

Psoriatic Arthritis

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Psoriatic Arthritis

- Seronegative spondyloarthropathy associated with psoriasis
- HLA-B27 positive in 50%

Seronegative Spondyloarthropathies

- 1. Ankylosing spondylitis
- 2. Psoriatic arthritis
- 3. Reiter's syndrome
- All 3 produce abnormalities at:
 - Cartilaginous Joints and Enthesis
 - Bursae and Tendon Sheaths (tenosynovitis and periostitis)
 - Synovial Joints

Psoriatic Arthritis

- Affects up to 1-2% US population
- Reported in up to 20% of patients with psoriasis
- Majority: skin manifestations precede joint involvement
- Although in 15-20% joint involvement precedes skin involvement (2)

Moll and Wright Original Diagnostic Criteria

- The original criteria are the simplest and most frequently used
- Criteria:
 - An inflammatory Arthritis (peripheral arthritis and/or sacroiliitis or spondylitis)
 - The presence of psoriasis
 - The (usual) absence of rheumatoid factor

5 Patterns (Moll and Wright)

- Asymmetric Oligoarticular type (4 or fewer joints) *most common
- Polyarticular type (5 or more joints)
- Predominant DIP involvement
- Arthritis Mutilans
- Psoriatic Spondylitis (2)
- Some have symmetric seronegative polyarthritis simulating RA (vs Predominant DIP type, Polyarticular and DIP are grouped together



Skin and Nail Involvement



- Skin lesions of psoriasis: sharply marginated salmon pink papules and plaques with silver white scale (1)
- Scalp, Genital and Nail involvement (pitting, oil spots, onycholysis (separation from nail bed))



Nail Pitting



onycholysis

Pathogenesis

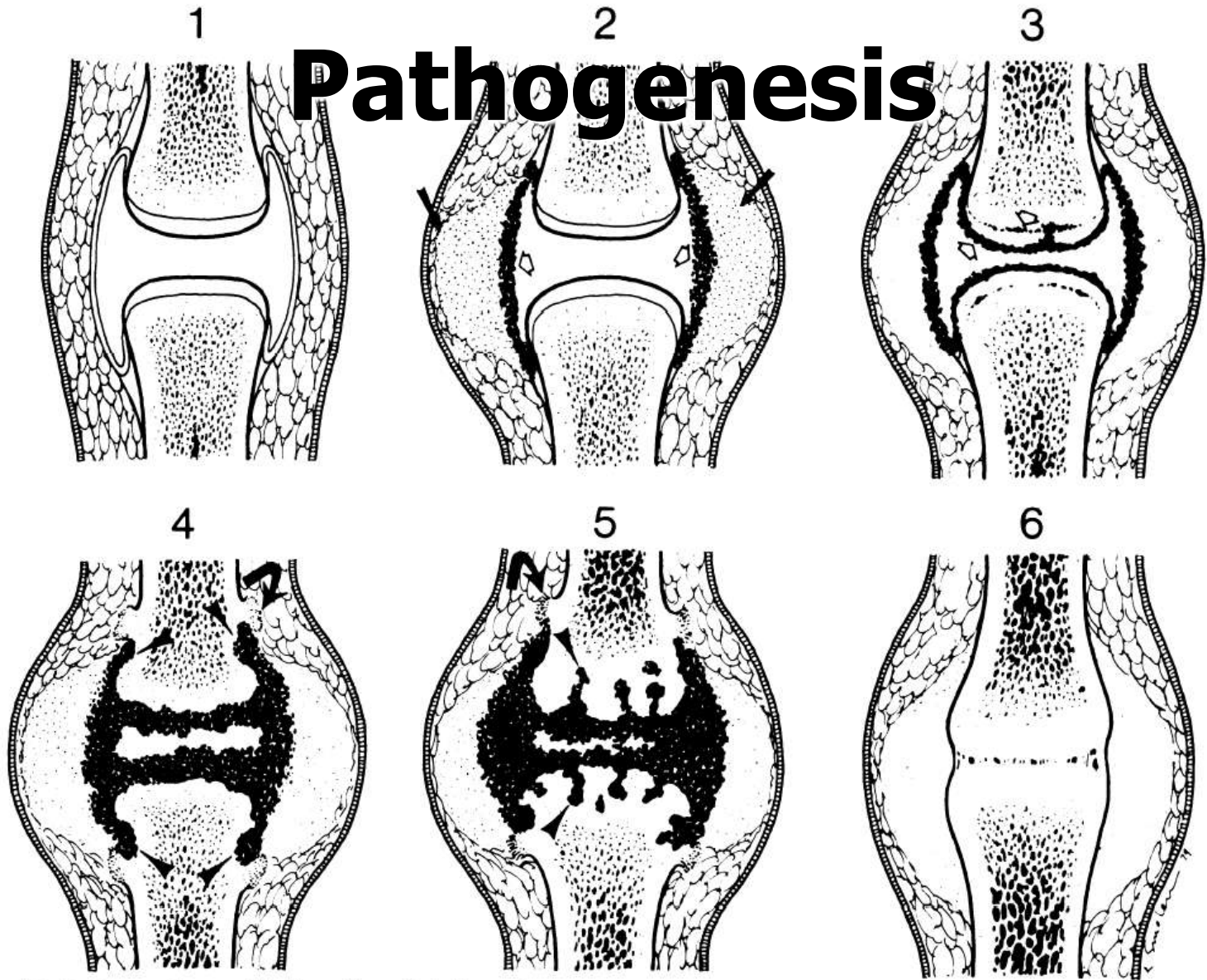


Fig. 7.—Seronegative spondyloarthropathies: pathologic overview.

- 1, Normal synovial joint.
- 2, Early changes consist of synovial inflammation (open arrows) and soft-tissue edema (solid arrows). Osteoporosis may not be evident.
- 3, Subsequently, synovial inflammatory tissue or pannus extends across and beneath chondral surface (arrows), leading to cartilaginous erosion or disruption.
- 4 and 5, Later stages. Marginal and central osseous erosions develop (arrowheads). Associated bone proliferation (arrowheads) may occur.
- 6, Finally, intraarticular bone ankylosis may develop.

Radiologic Pathologic Correlation of Synovial Joint Abnormalities

- | | |
|--|---|
| ■ Soft tissue swelling and widening joint space | ■ Synovial Inflammation and production of fluid |
| ■ Narrowing of joint space | ■ Pannus destruction of cartilage |
| ■ Marginal erosion | ■ Pannus destruction of unprotected bone and joint margin |
| ■ Bone erosion and subchondral cyst formation | ■ Pannus destruction of subchondral bone |
| ■ Bony ankylosis | ■ Fibroplasia, cartilaginous metaplasia, chondral and capsular ossification |
| ■ Marginal "whiskering", periostitis and subchondral sclerosis | ■ Bony proliferation in response to damage |
| ■ Cortical Atrophy, osteolysis | ■ Noninflam proliferation of periosteum |

Radiographic Features

- **Productive changes** with Erosions
 - *distinguishes from RA
- PsA erosions occur at “bare areas” vs Erosive Osteoarthritis
 - (subchondral cortex is primarily affected)

Radiographic Features

- Bone Production:
 - Mouse ears- bone production adjacent to erosions
 - Ivory Phalanx- sclerosis of distal phalanx
- Erosions: aggressive
 - Pencil in cup deformity
 - Acroosteolysis- resorption of terminal tufts

Psoriatic Arthritis

- Joint inflammation ranges from axial to peripheral
- Synovial and adjacent soft tissue inflammation
- Severe osteolysis

Psoriatic Arthritis

- Distinguishing radiographic feature of psoriasis entheses related changes include:
 - enthesal new bone formation
 - enthesitis
 - osteitis, periostitis
 - enthesal erosions (4, Ann Rheum Dis 2005;64)

Psoriatic Arthritis

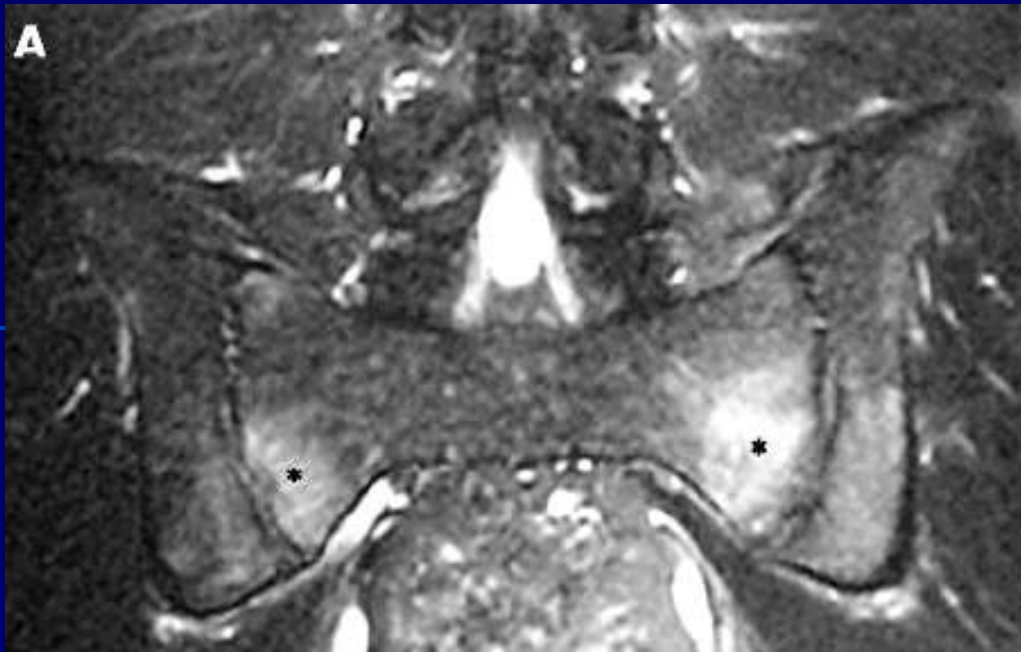
- Scintigraphy, arthroscopy, ultrasonography, and MRI indicate these features are more common than evident on clinical grounds (4, Ann Rheum Dis 2005;64)

Enthesitis: cardinal feature of spondyloarthropathies

- Enthesis: insertion of ligament, tendon or joint capsule to bone
- Enthesitis: focal insertional inflammation

Enthesitis: cardinal feature of spondyloarthropathies

- Unlike RA where disease centers on *synovium*, PsA also centers on the *enthesis organ* (includes adjacent tendons, periosteum and underlying bone at attachment sites)(4 Ann Rheum Dis 2005)



Male with PsA : Osteitis (asterisk)

SI joints behave like functional entheses, due to high shear and compressive stress

Similar MRI pattern to areas of insertion --> extensive bone disease independent of synovitis



Extracapsular inflammation (*)

Bone edema at distal capsular enthesis (arrow)

MCP head edema in region of synovium (arrow head)

MRI Findings



T1 pre and post gad in pt with PsA

Synovitis at 3rd and 4th PIP and DIP joints (large arrows).

Joint space narrowing with **bone proliferation** at the third PIP joint

Erosions at the fourth DIP joint (white circle).

Enthesitis (extracapsular enhancement : small arrows) medial to 3rd and 4th PIP (8)

Hand Manifestations

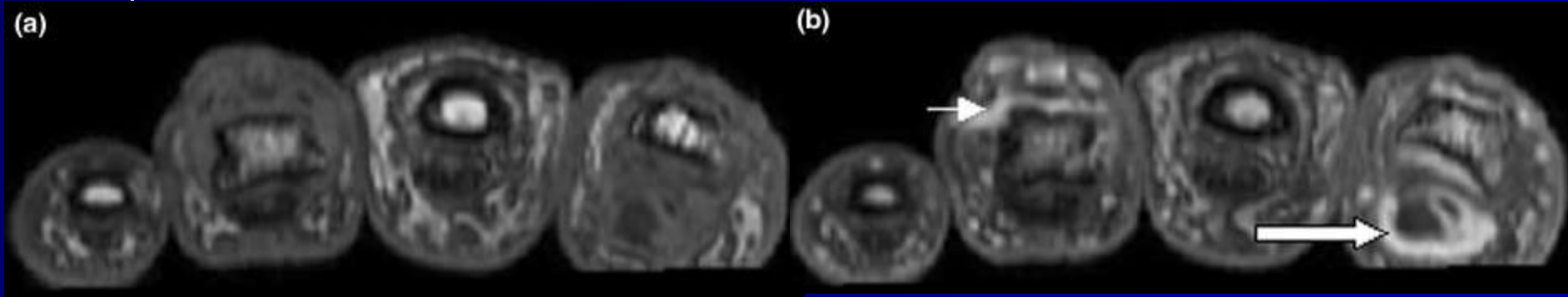
- Sausage digit
- Pencil in cup deformity
- Ivory phalanx
- Acroosteolysis
- Bony Ankylosis
- Erosions (DIP) (often affected 1st)
- Bone formation

Sausage Digit



Tenosynovitis
and
soft tissue
swelling

PsA With Flexor Tenosynovitis on MRI



T1 pre

T1 post

Flexor tenosynovitis at 2nd digit with enhancement and thickening of the tendon sheath (large arrow)

Synovitis in 4th IP Joint (small arrow) (8)

Arthritis Mutilans



Bony ankylosis IP
joints

Pencil in cup

Ivory Phalanx



Bony Proliferation
and endosteal
bone formation as
exaggerated
healing response

Unique and
specific to PsA, but
uncommon finding

“Whiskering” or Mouse Ears (Bony Proliferation)



(Resnick 3)

“Whiskering” or Mouse Ears (Bony Proliferation)

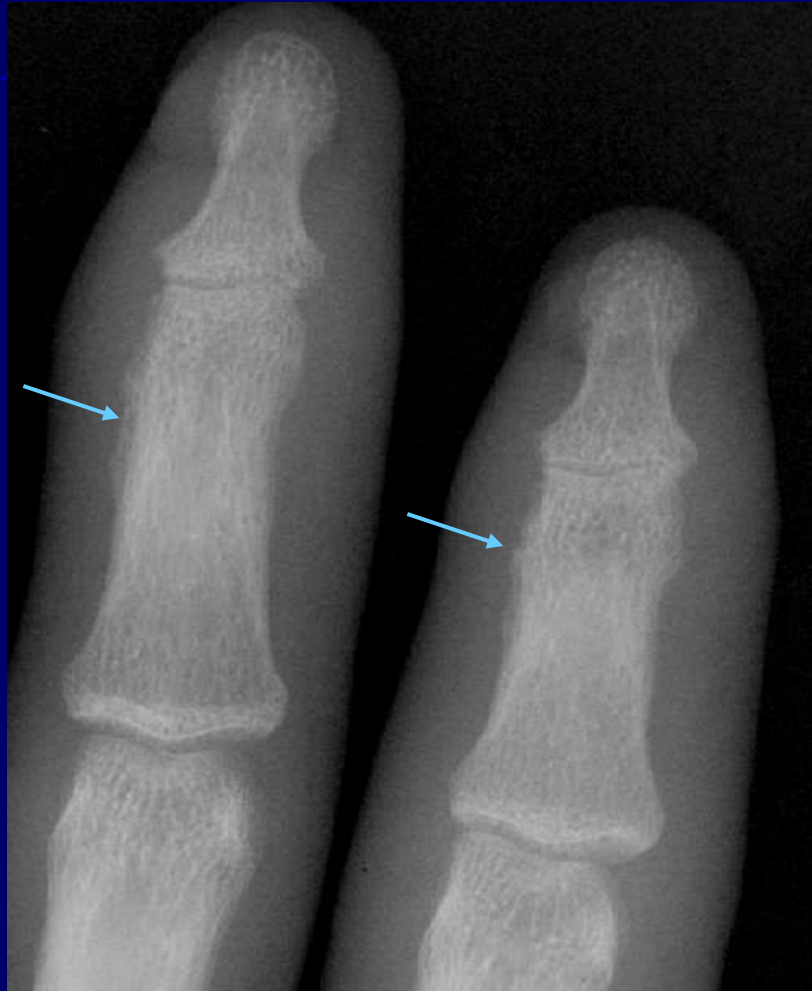


Marginal Erosions: Pannus destruction of unprotected bone at joint margins

Erosions and Subchondral cyst formation: Pannus destruction of subchondral bone

Narrowing of joint space: Pannus destruction of cartilage

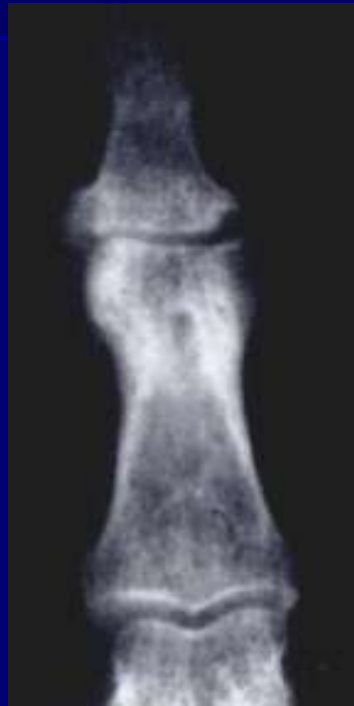
Shaft Periostitis



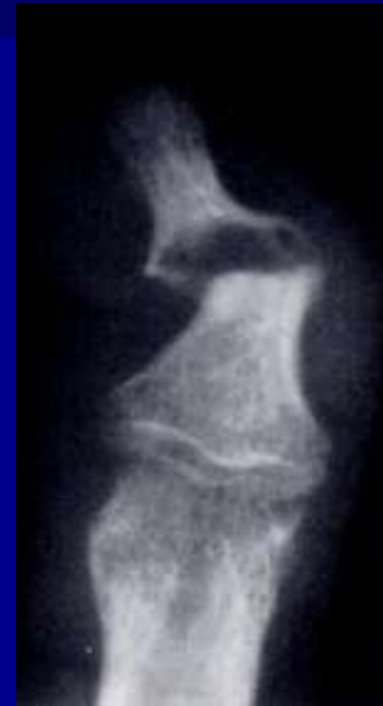
Progressive Erosion of DIP Joint



No erosion



Bare area
erosion
3 years later

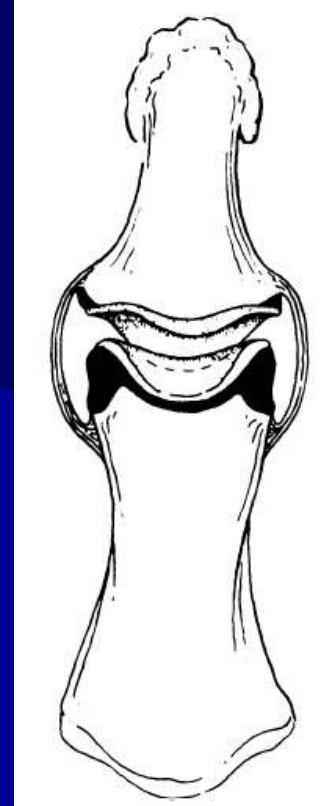


Diffuse
subchondral
destruction

Erosions



Psoriatic Arthritis Vs. Erosive Osteoarthritis



PsA typical
"bare area"
erosions



EOA Typical
subchondral
erosions "gull
wings"

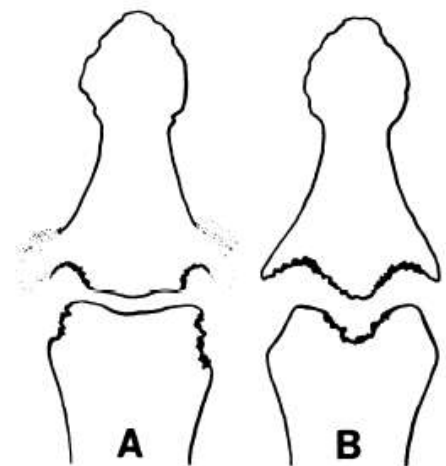


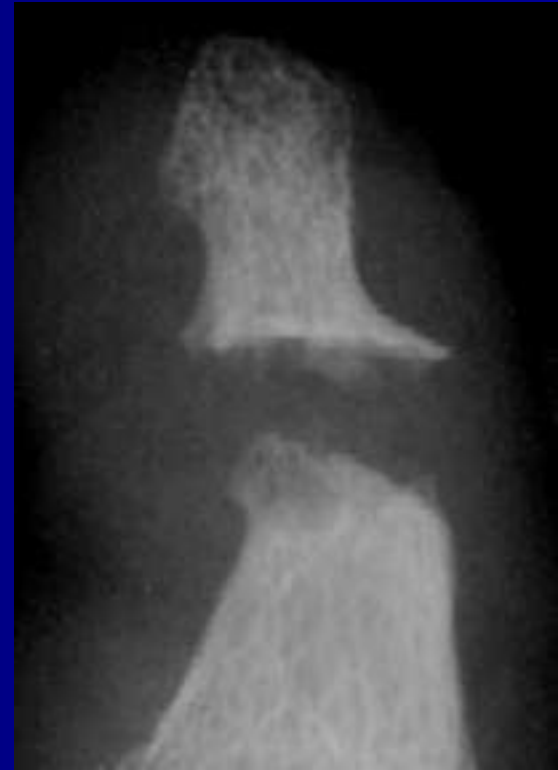
Fig. 20.—DIP joint. A. Bare area erosions of psoriatic arthritis ("mouse ears"). B. Subchondral erosions of erosive osteoarthritis ("gull wings").

Osteolysis

Pencil Cup Osteolysis



Gross Osteolysis



Acroosteolysis

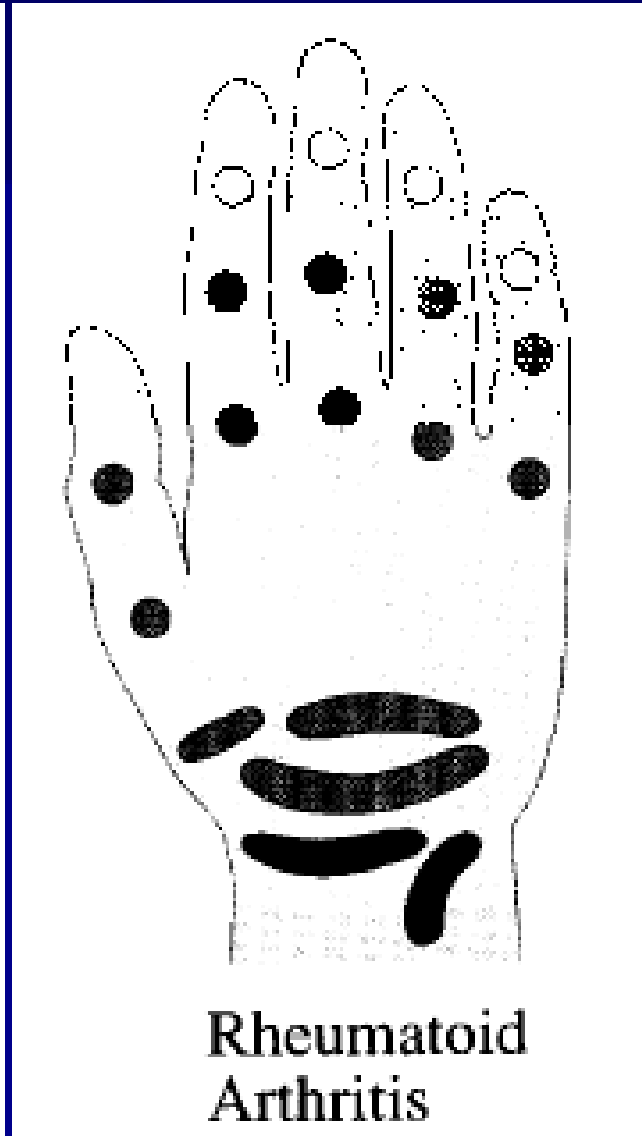
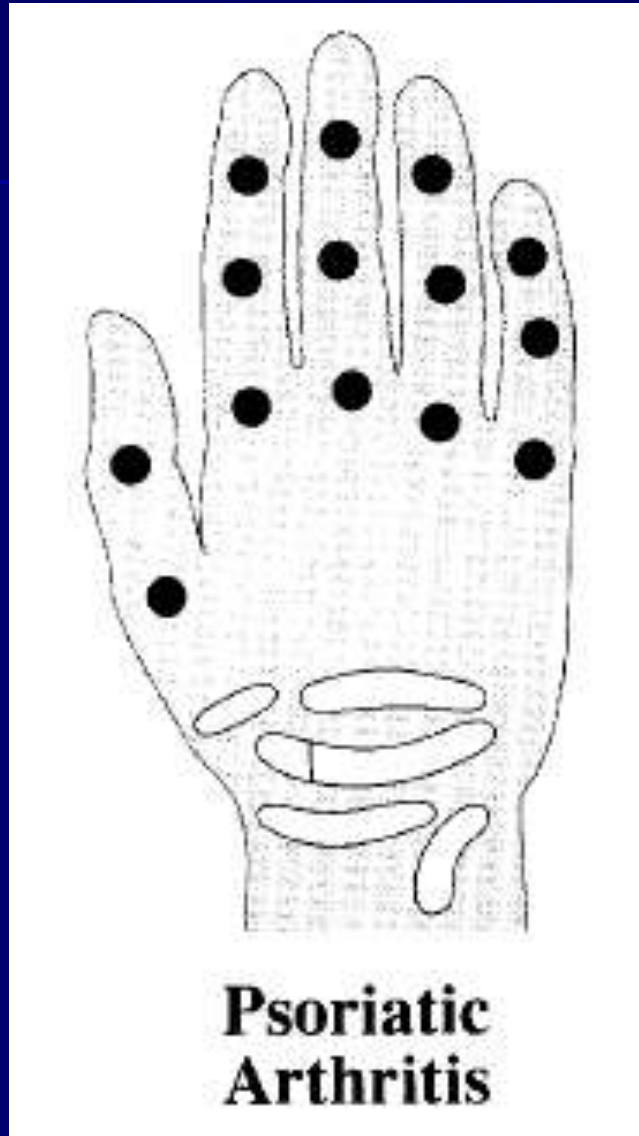
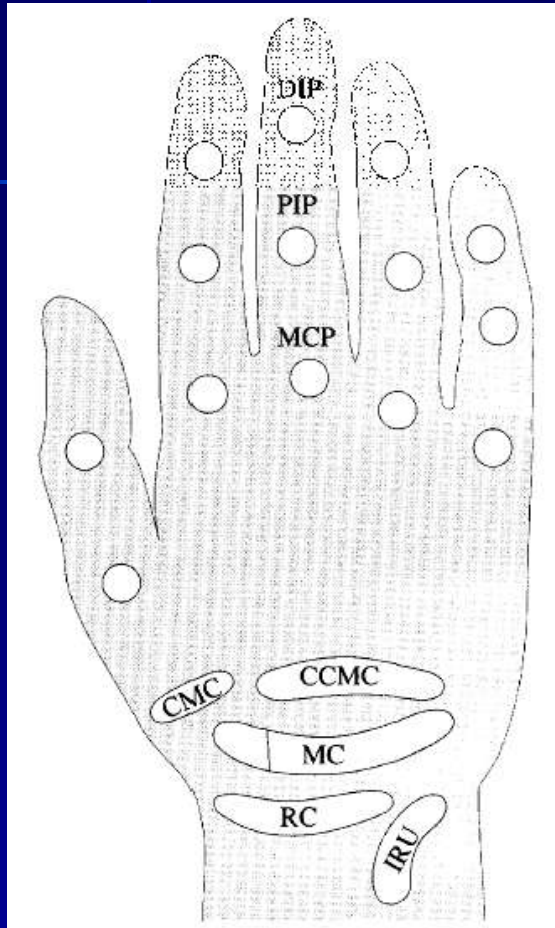


Resorption of terminal tufts of distal phalanges

Noninflammatory proliferation of the periosteum

Arthritis DIP, 3rd and 4 digits

Hand Distribution



Foot

- **Erosive changes and bone proliferation** in feet usually involves the IP and MTP joints,
- *IP joint of great toe most often affected

Erosive Changes Great Toe IP Joint



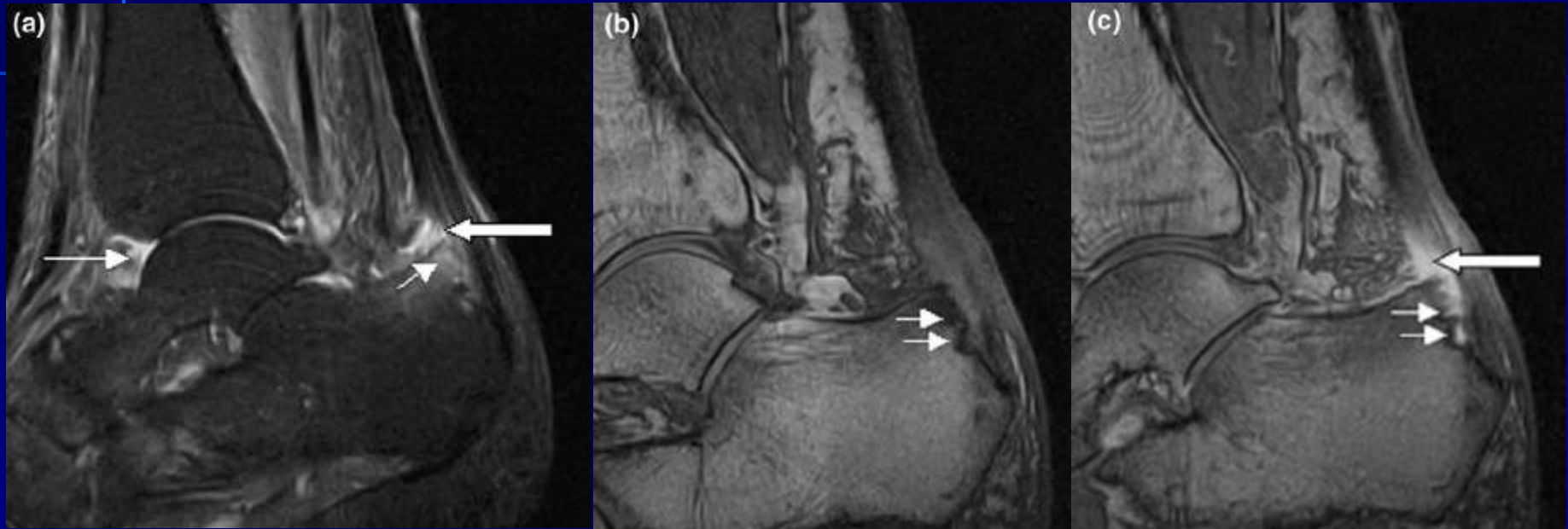
Calcaneus

- New bone formation at attachment of achilles and plantar aponeurosis
- Erosions superior margin of calcaneus

Calcaneus



Calcaneus



(a) (STIR) image:
Enthesitis at the Achilles tendon insertion (thick arrow)
Bone marrow edema (short thin arrow)
Synovitis (long thin arrow)

(b,c) T1 weighted images pre and post gad :
Enthesitis (large arrow)
Bone erosion at tendon insertion (short thin arrows).(8)



Pt with symmetrical polyarthritis type of Psoriasis with multiple sites of fusion, fibular deviation and pencil in cup deformity left fifth toe (4)

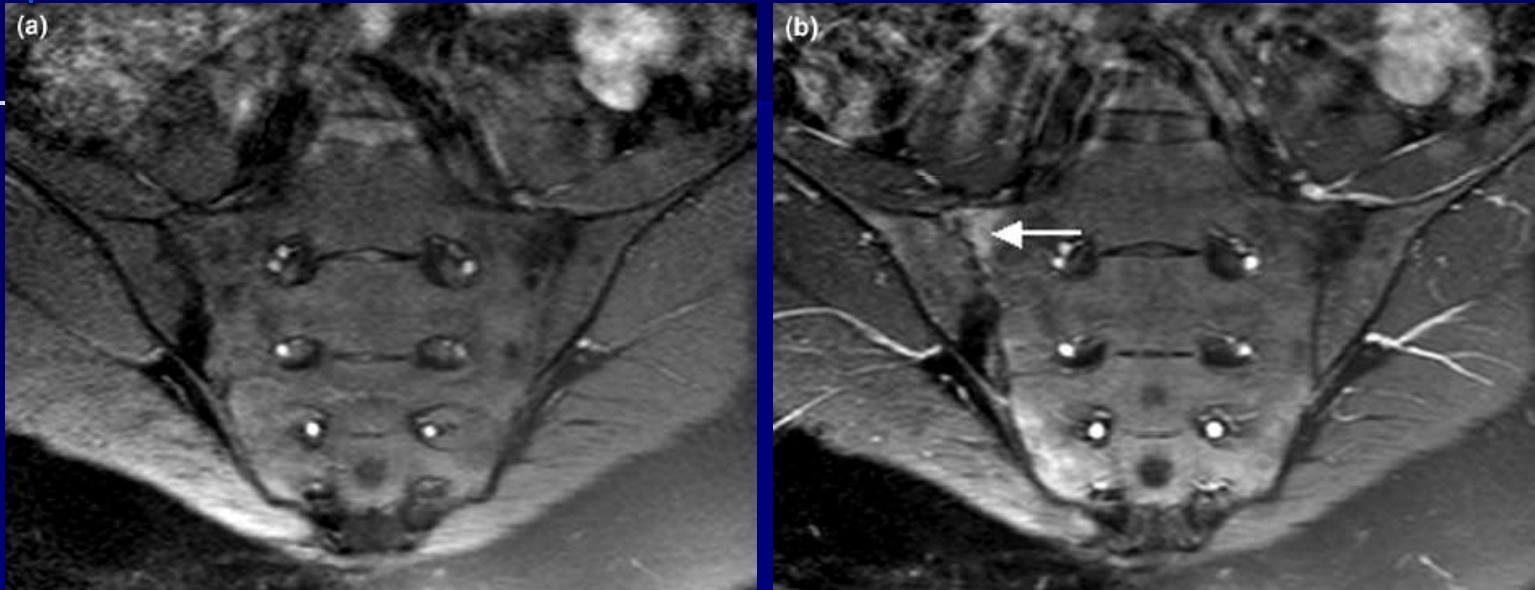
Axial Skeleton

- **Sacroiliitis** (up to 25% in 2 series, and in up to 78% in another series) (5)
- **Spondylitis**
- Frequent *asymptomatic* involvement of spine and SI joints in association with PsA

Sacroiliitis

- Bilateral Symmetric
 - Ankylosing Spondylitis
 - Enteropathic Arthropathy
 - Late RA
- Bilateral Asymmetric
 - Psoriatic arthritis
 - Reiters
 - Juvenile RA
- Unilateral
 - infection
 - OA from abnormal mechanical stress

Sacroiliitis



T1 pre and post gad showing enhancement right SI joint indicating active sacroiliitis (8)

MRI findings: bone edema (common), SI erosions,
more chronic: periarticular fat accumulation and
sclerosis

Spinal Involvement

- Atlantoaxial subluxation and odontoid abnormalities

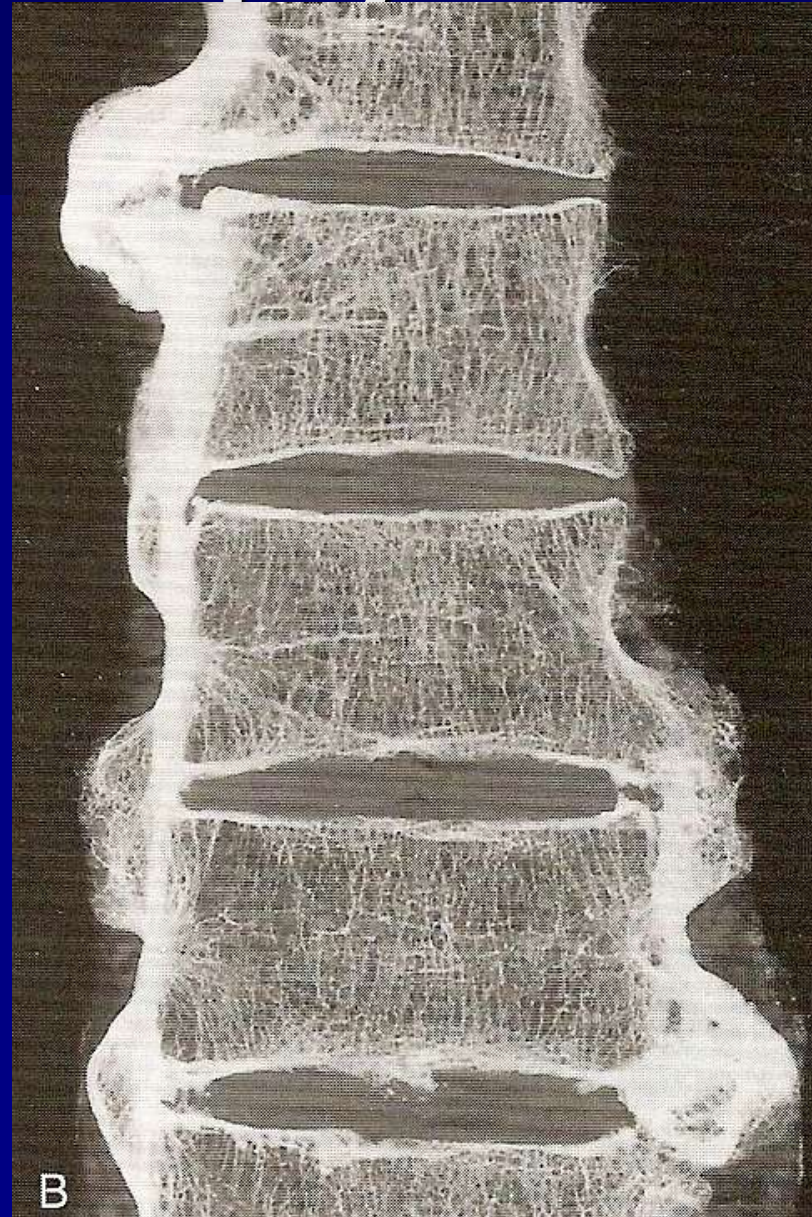
Spinal Involvement

- Bulky asymmetric non-marginal / paramarginal syndesmophytes
- Erosions on surface of vertebrae and syndesmophytes form at site of erosion or in adjacent soft tissue
- Paravertebral ossification (rare)
- Apophyseal joint ankylosis

“Bulky” Syndesmophyte Why?

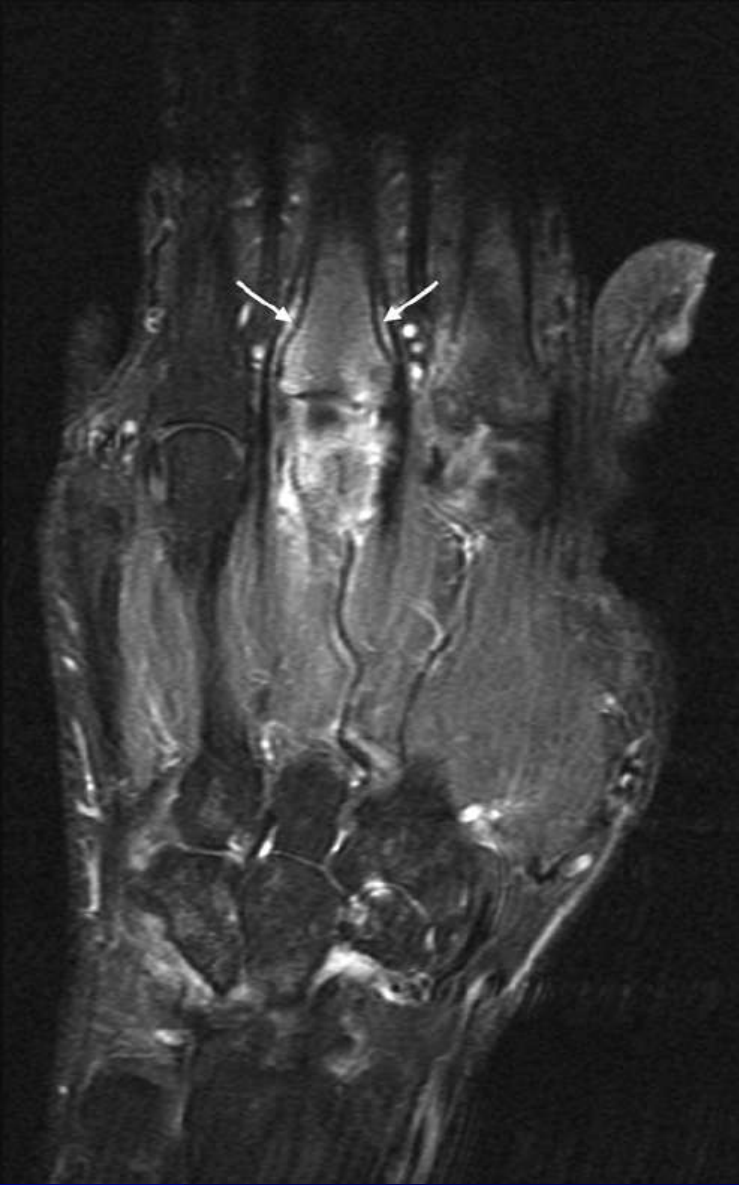
- De Vlam postulates that syndesmophyte morphology is the result of the amount of motility at zygoapophyseal joint
- De Vlam demonstrated association between zygoapophyseal fusion and classic marginal syndesmophytes and “bulky” syndesmophytes where posterior fusion had not occurred(6)

Psoriatic Syndesmophytes



MRI Imaging

- MRI may have advantage of detecting abnormalities earlier than plain radiography
- Response to treatment and disease activity may be measured before structural damage occurs.



52 year old male with psoriasis
T1 fat sat post gad: enhancement demonstrating **periostitis** of proximal phalanx
Radiograph 2 months later: No evidence of periostitis (7)

Uses of MRI Imaging

- MRI enhancement has been used to measure synovial vascularity in RA wrist following initiation of therapy
- Same approach employed in PsA trials with antitumor necrosis factor (infliximab) (5)
 - Reduced enhancement parallels reduced inflammation

Ultrasonography

- Can be used to assess disease activity in inflammatory joint disease
- Assess synovial tissue, joint effusions, erosions, hyperemia (with doppler), tenosynovitis and enthesitis (identified at Achilles tendon by U/S in much higher frequency than on clinical exam, however U/S findings are nonspecific and can be seen with OA, RA and PsA) (5)

Summary

- Clinical findings
- Pathophysiology of Radiographic features
- Disease processes of the synovium and enthesis
- Small Joints of the Hand and Foot
- Spondylitis, Sacroiliitis

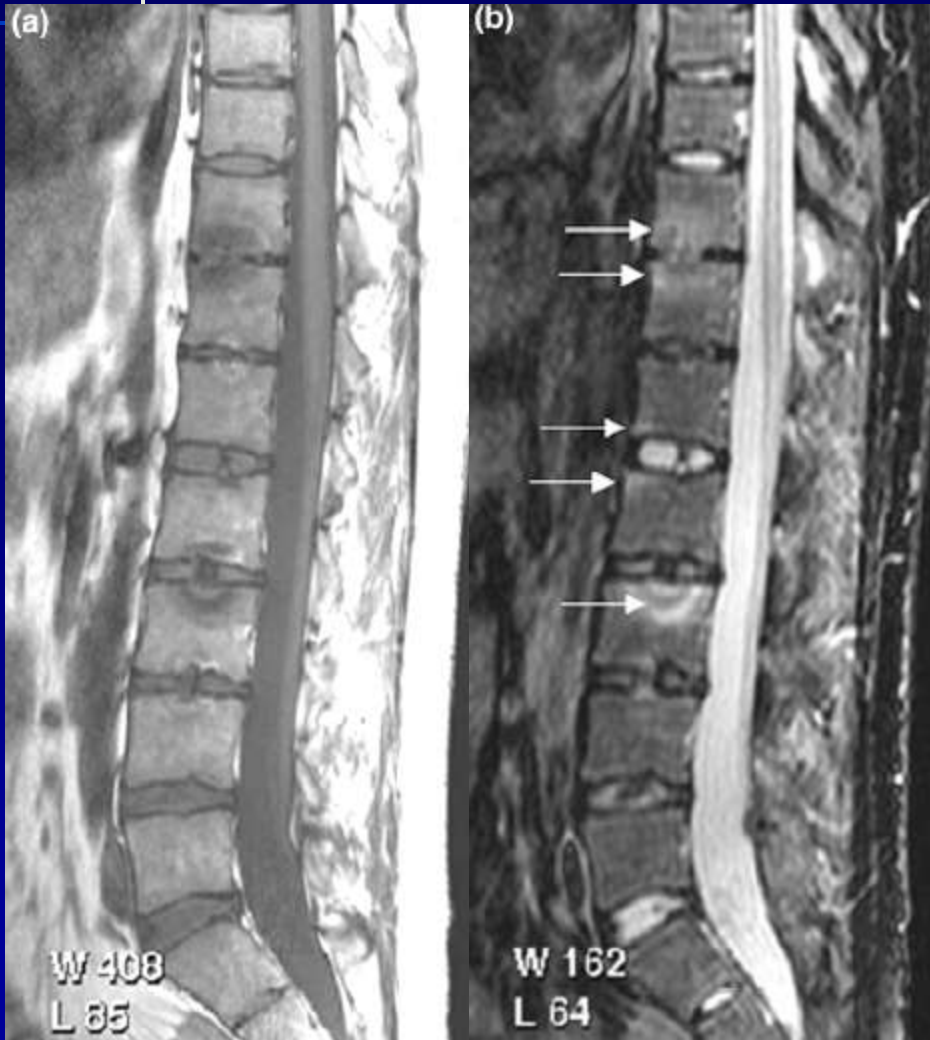
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Spinal Involvement

- Spondylitis, may be difficult to distinguish from ankylosing spondylitis
- Syndesmophytes (bony outgrowths) in both

Spinal Involvement



T1 and STIR

active inflammation (arrows)

Anterior Spondylitis L1/L2

Inflammatory Anderson lesion
upper endplate of L3 (8)



Radiographic Features

- Asymmetric paravertebral ossification of thoracolumbar junction (from vertebral body to body vs AS, corner to corner)
- Sacroiliitis usually bilateral (more asymmetric vs Ank spond)

Seronegative Spondyloarthropathies vs. Rheumatoid arthritis

- Synovial articulations:
 - 1. Absence of periarticular osteoporosis
 - 2. Intr-articular bony ankylosis
 - 3. Bony proliferation (Whiskering: irregular excrescences and Periostitis of shafts in small bones of the hands and feet) in seronegative arthropathies.
(Resnick)



Radiographic Features

- Usually no osteoporosis (unlike RA)
- Severe joint space loss
- Sausage digit: soft tissue swelling of entire digit
- Ankylosis: most common in the hands and feet (10%)

Periosteal Bone Apposition causing widening of affected bones



4th and 5th
DIP affected

widening
multiple
phalanges

Radiographic Assessment

- Radiographic features of PsA
 - Soft tissue swelling
 - Relative lack of periarticular osteopenia
 - Erosions and joint space narrowing
 - Pencil-in-cup of DIPs
 - Bone proliferation common, including peri-articular and shaft periostitis
 - Ankylosis (most common hands and feet)
 - Osteolysis of digit tufts

MRI Imaging

- An international Outcome Measures in Rheumatologic Clinical Trials (OMERACT) MRI in working group has been developing scoring system to assess synovitis, bone edema, and erosions in hands and wrists.
- Since pts with Psa share same clinical features as pts with RA, this MRI scoring system may have potential outcome measure in pts with PsA

3. Psoriatic arthritis

= rheumatoid variant / seronegative
spondyloarthropathy; peripheral manifestation in
monarthritis / asymmetric oligoarthritis / symmetric
polyarthritis

Target areas: all hand + wrist joints (commonly
distal); bi- / unilateral asymmetric
polyarticular changes

- √ "mouse ears" marginal erosions
- √ intraarticular osseous excrescences
- √ new bone formation ± fusion
- √ osteoporosis may be absent

Conclusions:

- Distribution of psoriatic arthritis is variable, a polyarticular disorder of the synovial joints of the axial skeleton with prominent involvement of the of the interphalangeal articulations of the hand and foot, combined with synovial and cartilagenous joints of the axial skeleton and entheses of the axial and appendicular skeleton is distinctive.
(Resnick)

Ivory Phalanx



Seronegative Spondyloarthropathies vs. Rheumatoid arthritis

- Sites of tendon and ligament attachments to bone: inflammatory enthesopathy leading to osseous destruction and repair is characteristic of the spondyloarthropathies (Resnick)
- Enthesopathy- derived from Enthesis
- Enthesis- site of ligamentous or tendinous attachment to bone





Pencil in Cup Deformity



Sausage Digit



Marginal Bony Erosions, Subchondral Cysts and Narrowing of Joint Space Narrowing

Pannus destruction of unprotected bone at joint margins (marginal erosions)

Pannus destruction of subchondral bone (erosions and subchondral cyst formation)

Pannus destruction of cartilage (narrowing of joint space)



Seronegative Spondyloarthropathies vs. Rheumatoid arthritis

- Cartilagenous joints: extent of osseous erosion and bone proliferation in seronegative arthropathies. (Resnick)

Outline

- Pathogenesis
- Manifestations
 - hand,
 - foot
 - calcaneus
 - SI
 - spine
- MRI