Physical diagnosis of musculoskeletal system

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Evaluation of patients with musculoskeletal complaints

- Anatomic localization of the complaint
  - articular or nonarticular
- Determination of the nature of the pathological process
  - inflammatory or non-inflammatory
- Determination of the extent of involvement
  - Monartricular, polyarticular
- Determination of chronology
  - Acute or chronic
- Consider the most common disorders first
- Differential diagnosis
Articular or nonarticular pain

• **Articular** (structures: synovium, synovial fluid, articular cartilage, intraarticular ligaments, joint capsule, and juxtaarticular bone)
  – Deep or diffuse pain
  – Pain or limited range of motions on active and passive movement
  – Swelling (synovial proliferation, effusion or bone enlargement)
  – Crepitation (a palpable vibratory or cracking sensation elicited with joint motion, that indicates advanced cartilaginous and degenerative changes), instability, deformity

• **Non- or periarticular** (extraarticular ligaments, tendons, bursae, muscle, bone, nerve, and overlying skin)
  – Painful on active, but not passive range of motion
  – Focal tenderness in region adjacent to articular structure
  – Seldom swelling, crepitus, instability, or deformity
Inflammatory or non-inflammatory

• Inflammatory may be:
  – Infectious (Neisseria gon, Mycobacterium tuberculosis)
  – Crystal-induced (gout, pseudogout)
  – Immune-related (rheumatoid arthritis, SLE)
  – Reactive (rheumatic fever)

• Signs of inflammation
  – Erythema, warmth, pain, swelling
  – Systemic symptoms (fatigue, rash, fever, weight loss)
  – Laboratory evidence of inflammation
  – Morning stiffness is precipitated by prolonged rest, last for hours, and may improve with activity.
Non-inflammatory conditions (such as osteoarthritis)

- the stiffness last <60 min
- the complaints are exacerbated by activity
- the symptoms are related to the trauma (rotator cuff tear), or repetitive use (tendinitis, bursitis)
- The disorders are often characterized by pain without swelling or warmth, absence systemic features.
The extent of the involvement

- The articular disorders are classified based on the number of joints involved:
  - Monarticular (one joint)
  - Oligoarticular (two or three joints): crystal-induced arthritis and infectious arthritis
  - Polyarticular (more than three joints):
    - rheumatoid arthritis - symmetric
    - Osteoarthritis, spondylarthropathies - asymmetric
Identification of the landmarks of the shoulder

- Manubrium of the sternum
- The sternoclavicular joint
- The clavicle
  - With your finger trace the clavicle laterally (medial two thirds is convex, lateral third is concave)
  - From behind follow the bony spine of the scapula laterally and upward until it becomes acromion, the summit of the shoulder
  - With the index finger on top of acromion, just behind its tip, press medially to find the slightly elevated ridge that marks the acromioclavicular joint
  - From the top of the acromion again, move your finger laterally and down a short step and you will find the next bony prominence, the greater tubercle of humerus
  - Now sweep your finger medially a few centimetres and you will feel a large bony prominence, the coracoid process of the scapula
The normal range of motion at the shoulder

180° forward flexion

90° 90° External rotation

180° Abduction

90° Internal rotation

50° extension

50° Adduction

Abduction:: Movement of the arm at the glenohumeral joint, and movement of the shoulder girdle (clavicle and scapula) in relation to the thorax
Physical examination of the shoulder

• Ask the patient to
  – raise both arms to a vertical position at the sides of the head
  – place both hands behind the neck, with elbows out to the side (external rotation and abduction)
  – place both hands behind the back (internal rotation)

• Inspection: note any swelling, deformity, or muscular atrophy

• Palpation:
  – The sternoclavicular joint
  – The acromioclavicular joint
  – The subacromial area
  – The bicipital groove (rotate the arm externally and find the tendinous cord that runs just medial to the greater tubercle. This is the tendon of the long head of the biceps)
The most common cause of shoulder pain is rotator cuff tendinitis

- When the arm is raised, the rotator cuff may impinge against the under surface of the acromion and the coracoacromial ligament.
- Repeated impingement, as in throwing or swimming, can cause haemorrhage and oedema, followed by inflammation and fibrosis.
- Sharp catches of pain may occur as the arm is elevated into an overhead position.
- Acute, recurrent or chronic pain may result, aggravated by activity.
- The patients tend to be young, and are often athletically active.
The physical examination of the spine

Unusually prominent spinous process of CVII. and often Th1.

Identify the following landmarks:

1. Spinous processes (more evident on forward flexion)
   - Scoliosis – often becomes evident during adolescence
   – pain during percussion of spinous processes can indicate osteoporosis, malignancy, and infection involves the spine

2. The paravertebral muscles – spasm looks prominent, feels tight, and is usually tender

3. The iliac crest – unequal heights of the iliac crests suggest unequal lengths of the legs

A line between iliac crests crosses the spinous process of LIV.
Schoeber’s sign

Restricted flexion of lumbar portion of spine (spondylitis ankylopoetica)

At the bending forward position does not occur the normal lumbar kyphosis.
Lasegue’s sign

In case of low back pain that radiates down the leg, check straight leg raising on each side in turn.

Raise the patient’s relaxed and straightened leg until pain occur. Then dorsiflex the foot. (dorsiflexion increases the pain)

- Sharp pain radiating from the back down the leg in an L5 or S1 distribution (radicular pain) suggests compression of the nerve roots, often caused by a herniated lumbar disc.
• **Osteoarthritis** – a joint failure, a disease in which all structures of the joint have undergone pathologic change. The pathologic sine qua non of disease is hyaline articular cartilage loss, accompanied by increasing thickness and sclerosis of the subchondral bony plate, by outgrowth of osteophytes at the joint margin, by stretching of the articular capsule, by mild synovitis, and by weakness of muscles bridging the joint.

  – Involvement of peripheral joints – polyarthrosis, polyarthritis
  – Involvement of the spine – spondylarthritis, spondylarthritis
Osteoarthritis (OA)

• OA was previously thought to be a normal consequence of aging
• It is now realized that OA result from a complex interplay of:
  – joint integrity
  – genetic predisposition
  – local inflammation
  – mechanical forces
  – cellular and biochemical processes
Risk factors and possible causes

• Age
  – Advanced age is one of the strongest risk factors associated with OA.
    • Prevalence of OA less than 0,1% in those aged 25 to 34 years old versus of over 80% percent in people over age 55

• Female gender
  – The relative risk of developing OA for women has been estimated to be 2,6
Risk factors and possible causes

• **Obesity**
  – Strong association between obesity and osteoarthritis of the knee

• **Lack of osteoporosis**
  – Positive association between BMD and the prevalence of osteoarthritis of knee and hip

• **Occupation** (carpenters, cotton workers, dock workers)
  – Mechanisms for the association may involve joint loading and repetitive damage over time. For example prolonged knee bending is a risk factor of OA of knee.
Risk factors and possible causes

• **Sports activity**
  – Boxing – carpometacarpal joints
  – Cycling - patellofemoral joints
  – Gymnastics - shoulders, wrists, and elbows
  – Soccer – hips, knees, ankles, cervical spine, and talar joints

• **Previous injury**
  – In patients with symptomatic OA of the knee some meniscal abnormality was present in 75 percent
• **Genetic factors**
  - Correlation of OA were consistently twofold higher in identical as compared to non-identical twins.
  - A mutation in the gene for a non-collagenous matrix protein, matrillin-3, segregated with hand OA in several families.
  - Nodal OA, characterized by Heberden’s nodes, Bouchard’s nodes is associated with HLA-A1 and HLA-B8 haplotypes.
  - Mutation of COL2A1 gene (on chromosome 12) associates with generalized osteoarthritis in studies.
Risk factors and possible causes

• Familial chondrocalcinosis
  – Inherited form of premature osteoarthritis
  – Calcium-containing crystals are deposited in joint tissue which progresses to severe degenerative osteoarthritis at an early age
  – Autosomal dominant mode of inheritance is observed (suspect genetic areas: chromosome 8q, chromosome 5p, point mutation in a type II procollagen gene

• Acromegaly
  – Associates with the development of secondary osteoarthritis, presumably due to the effects of elevated growth hormone levels on bone and cartilage
Types of osteoarthritis

• **Idiopathic OA:**
  – Localized form (1 or 2 joints), most commonly hands, feet, knee, hip, and spine
  – Generalized form consists of involvement of three or more joint sites

• **Secondary OA:** Specific conditions may cause or enhance the risk of developing osteoarthritis
  – Trauma
  – Congenital or developmental disorders
  – Calcium pyrophosphate dihydrate deposition disease
  – Other bone and joint disorders (RA, osteonecrosis, gout, septic arthritis, Paget’s disease)
  – Other diseases (diabetes mellitus, acromegaly, hypothyroidism)
Clinical diagnosis of osteoarthritis

- Presence of typical clinical symptoms
  - Joint pain, greater than 50 (40) years of age, morning stiffness less than 60 minutes

- Physical examination
  - Bony tenderness, bony enlargement, crepitus on active motion of the joint, no palpable warmth

- Laboratory features
  - ESR, rheumatoid factor titer, evaluation of synovial fluid

- Imaging features
# Clinical manifestations of osteoarthritis

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<tr>
<th>Topic</th>
<th>Description</th>
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<tr>
<td><strong>Age of onset</strong></td>
<td>Usually after age 40</td>
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<td><strong>Commonly affected joints</strong></td>
<td>Cervical and lumbar spine, first carpometacarpal joint, proximal interphalangeal joint, distal interphalangeal joint, hip, knee, subtalar joint, first metatarsophalangeal joint</td>
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<td><strong>Uncommonly affected joints</strong></td>
<td>Shoulder, wrist, elbow, metacarpophalangeal joint</td>
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<td><strong>Symptoms</strong></td>
<td>Pain, stiffness, gelling</td>
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<td><strong>Findings on physical examination</strong></td>
<td>Crepitus, bony enlargement, decreased range of motion, malalignment, tenderness to palpation</td>
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<td><strong>Synovial fluid analysis</strong></td>
<td>Clear fluid, WBC &lt;2000/mm³, normal viscosity</td>
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<td><strong>Radiographic features</strong></td>
<td>Joint space narrowing, subchondral sclerosis, marginal osteophytes, subchondral cysts</td>
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<td><strong>Patterns of presentation</strong></td>
<td>Monoarticular in young adult; oligoarticular, large-joint in middle age; polyarticular generalized; rapidly progressive; secondary to trauma, congenital abnormality, or systemic disease</td>
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<td><strong>Prognosis</strong></td>
<td>Variable, generally slowly progressive</td>
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This preoperative radiograph (x-ray) shows severe loss of cartilage affecting the medial compartment of the knee.

Plain radiograph of the right hip joint demonstrates marked joint space narrowing, sclerosis about opposing joint space margins, and periarticular osteophyte formation. These features are all characteristic of osteoarthritis.
Differential diagnosis

• Calcium pyrophosphate crystal deposition disease (CPPD)
  – Most commonly affected joints are the knees, followed by wrists, MCP joints, hips, shoulders, elbows, and spine. Such a distribution of affected joints strongly suggests CPPD and not OA

• Infectious monoarticular disease

• Rheumatoid arthritis