine**

- Fat deposition vertebral corners
- Syndesmophytes
- Ankylosis

**Fat deposition**

**STIR T1**

**Shiny corners**

**MRI edema:** active lesions  
**MRI fat:** inactive lesions  
**XR sclerotic, MRI low SI:** chronic lesions

**T1** New active  
 Old inactive

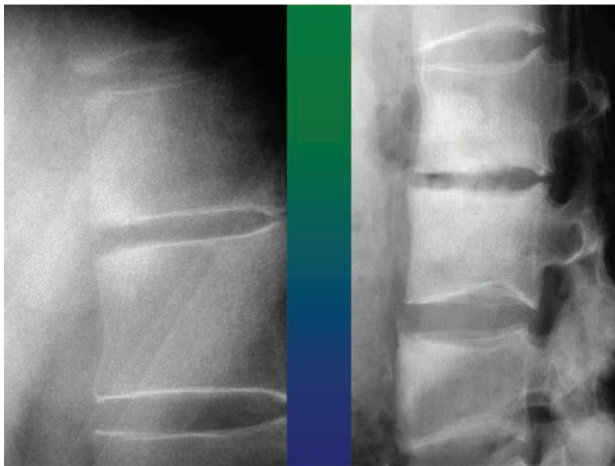
**Ankylosis**  
 Osseous bridges and new bone formation occur in the IV disks

Syndesmophytes

**Additional features in long standing AS**

- Shiny corners on X Rays
- Dagger sign - Trolley track sign
- Bamboo spine
- Disc calcification-ballooning
- Arachnoid diverticula
- Fractures, MDCT





**Dagger sign: ossification of posterior interspinous ligaments**

The slide features two X-ray images of the spine. The left image shows a normal spine, while the right image shows a spine with a prominent spur extending from the posterior interspinous ligament area, characteristic of the dagger sign. To the right of the X-rays is a small illustration of a dagger with a cape.

**Trolley track sign: ossification of facet joints**

The slide features two X-ray images of the spine. The left image shows a normal spine, and the right image shows a spine with a continuous line of ossification along the facet joints, resembling trolley tracks. A small image of actual trolley tracks is included for comparison.

**Bamboo spine**

The slide features two X-ray images of the spine. The left image shows a normal spine, and the right image shows a spine with a continuous line of ossification along the vertebral bodies, resembling bamboo. A small image of bamboo stalks is included for comparison.

**Disc ballooning**

The slide features two X-ray images of the spine. The left image shows a normal spine, and the right image shows a spine with a ballooning disc. A small image of an arachnoid diverticulum is included for comparison.

**Arachnoid diverticula**

**Disc calcification**

The slide features two X-ray images of the spine. The left image shows a normal spine, and the right image shows a spine with a calcified disc. A small image of a calcified disc is included for comparison.

**AS- Fracture**

The slide features two X-ray images of the spine. The left image shows a normal spine, and the right image shows a spine with a fracture of the anterior superior iliac spine (ASIS). A small image of an ASIS fracture is included for comparison.

**Common clinical scenario**

- Young patient
- Inflammatory back pain
- Normal SI joints on plain radiographs

↓

**• GO FOR MRI**

# MRI



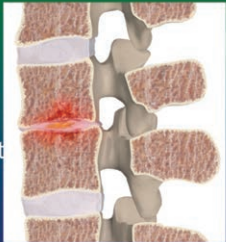
**for early diagnosis**

X rays are not suitable for early diagnosis of spondyloarthritis

*Sieper Rheum Dis 2009*


## INFECTIONS: Presentation

- Delay in diagnosis frequent
  - Non-specific symptoms
  - Little or subtle radiological changes
- Intervertebral disc and adjacent vertebral bodies usual site




## Spinal infection

- T & L spine most common
- Recent history of
  - Catherterisation
  - Cystoscopy
  - Surgery
- Staphylococcus aureus in 50%



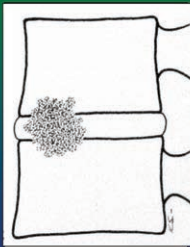
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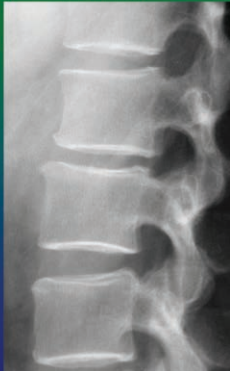
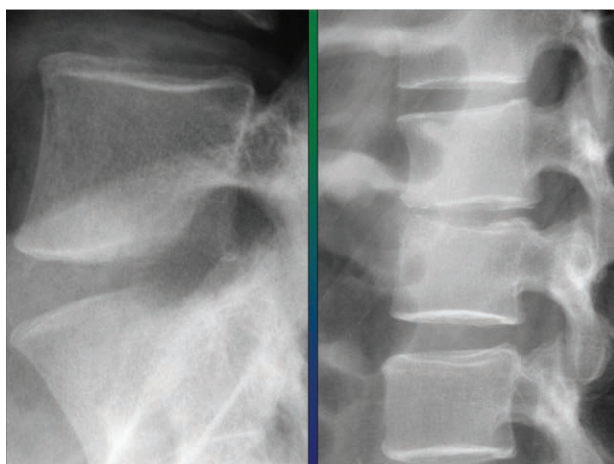

## Haematogenous spread

- Involves anterior subchondral region of vertebral body
- Spreads rapidly to intervertebral disc



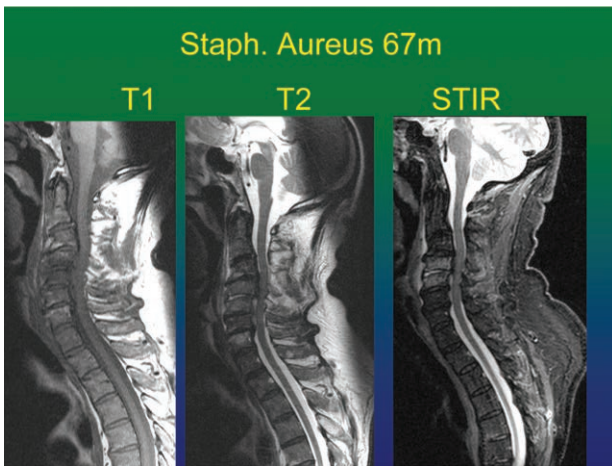
## Radiology

- Initially normal
- 1-3 w ↓ intervertebral disc ht
- Ill defined subchondral bone
- Enlarging destructive focus within vertebral body

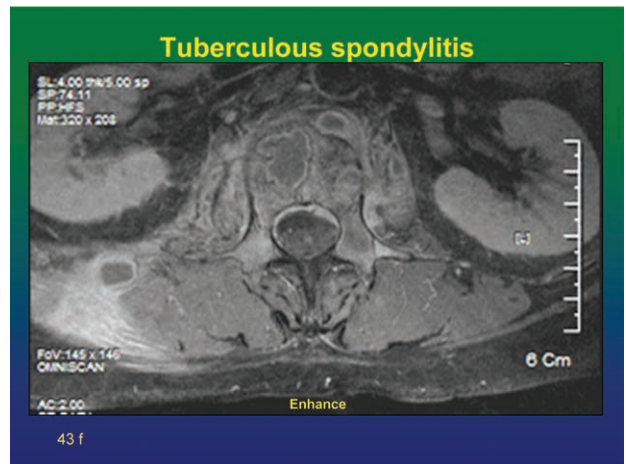
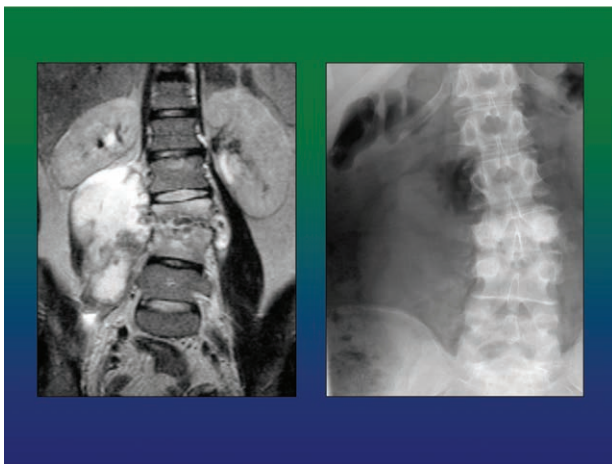
**Pyogenic spondylitis**





## Tuberculosis

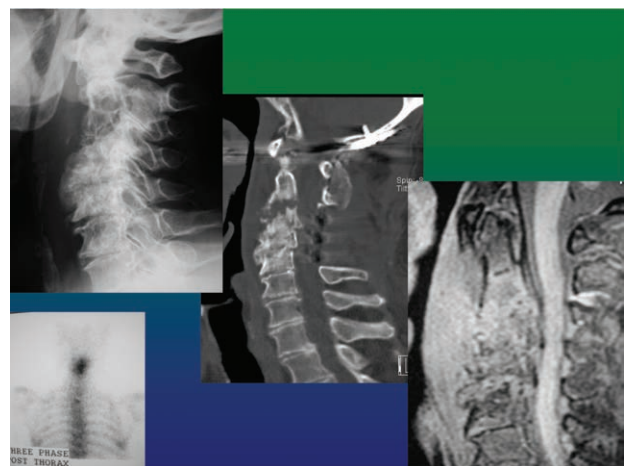
- Slow progression
- Preservation of disc ht until late
- Subligamentous spread with multilevel involment
- Large, sometimes calcified soft tissue abscesses
- Absence of reactive sclerosis



**POSTOP**

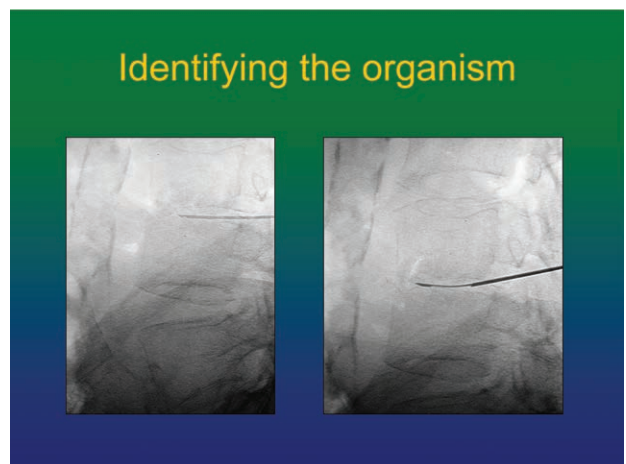
77 y/o,f  
2m postop  
Pain  
Increased BT

### Epidural abscess



## Differential diagnosis

- Acute degenerative disc disease
- Acute Schmorl node herniation
- Ankylosing spondylitis
- Amyloid destructive discitis of haemodialysis



## Conclusion - spinal infection

- Diagnosis
  - Disc space narrowing
  - Early end plate destruction
  - Image guided aspiration
- MR imaging
  - Detection
  - Extent
  - Differential diagnosis



## Key points

- MRI powerful tool in spinal inflammation and infection
- Early diagnosis = better prognosis
- Need to know the proper sequences



Russia, St. Petersburg

# ESSR 2015

Sports Imaging Subcommittee  
18–19 September 2015, PELVIS & LOWER LIMB

**Address of the meeting:** Russia, St. Petersburg, Moskovsky prospect 97A, Holliday Inn Hotel.

**Moderators:** professor J. Kramer (Austria), professor T. Trofimova (Russia).

**Contacts:** Coordinator of the meeting Voschieva Mariia [voschieva@gmail.com](mailto:voschieva@gmail.com)