Approach to the Patient with Multiple Aches and Pains

SPEAKER
Peng Thim Fan, MD, FACP

Learning Objectives

• Recognize the importance of pathophysiology in understanding rheumatic disease – target tissue and characteristic joint distribution
• Distinguish inflammatory from non-inflammatory (degenerative) arthritis and non-articular (soft-tissue) rheumatic conditions.
• Discuss the role of laboratory and imaging studies in rheumatologic diagnosis
• Review the features that distinguish fibromyalgia from other rheumatic diseases

Prevalence of Diagnosed Musculoskeletal Disorders

- Degenerative: Osteoarthritis
- Inflammatory: Rheumatoid arthritis, Spondyloarthritis
  - Psoriatic arthritis
  - Ankylosing spondylitis
- Non-articular: Fibromyalgia

*Data updated 2008
Two Pragmatic Principles for Recognizing Arthritis

I. Every arthritis has a specific target tissue:
   - Osteoarthritis: articular cartilage
   - Rheumatoid arthritis: synovium
   - Spondyloarthritis: enthesis
   - Fibromyalgia does NOT have a target tissue

II. Every arthritis has a specific pattern of joint distribution:
   - Osteoarthritis (OA): symmetrical pattern involving mechanical degradation of hyaline cartilage
   - Rheumatoid arthritis (RA): symmetrical synovitis
   - Spondyloarthritis (SpA): asymmetric inflammation of enthesis and synovium
Normal

- Normal Cartilage

- Note the smooth surface of the articular cartilage and uniform staining of the matrix with healthy embedded chondrocytes.
- There are no blood vessels in the cartilage; nutrients are supplied by diffusion from bone.

Osteoarthritis

- Osteoarthritis Cartilage – Early
- Fibrillation and Loss of Matrix

- Normal Osteoarthritis
- Prevalence of Radiological OA in a Dutch Population

Osteoarthritis Cartilage – Late
Deep Clefts in the Cartilage and Bone Hypertrophy

Joints Commonly Involved in Osteoarthritis

Osteoarthritis Late
Complete Loss of Cartilage

Note asymmetric cartilage loss

Osteoarthritis: Cervical Spondylosis

Disc space narrowing at C5-6 and C6-7
Neuroforaminal narrowing by encroaching osteophytes
Osteoarthritis: Heberden’s Nodes

Two bony prominences at the DIP joint; note irregular joint space narrowing and marginal osteophytes.

Osteoarthritis: Bouchard’s Nodes

Note bony enlargement of the PIP joints; she also has Heberden’s nodes.

Osteoarthritis

First Carpometacarpal Joint

Osteoarthritis: Hands
Genetics of Osteoarthritis

Sisters of women with Heberden’s nodes were 3x as likely to have generalized osteoarthritis as those in the general population: Stecher, 1941

Heberden’s and Bouchard’s nodes

Osteoarthritis: Effect of Disuse

Patient with multiple sclerosis: left hemiplegia for 30 years
Note absence of bony changes in the left hand

Chopstick Arthropathy

OA of the IP joint of the thumb and the second and third PIP and MCP joints.

Chopstick Arthropathy

OA of the IP joint of the thumb and the second and third PIP and MCP joints.

Osteoarthritis: Lumbar Spine

Acute back pain with stooping
Disc space narrowing and vacuum disc at L4-5 with Grade I spondylolisthesis

Osteoarthritis: Lumbar Spine

Acute back pain with stooping
Disc space narrowing and vacuum disc at L4-5 with Grade I spondylolisthesis
Osteoarthritis: Spinal Stenosis

CT Scan of the lumbar spine showing encroachment of degenerative disc material into spinal canal.

Pathoanatomy of Neurogenic Claudication
Dimensions of Spinal Canal, Lateral Recess, and Neural Foramina

- Increase in Flexion
- Decrease in Extension

Clinical Presentation of Lumbar Spinal Stenosis Syndrome and Neurogenic Claudication

- Extension provokes symptoms
- Pain/weakness in the legs
- Patients lean forward while walking to ambulate more comfortably
- Sitting relieves symptoms

Osteoarthritis: Hip

Suspect hip osteoarthritis if internal rotation <24 degrees and groin symptoms

**Osteoarthritis: Hip**

Progressive loss of superior cartilage and femoral head deformity

**Osteoarthritis: Cam-type deformity in young men**


**Osteoarthritis: Knee**

Tri-compartmental cartilage degeneration: Note irregular bare areas with exposed bone

**Asymmetric Cartilage Loss in OA of the Knee**

Asymmetric joint space narrowing causing varus or valgus deformity
Osteoarthritis of the Knees

Both valgus and varus alignment abnormalities are the principal factor in progression; nullifies effect of weight reduction. Even minor alignment changes are important.

- Felson D. Arth Rheum 2/13

Hallux Rigidus and Hallux Valgus Deformity in OA

Degenerative changes are confined to the first MTP joint

Bunion and Overlapping Toes in OA

Erosive Osteoarthritis

Note "gull-wing" appearance of the PIP joint
Inflammatory OA: Calcium Pyrophosphate Deposition Disease: CPPD

A common cause of inflammatory reaction in an osteoarthritic joint

Charcot Arthropathy

A 50-year-old Man with Painful Knuckles

Note joint space narrowing and osteophytes at the MCP joints
A 50-year-old Man with Painful Knuckles

- Serum iron = 75 µg/dL (50-160)
- Iron saturation = 23% (15-50)
- TIBC = 328 µg/dL (300-360)
- Ferritin = 1081ng/mL (27-360)
- ESR = 11 mm/hour, C-Reactive Protein negative
- Liver function tests elevated 1.5 normal
- Positive homozygous C282Y mutation

- Diagnosis: Hemochromatosis

“Iron Fist” Sign of Hemochromatosis Arthropathy

Typical involvement of 2nd and 3rd MCP joints

Osteoarthritis

- No systemic symptoms
- Morning stiffness under 30 minutes
- ESR and C-reactive protein are normal
- Very uncommon in patients under 40 except for trauma or certain inherited patterns
- No pathognomonic serologic test for OA

Rheumatoid arthritis
**RA: Proliferative Synovium with Invasion of Cartilage and Bone**

Note synovial proliferation and reduplication with intense lymphoid activity.

**Difference between Normal Joint and Joint Affected by Rheumatoid Arthritis**

- **Normal Joint**
  - Muscle
  - Cartilage
  - Tendon
  - Bone
  - Synovium
  - Joint Capsule
  - Synovial Fluid

- **Joint Affected by RA**
  - Bone Loss/Erosion
  - Cartilage
  - Inflamed Synovium
  - Swollen Joint Capsule

- Swelling is confined to the area of the joint capsule
- Synovial thickening feels like a firm sponge

Adapted from US Department of Health and Human Services Handout on Health. Publication 04-4179.
Principle

- Every arthritis has a specific pattern of joint distribution:
  - Osteoarthritis: symmetrical pattern involving mechanical degradation of hyaline cartilage
  - Rheumatoid arthritis: symmetrical synovitis

Rheumatoid Arthritis: Joint Distribution

- Symmetric polyarthritis
- Corresponds to the distribution of synovial lined joints
- Note absence of axial involvement except at C1-2

Early RA: Symmetrical Synovitis

Note fusiform swelling of the PIP joints and less obvious swelling of the MCP joints and wrists
The DIP joints are not affected

Radionuclide Scan in Early RA

Note intense symmetric uptake at the PIP, MCP joints and wrists
Note sparing of the DIP joints
Early RA Clinics

- Evaluation of patients with disease duration initially 6 months or less, then 3 or less

- Criteria for rapid referral:
  - 3 or more swollen joints
  - MCP or MTP joint involvement
  - Morning stiffness over 30 min

- Current European clinics: Smolen, Austria
- Leiden group over 2000 patients


RA: Atlantoaxial Subluxation

Separation of the posterior surface of the atlas and the anterior surface of the odontoid process exceeds 3 mm
Overlapping bony rings compromise the spinal cord

RA: Finger Deformities

Deformity of the fingers caused by weakness of the intrinsic muscles and slippage of ligaments

RA: Hand Deformities

Collapse of the thumb, ulnar deviation and muscle atrophy
RA: Wrist
Wrist synovitis restricts extension with weakening of grip and trapping of the median nerve causing carpal tunnel syndrome.

RA: Extensor Tendon Rupture
Painless rupture of extensor tendon typically in the morning.

RA: Knee Swelling and Popliteal Cyst
Dissection of Popliteal Cyst; Rupture causes pseudo-thrombophlebitis.

RA: Feet
Metatarsalgia, Callus Formation and Subluxation.
RA: Foot Deformities

Collapse of arches and overlapping toes

Rheumatoid Nodules

Prominent and Subtle painless rheumatoid nodules

The Value of X-rays in Rheumatoid Arthritis

- For a Symmetric polyarthritis that satisfies ARA Criteria for rheumatoid arthritis:
  - Perform X-rays of the hands and feet
  - Repeat them at 1 year or sooner if the disease is not controlled

Early x-rays are normal

Radiographic Progression of Joint Erosions

6 months: cystic erosions at scaphoid
1 year: more extensive erosions
Rheumatoid Arthritis

Early erosion at the tip of the ulnar styloid

How fast is joint damage progressing?

- A. Soft-tissue swelling, no erosions
- B. Thinning of the cortex on the radial side and minimal joint space narrowing
- C. Marginal erosion at the radial side of the metacarpal head with joint space narrowing

Successive x-rays taken 9 months apart

In ACR Clinical Slide Collection, 1997.

Rheumatoid Arthritis

- Frequency distribution of erosions in the foot

Arthritis Care Res 2008;59:1729

25% of Patients in an Early Arthritis Clinic Already Had Erosions at the First Visit

- Duration of Symptoms
- Erosions Present

474 patients seen in an early RA clinic; 141 had definite or probable RA

Joint Erosions Occur Early in Rheumatoid Arthritis


Magnetic Resonance Imaging as a Diagnostic Tool


MRI Scan of the MCP Joints as an Index of Disease Progression in RA

An MRI of metacarpophalangeal joints 2-5 shows synovial hypertrophy and flexor tenosynovitis

MRI scan of the feet in Early RA

High sensitivity: 97% synovitis, 80% erosions

Erosions at 5th MTP
MRI scans of the wrist, taken when patients first present with RA, can predict radiographic erosions at two years. McQueen F, et al. Ann Rheum Dis 2001;60:859-868

Diagnosis of RA: Utility of Ultrasonography

RA Patient

Healthy Subject

* Erosion; mc = metacarpal head; ph = phalanx

Diagnosis of RA: Utility of Ultrasonography – Power Doppler Measures Vascularity

*AOM: Area of Measurement
*AOC: Area of Calibration

Progression of Rheumatoid Arthritis

Early Intermediate Late

RA: Severe Hand Deformity

Radiographic progression correlates well with deformities and disability

Useful Tests in Inflammatory Arthritis

- ESR and CRP reflects general systemic inflammation
- Rheumatoid factor is positive in 80% of RA patients
- Anti-CCP antibody is positive in 70+% of RA patients
- ANA needs to be interpreted with great caution in patients with musculoskeletal pain.
  — It does NOT imply a diagnosis of SLE


Anti-CCP Antibody
(cyclic-citrullinated peptide)

- A better and more specific assay than RF
- Sensitivity 60-70 (66.4)%, specificity >100(98.3)% (active TB – 7-39%)
- Present in early and preclinical disease (up to 14 years)
- Correlates with increased risk for progressive joint damage
- Does not correlate with fluctuation of RF


Seronegative spondyloarthropathy:
ankylosing spondylitis, psoriatic arthritis

Principle

- Every arthritis has a specific target tissue:
  — Osteoarthritis: articular cartilage
  — Rheumatoid arthritis: synovium
  — Spondyloarthritis: enthesis
Spondyloarthritis

- Ankylosing spondylitis
- Psoriatic arthritis
- Reactive arthritis
- Arthritis of inflammatory bowel disease
- Characteristics:
  - Negative rheumatoid factor
  - Spinal involvement and sacroiliitis
  - Asymmetric oligoarthritis
  - Sausage digits

Family of Spondyloarthropathies

- Axial involvement: shoulders and hips are included
- Common targets highlighted
- Pattern is symmetrical in ankylosing spondylitis and asymmetric in psoriatic arthritis
Enthesopathy

Bone

Inflammatory cells

Ligament

Spinal Ligaments

Enthesal inflammation at the ligaments is the principal cause of spinal symptoms

Principle

• Every arthritis has a specific pattern of joint distribution:
  — Osteoarthritis: symmetrical pattern involving mechanical degradation of hyaline cartilage
  — Rheumatoid arthritis: symmetrical synovitis
  — Seronegative spondyloarthritis: asymmetric inflammation of enthesis and synovium

Spinal Inflammation

Limited flexion. Thermogram shows increased spinal temperature
**Spinal Inflammation**

- Restricted lateral flexion and pectoral muscle wasting

**When Should You Suspect Inflammatory Back Pain?**

- Young male
- Morning stiffness greater than 30 minutes
- Back pain is worse with rest and better with movement
- Unable to sleep through the night: usually awakens in the early hours of the morning
- Alternating buttock pain but no true radicular symptoms


**Sacroiliitis**

- Sclerosis, irregular joints and pseudowidening

**Sacroiliac Joint Fusion**

- Fusion of sacroiliac joints in late sacroiliitis
MR Imaging of Sacroiliac Joints:  
Most Sensitive Way to Detect Sacroiliitis: nr-axSpA

X-rays show normal sacroiliac joints  
White areas on STIR indicate bone marrow edema

Progression of nonradiographic axial SpA: 6.4% in 5 years, 17.3% at 10 years, 26.4% at 15 years. Wang 2015 SPARTAN

Spinal Fusion: Syndesmophytes

Spinal Fusion: Syndesmophytes

Squaring of the vertebral bodies  
Syndesmophytes

The Bamboo Spine

Complete fusion of the spine
Spinal Immobility in a woman

Complete fusion of axial skeleton with poor posture

Stephen Lewis, orthopedic surgeon. Toronto Western Hospital and Hospital for Sick Children

Gender differences in ankylosing spondylitis

- Delayed diagnosis
- High disease burden
  - Enthesitis
  - Psoriasis
  - Inflammatory bowel disease
- Lower risk of uveitis
- Males higher radiological damage and progression

- Females more atypical presentations
- Non-radiographic axial SpA show the same frequency
- Less responsiveness to treatment with TNF inhibitors


Diffuse idiopathic skeletal hyperostosis

Peripheral Arthritis: Enthesopathy

Inflamed Achilles tendon on the left
Peripheral Arthritis: Enthesopathy

Sites of enthesial inflammation

Peripheral Arthritis: Enthesopathy

Regions of tenderness

Peripheral Arthritis: Enthesopathy

Note sclerosis, fluffy periostitis and new bone formation

RA Symmetrical Synovitis
Peripheral Arthritis: Asymmetry

Rheumatoid Arthritis: Synovitis

PsA: The Sausage Digit

Dactylitis caused by ligamentous inflammation

PsA: The Sausage Digit
PsA: Arthritis Mutilans

Note dystrophic nails and telescoping of digits

Psoriasis: Nail Pitting, Onycholysis

Variants of Psoriasis

- Plaque Psoriasis
- Guttate Psoriasis
- Scalp Psoriasis
- Palmar-Plantar Psoriasis
- Erythrodermic Psoriasis
- Inverse Psoriasis “pinking”

What Distinguishes Psoriatic Arthritis from Rheumatoid Arthritis?

- Asymmetry
- Spine involvement
- Sausage digits
- Absence of nodules
- Psoriasis may be subtle and easy to miss
**Fibromyalgia**

- A clinical syndrome characterized by chronic widespread pain and tenderness to palpation at specific body sites.
- Fibromyalgia has no target tissue but an easily recognizable clinical presentation.

**The Paradox of Fibromyalgia: No Target Tissue**

- Normal passive range of joint motion
- Minimal mechanical disability
- Absence of muscle weakness or atrophy
- Normal ESR
- Normal radiographs, electromyogram, etc.

**Fibromyalgia More Prevalent than Rheumatoid Arthritis**

[Graph showing number of patients in millions for OA, FM, and RA in the US]
ACR Fibromyalgia Criteria

- From History: widespread pain of 3 months duration
- From Examination: tender points defined by digital palpation with a force of 4 kg pain experienced in at least 11 of 18 tender point sites


Map of 18 Possible Tender-Points in Fibromyalgia

The Tender Point: Key to Fibromyalgia Diagnosis

- Excessively tender, discrete area of soft tissue
- Palpated with thumb or first two fingers
- Palpation pressure: ~4 kg/cm, enough to whiten nail

Tender-Point Palpation: IV. Neck and Chest
- Lower sternomastoid
- Second costochondral junction

Tender-Point Palpation: II. Upper Back
- Mid upper trapezius
- Origin of supraspinatus

Tender-Point Palpation: V. Arms
- Lateral epicondyle

Tender-Point Palpation: III. Lower Back
- Upper outer buttock quadrant
Tender-Point Palpation:
VI. Legs

- Prominence of greater trochanter
- Medial fat pad of the knee

Fibromyalgia Patients Have Widespread Somatic Symptoms

<table>
<thead>
<tr>
<th>Criterion</th>
<th>% Positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Widespread Pain</td>
<td>97.6</td>
</tr>
<tr>
<td>Tenderness 11 of 18 tender points</td>
<td>90.1</td>
</tr>
<tr>
<td>Fatigue</td>
<td>81.4</td>
</tr>
<tr>
<td>Morning stiffness &gt; 15 minutes</td>
<td>77.0</td>
</tr>
<tr>
<td>Sleep disturbance</td>
<td>74.6</td>
</tr>
<tr>
<td>Parasthesias</td>
<td>62.8</td>
</tr>
<tr>
<td>Headache</td>
<td>52.8</td>
</tr>
<tr>
<td>Anxiety</td>
<td>47.8</td>
</tr>
<tr>
<td>Dysmenorrhea</td>
<td>40.6</td>
</tr>
<tr>
<td>Sicca symptoms</td>
<td>35.8</td>
</tr>
<tr>
<td>Prior depression</td>
<td>31.5</td>
</tr>
<tr>
<td>Irritable bowel syndrome</td>
<td>29.6</td>
</tr>
<tr>
<td>Urinary urgency</td>
<td>26.3</td>
</tr>
<tr>
<td>Raynaud's phenomenon</td>
<td>16.7</td>
</tr>
</tbody>
</table>

Syndromes That Overlap with Fibromyalgia

The neurologist sees chronic headache, the gastroenterologist sees IBS, the otolaryngologist sees TMJ syndrome, the cardiologist sees costochondritis, the rheumatologist sees fibromyalgia, and the gynecologist sees PMS.

Conclusions

- Examine the whole patient
- Identify the target tissue and joint distribution
- Recognize synovitis
- Interpret laboratory studies in the context on the clinical picture
ASK QUESTIONS USING OUR NEW SOCIAL Q&A FEATURE!

Navigate to www.west.cnf.io