Osteoarthritis

LECTURE IN INTERNAL MEDICINE FOR V COURSE STUDENTS

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Plan of the Lecture

- Definition
- Epidemiology
- Risk factors
- Etiology
- Mechanisms
- Classification
- Clinical investigation
- Diagnosis
- Treatment
- Prognosis
- Prophylaxis
- Abbreviations
- Diagnostic and treatment guidelines

Osteoarthritis of the right hip with the sclerosis at the superior aspect of the acetabulum.

http://emedicine.medscape.com/article/330487-overview

Definition

Osteoarthritis (OA) is the most common type of joint disease, that can be thought of as a degenerative disorder arising from the biochemical breakdown of articular (hyaline) cartilage in the synovial joints, however, it involves not only the articular cartilage but the entire joint organ, including the subchondral bone and synovium.

http://emedicine.medscape.com/article/330487-overview

US MLE TEST

A 72-year-old man presents to his primary care physician for his annual exam. He has a very stoic personality and says that he is generally very healthy and has "the normal aches and pains of old age." On further probing, you learn that he does have pretty significant back and hip pain that worsens throughout the day. On physical exam you note bony enlargement of the distal interphalangeal joints bilaterally. Which of the following is the likely cause of his symptoms?

1. Gout, 2. Pseudogout, 3. Rheumatoid arthritis,
4. Osteoarthritis, 5. Osteopenia.

https://www.mommd.com/usmle1to10.shtml

US MLE TEST EXPLANATION

The correct answer is 4. This man has classic findings of osteoarthritis, which is characterized by DIP joint osteophyte/nodule formation.

Incorrect Answers:
1: Gout results in the painful swelling of a joint, most commonly the metatarsophalangeal joint that results from precipitation of monosodium urate crystals, 2: Pseudogout is similar to gout, but results from precipitation of calcium pyrophosphate crystals, 3: Rheumatoid arthritis is an autoimmune inflammatory disorder that most commonly affects the PIP joints. The symptoms of rheumatoid arthritis often improve throughout the day, 5: Osteopenia is the loss of bone density secondary to hormone-related calcium resorption that is especially common in postmenopausal women. It is otherwise asymptomatic but can predispose patients to fractures.

Epidemiology 1

- Internationally, osteoarthritis is the most common articular disease.
- On the basis of the radiographic criteria for osteoarthritis, more 50% of adults older than 65 years are affected by the disease.
- In individuals older than 55 years, the prevalence of osteoarthritis is higher among women than among men.

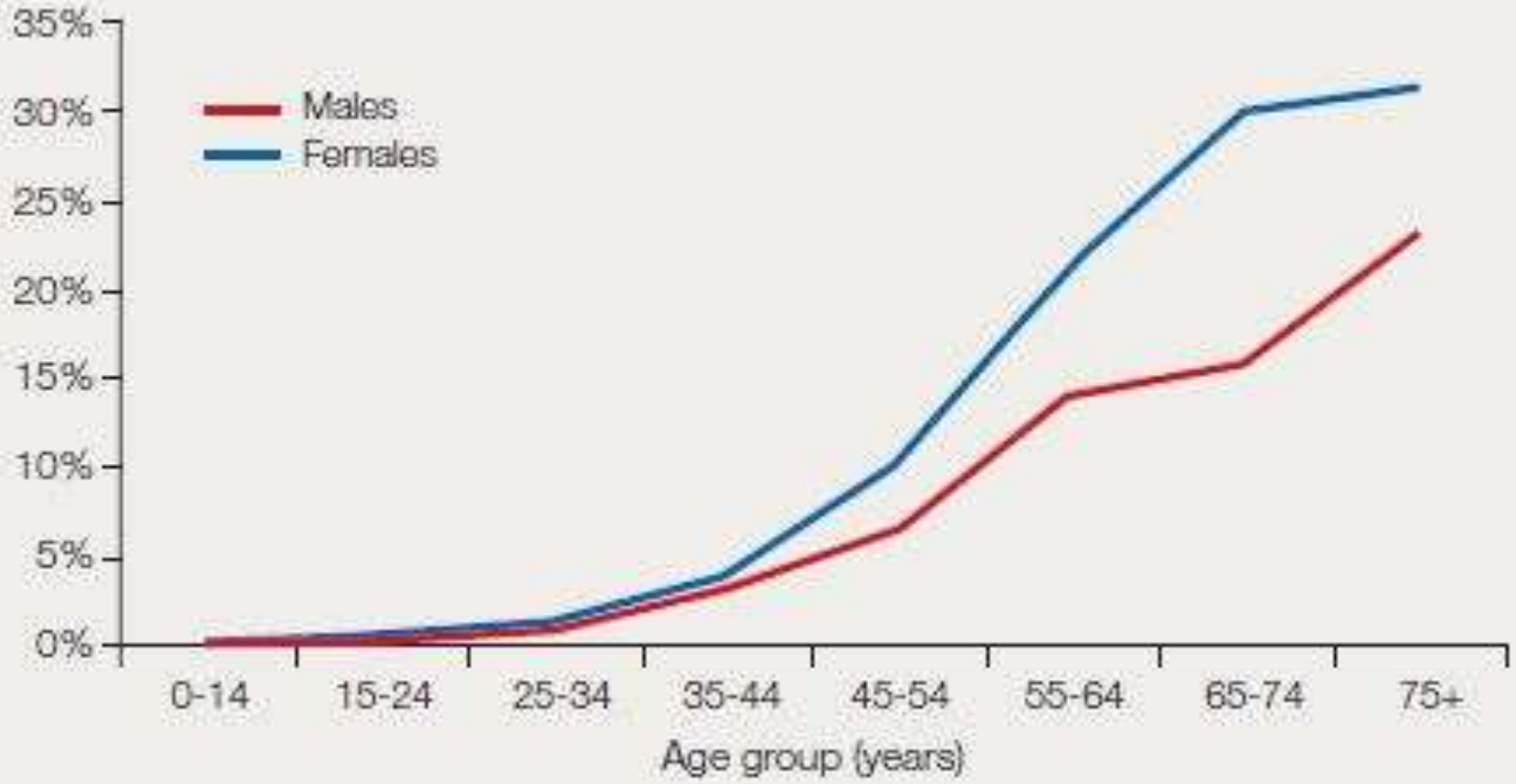
http://emedicine.medscape.com/article/330487-overview

Epidemiology 2

- Symptomatic knee osteoarthritis is extremely common in China.
- It is the leading cause of chronic disability in those older than 70 years, costing the US greater than $100 billion annually.

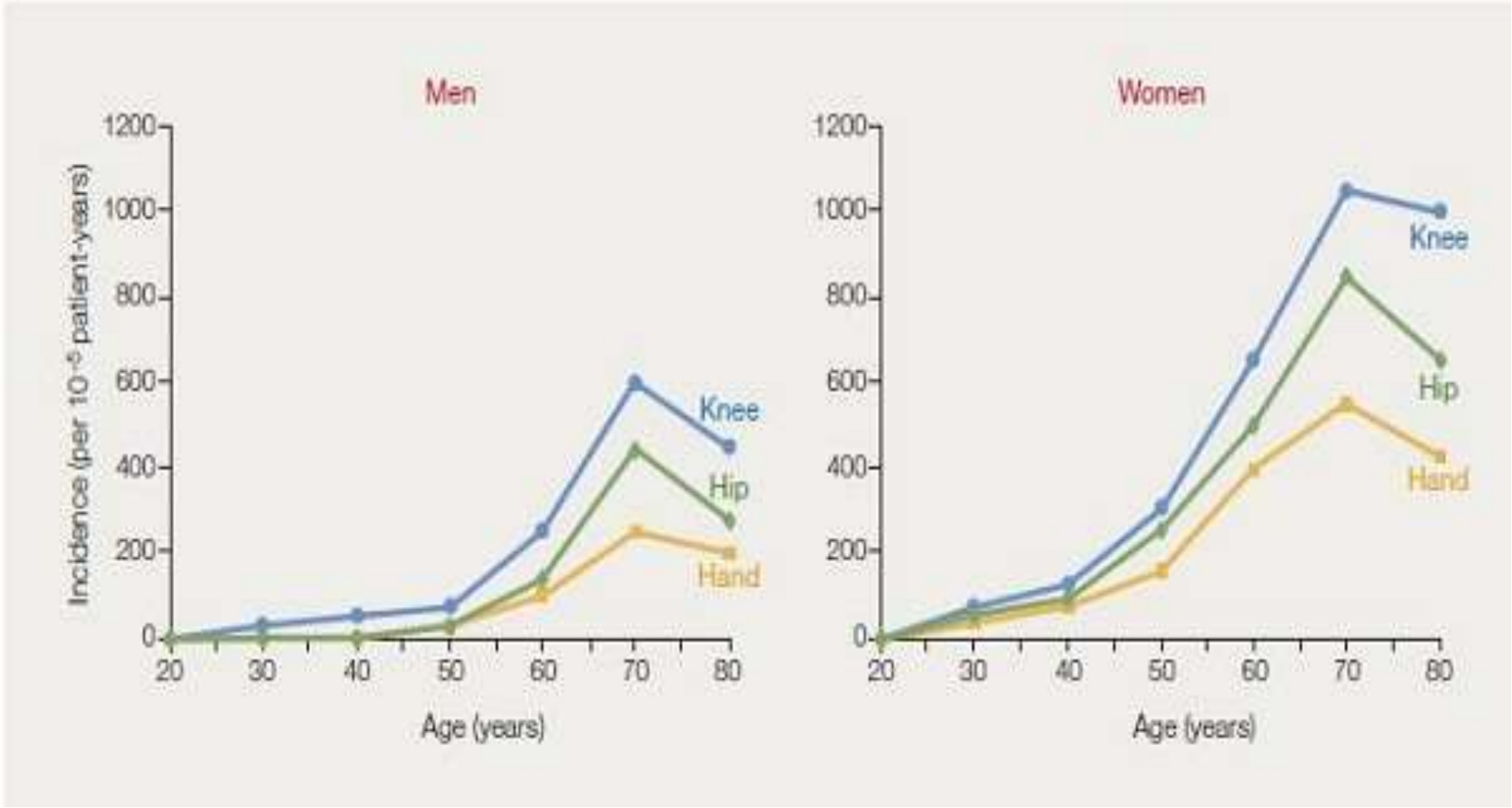
http://emedicine.medscape.com/article/330487-overview

Epidemiology
(Age-specific prevalence of osteoarthritis)



http://www.medicographia.com/wp-content/uploads/2013/07/12.jpg

Epidemiology
(Incidence of Clinical Osteoarthritis of the Hand, Knee, and Hip)



http://www.medicographia.com/wp-content/uploads/2013/07/12.jpg

Risk Factors 1

- AGE: symptomatic OA rise steeply after age 50 in men and age 40 in women.
- Sex: women are more likely to report pain in all affected joints, including the hip, than men.
- Obesity and metabolic disease.
- Local mechanical risk factors: a traumatic knee injury.
- Ethnicity and race: hip and hand OA are much less frequent among Chinese.

http://www.hopkinsarthritis.org/arthritis-info/osteoarthritis/oa-clinical-presentation/

Risk Factors 2

- Genetics: OA associated with a particular genetic syndrome, such as stickler syndrome or familial chondrocalcinosis.
- Nutrition (including vitamin D).
- Osteoporosis.
- Sarcopenia.
- Smoking.

http://www.hopkinsarthritis.org/arthritis-info/osteoarthritis/oa-clinical-presentation/

Etiology
(Primary and Secondary) 1

- Primary (in the absence of an extrinsic cause).
- Secondary:
  - Chondrocalcinosis,
  - Posttraumatic,
  - Metabolic bone disorders,
  - Hypermobility syndromes,

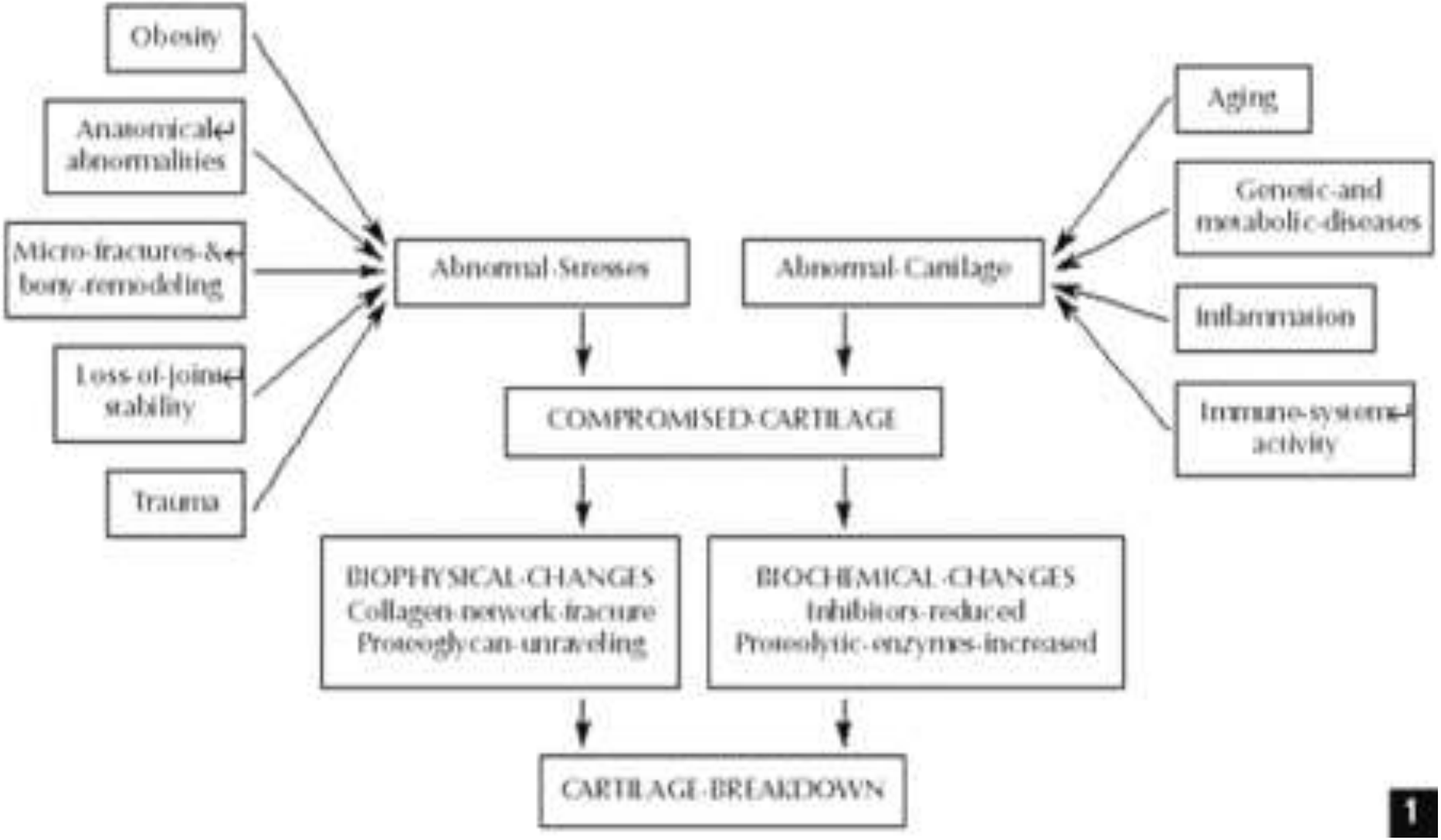
http://emedicine.medscape.com/article/330487-differential

Etiology
(Primary and Secondary) 2

- Secondary:
  - Neuropathic diseases,
  - Marfan syndrome
  - Obesity
  - Joint infection

http://emedicine.medscape.com/article/330487-differential

Risk Factors and Etiology
(Factors Involved in Osteoarthritis)



http://m3.wyanokecdn.com/80275454a68dea128abe5a23b2407ca8.gif

Mechanisms
(Onset) 1

- Cartilage is a unique tissue with viscoelastic and compressive properties which are imparted by its extracellular matrix, composed predominantly of type II collagen and proteoglycans.
- Under normal conditions, this matrix is subjected to a dynamic remodeling process in which low levels of degradative and synthetic enzyme activities are balanced, such that the volume of cartilage is maintained.

http://www.hopkinsarthritis.org/arthritis-info/osteoarthritis/oa-pathophysiology/

Mechanisms
(Onset) 2

- In OA cartilage, however, matrix degrading enzymes are overexpressed, shifting this balance in favor of net degradation, with resultant loss of collagen and proteoglycans from the matrix.
- Presumably in response to this loss, chondrocytes initially proliferate and synthesize enhanced amounts of proteoglycan and collagen molecules.

http://www.hopkinsarthritis.org/arthritis-info/osteoarthritis/oa-pathophysiology/

Mechanisms
(Progress) 1

- As the disease progresses, reparative attempts are outmatched by progressive cartilage degradation.
- Fibrillation, erosion and cracking initially appear in the superficial layer of cartilage and progress over time to deeper layers, resulting eventually in large clinically observable erosions.
- OA, in simplistic terms, therefore, can be thought of as a process of progressive cartilage matrix degradation to which an ineffectual attempt at repair is made.

http://www.hopkinsarthritis.org/arthritis-info/osteoarthritis/oa-pathophysiology/

Mechanisms
(Progress) 2

- OA and normal aging cartilage differ in the amount of water content and the in ratio of chondroitin-sulfate to keratin sulfate constituents, and degradative enzyme activity is increased in OA, but not in normal aging cartilage.
-

http://www.hopkinsarthritis.org/arthritis-info/osteoarthritis/oa-pathophysiology/

Mechanisms
(Role of Inflammation) 1

- Although synovial inflammation is present in OA, the inflammatory component is best appreciated at the molecular level and is characterized by the presence of a host of proinflammatory mediators, including cytokines and chemokines, that are part of an innate immune response to joint injury.
- MMPs and cytokines (e.g., interleukin – 1(IL-1)) appear to be important mediators of inflammation in OA.

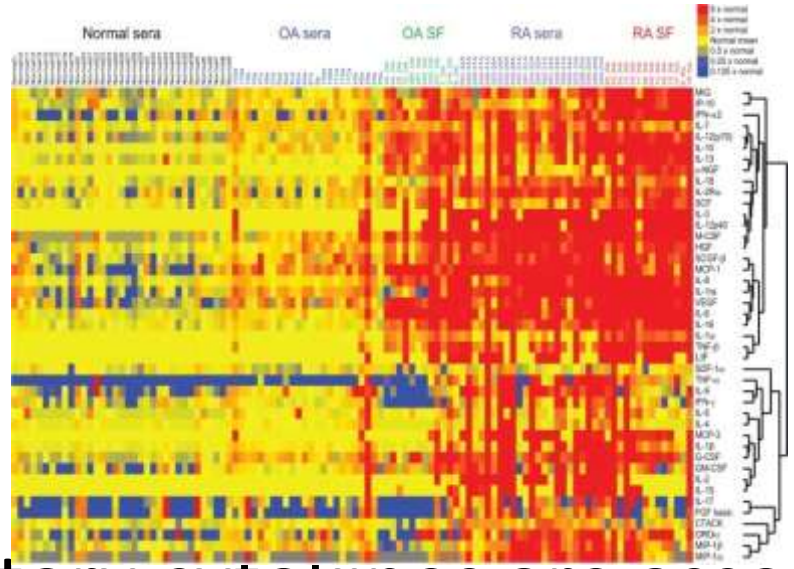
http://www.hopkinsarthritis.org/arthritis-info/osteoarthritis/oa-pathophysiology/

Mechanisms
(Role of Inflammation) 2

- However, classic cellular inflammation is not prominent in OA (the number of leukocytes in the joint fluid is normally low, and rarely exceeds 1000 to 2000 cells per milliliter), chronic low-grade inflammation is a major driver of ongoing JA joint degeneration.

http://www.hopkinsarthritis.org/arthritis-info/osteoarthritis/oa-pathophysiology/

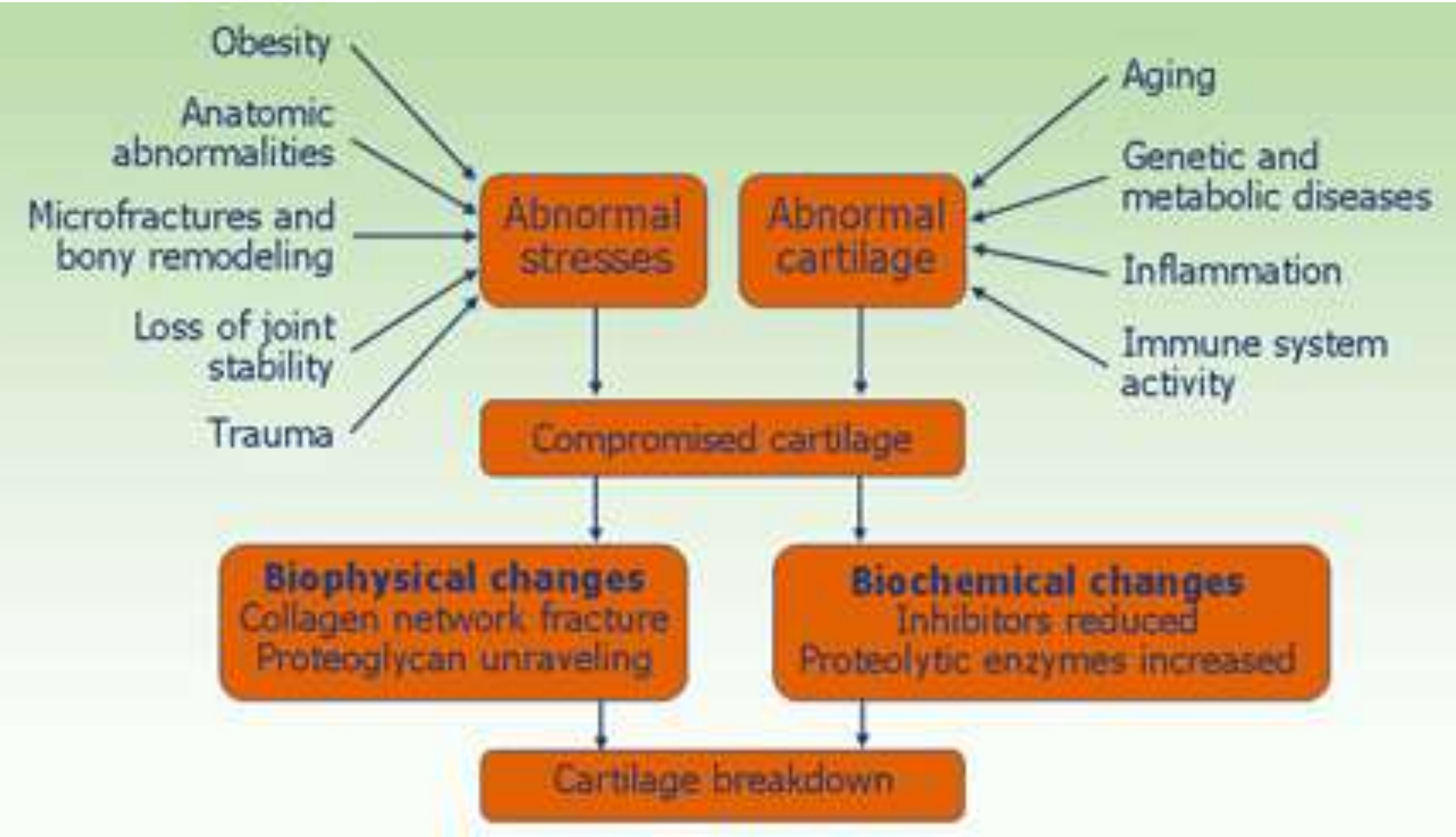
Mechanisms
(Role of Inflammation)



Inflammatory cytokines are associated with osteoarthritis. Relative cytokine levels in serum and synovial fluid (SF) samples from patients with osteoarthritis (OA) or rheumatoid arthritis (RA) and in serum samples from healthy individuals (normal sera).

http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3638313/

Mechanisms
(Pathogenetic Factors in Osteoarthritis)



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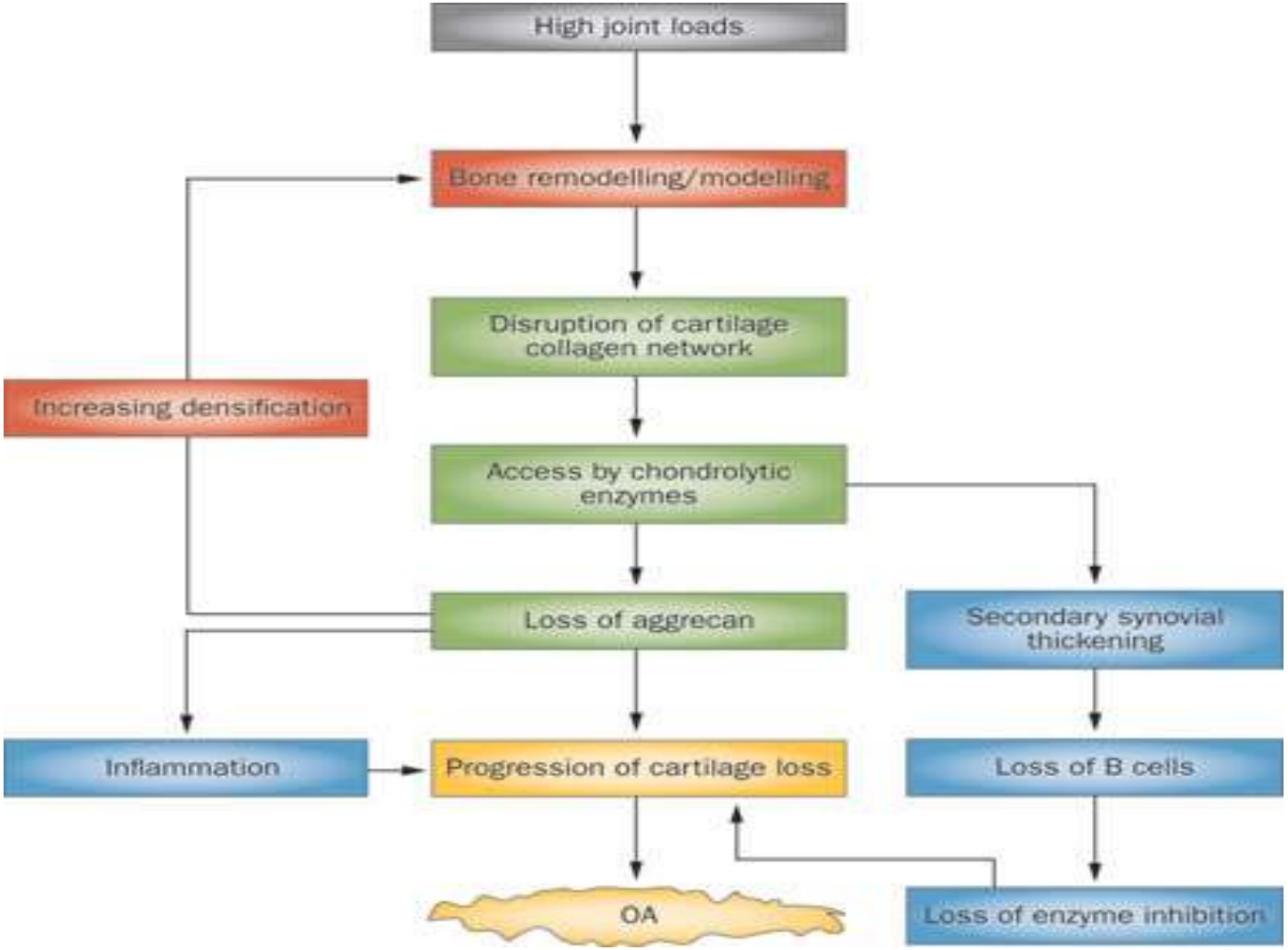
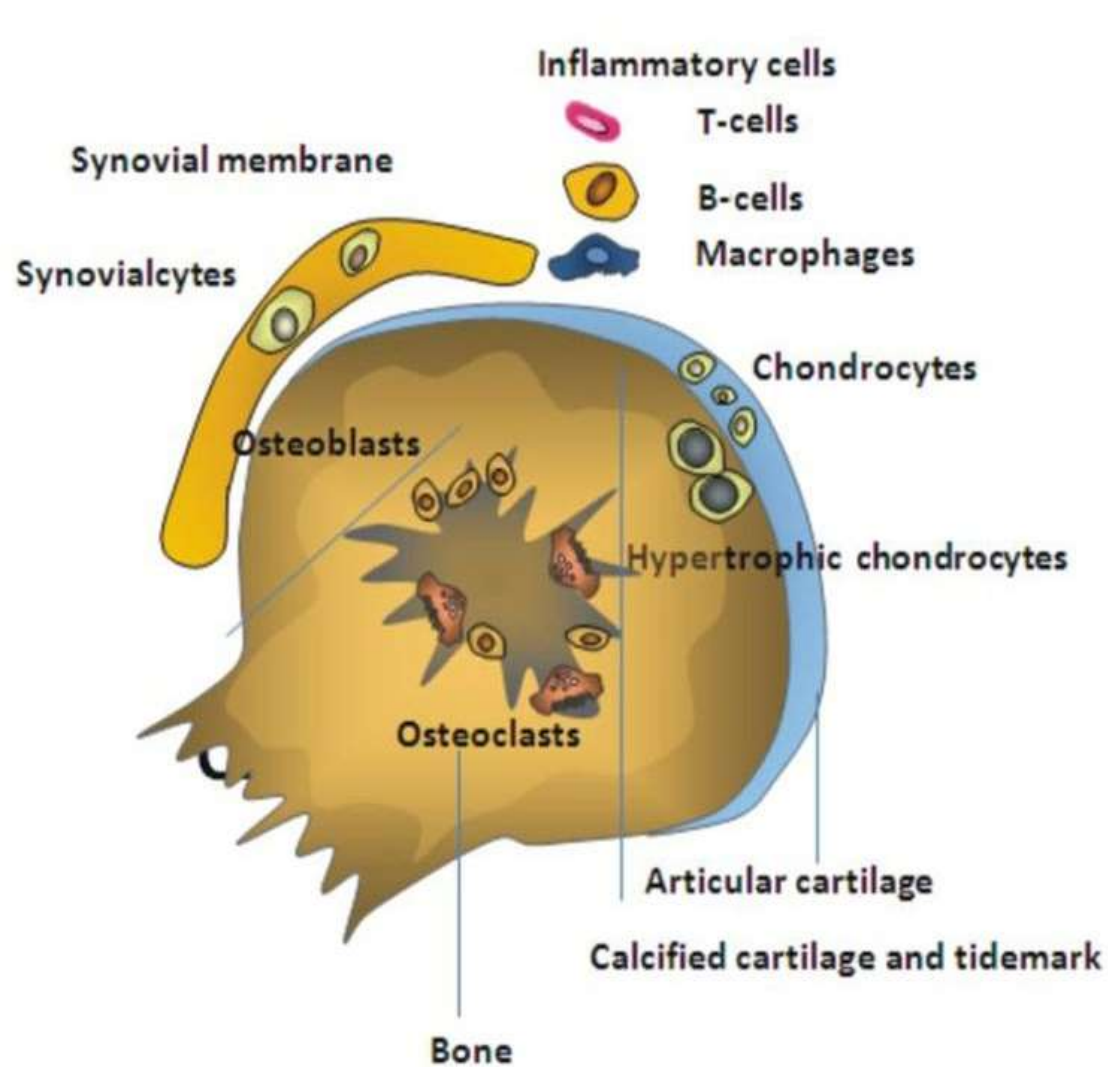
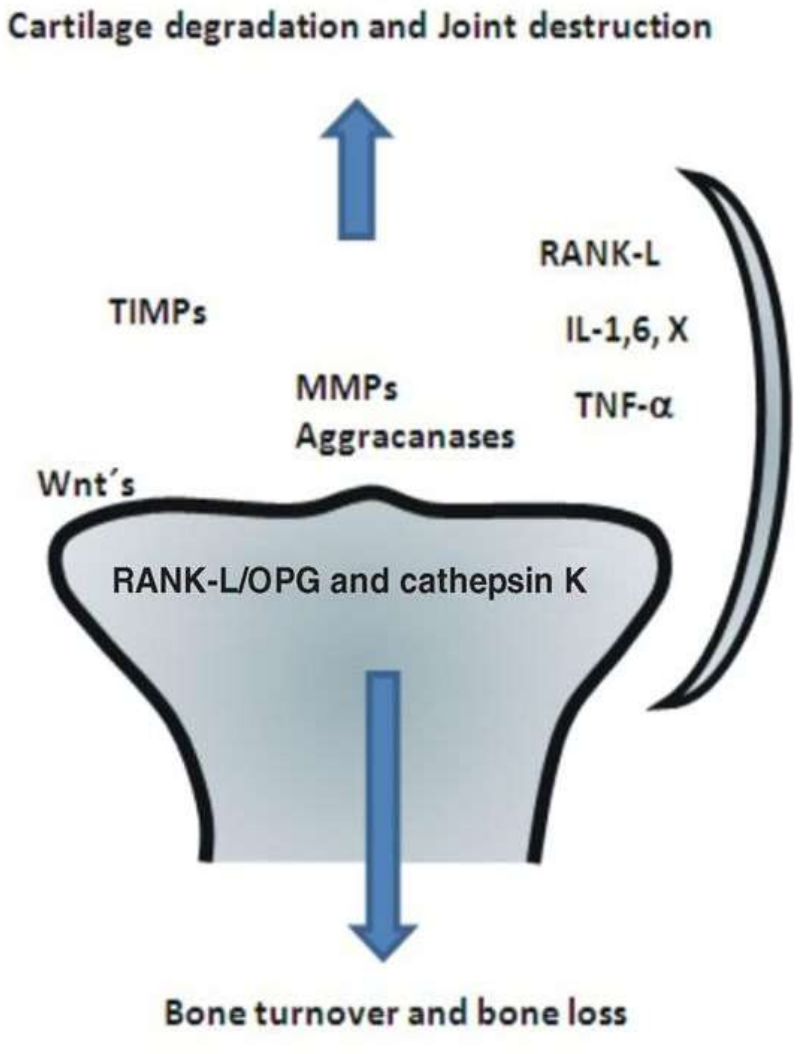
Mechanisms
(Bone Remodelling in Osteoarthritis)



http://www.nature.com/nrrheum/journal/v8/n11/fig_tab/nrrheum.2012.130_F5.html

Mechanisms
(Role of Inflammation)





http://min.sagepub.com/content/18/4/139/F3.large.jpg

Classification
(International Classification of Diseases (ICD)) 1

Diseases of the musculoskeletal system and connective tissue
(M00-M99)

- M00-M25 Arthropathies
  - M15-M19 Osteoarthritis
    - M19.01 Primary osteoarthritis, shoulder
    - M19.02 Primary osteoarthritis, elbow
    - M19.03 Primary osteoarthritis, wrist

Classification

(International Classification of Diseases (ICD)) 2

M19.04 Primary osteoarthritis, hand

M19.07 Primary osteoarthritis ankle and foot

M19.1 Post-traumatic osteoarthritis of other joints

M19.2 Secondary osteoarthritis of other joints

M19.9 Osteoarthritis, unspecified site

Osteoarthritis

BMJ best practice

A 60-year-old woman presents complaining of bilateral knee pain on most days of the past few months. The pain was gradual in onset. The pain is over the anterior aspect of the knee and gets worse with walking and going up and down stairs. She complains of stiffness in the morning that lasts for a few minutes and a buckling sensation at times in the right knee. On examination, there is a small effusion, diffuse crepitus, and limited flexion of both knees. Joint tenderness is more prominent over the medial joint line bilaterally. She has a steady but slow gait, slightly favouring the right side.

http://bestpractice.bmj.com/best-practice/monograph/122/diagnosis/case-history.html

Clinical Investigation
(Signs and Symptoms) 1

- Symptoms vary, depending on which joints are affected and how severely they are affected.
- Reduced range of motion and crepitus (frequently present).
- Stiffness during rest (gelling), may develop, with morning joint stiffness usually lasting for less than 30 minutes.
- Clicking or cracking sound when a joint bends.
- Mild swelling around a joint.

http://www.arthritis.org/about-arthritis/types/osteoarthritis/symptoms.php

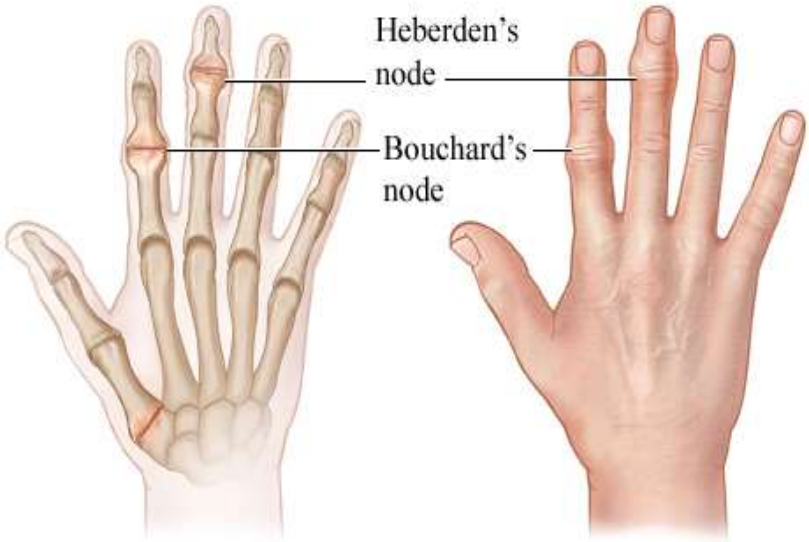
Clinical Investigation
(Signs and Symptoms) 2

- Pain that is worse after activity or toward the end of the day (the disease's primary symptom).
- Decreased function, muscle weakness and impaired balance with increased risk of falls and factures.
- Narcotic pain relievers can cause patient to feel dizzy and unbalanced.

http://www.arthritis.org/about-arthritis/types/osteoarthritis/symptoms.php

Clinical Investigation
(Signs and Symptoms: Hand)

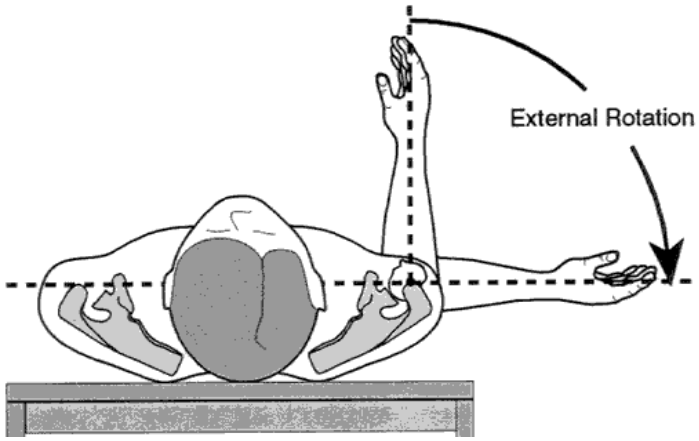
- Pain on range of motion.
- Hypertrophic changes at distal and proximal interphalangeal joints (Heberden nodes and Bouchard nodes).
- Tenderness over carpometacarpal joint of thumb.



http://img.webmd.com/dtmcms/live/webmd/consumer_assets/site_images/media/medical/hw/h9991469_003.jpg http://www.aafp.org/afp/2012/0101/p49.html

Clinical Investigation
(Signs and Symptoms: Shoulder)

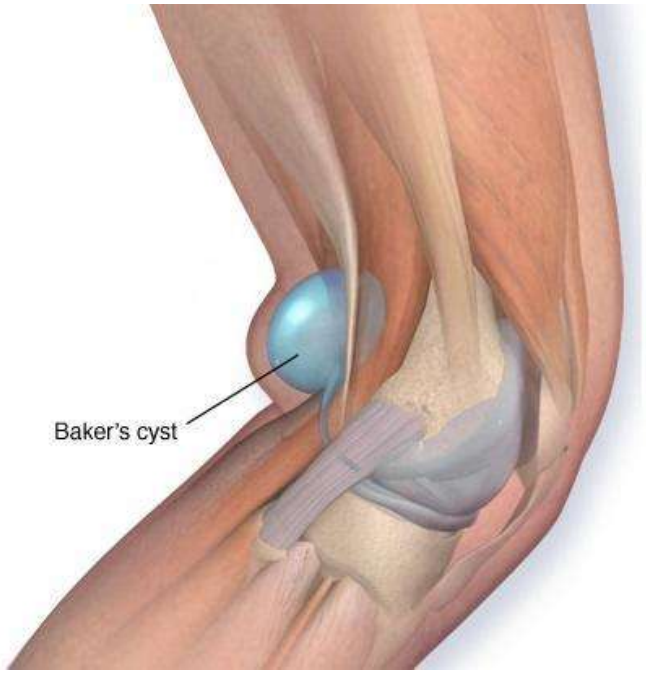
- Pain on range of motion.
- Limitation of range of motion, especially external rotation.
- Crepitus on range of motion



/www.orthop.washington.edu/orthodev/drupal/sites/default/files/Portals/21/LiveContent/7268/Images/figure2.gif http://www.aafp.org/afp/2012/0101/p49.html

Clinical Investigation
(Signs and Symptoms: Knee)

- Pain on range of motion.
- Joint effusion
- Crepitus on range of motion
- Presence of popliteal cyst (Baker cyst)
- Lateral instability
- Valgus or varus deformity



http://chhabraosteopathy.co.uk/wp-content/uploads/2014/09/Bakers-Cyst.jpg http://www.aafp.org/afp/2012/0101/p49.html

Clinical Investigation
(Signs and Symptoms: Hip)

- Pain on range of motion.
- Pain in buttock
- Limitation of range of motion, especially internal rotation

reconstructivereview.org/ojs/index.php/rr/article/view/119/144 http://www.aafp.org/afp/2012/0101/p49.html

Clinical Investigation
(Signs and Symptoms: Foot)

- Pain on ambulation, especially at first metatarsophalangeal joint.
- Limited range of motion of first metatarsophalangeal joint, hallux rigidus.
- Hallux valgus deformity.

thetagoeclinic.co.uk/foot-and-ankle-surgery/ http://www.aafp.org/afp/2012/0101/p49.html

Clinical Investigation
(Signs and Symptoms: Spine)

- Pain on range of motion.
- Limitation of range of motion.
- Lower extremity sensory loss, reflex loss, motor weakness caused by nerve root impingement.
- Pseudoclaudication caused by spinal stenosis.

http://www.movingwithease.com.au/images/osteoarthritisofthespine.jpg / http://www.aafp.org/afp/2012/0101/p49.html

Osteoarthritis

BMJ best practice

A 55-year-old woman has been complaining of pain and swelling in several fingers of both hands for the past 2 months. She describes morning stiffness lasting for 30 minutes. Her mother tells her that she had a similar condition at the same age. She denies any other joint pain or swelling. On examination, she has tenderness, slight erythema, and swelling in one PIP joint and two DIP joints in each hand. She has squaring at the base of her right thumb (the first carpometacarpal joint). There is no swelling or tenderness in her MCP joints.

http://bestpractice.bmj.com/best-practice/monograph/122/diagnosis/case-history.html

Diagnosis

- Osteoarthritis is typically diagnosed on the basis of clinical and radiographic evidence.
- No specific laboratory abnormalities are associated with osteoarthritis.
- Imaging studies include plain radiography, computed tomography (CT).
- Arthrocentesis: the presence of noninflammatory joint fluid helps distinguish osteoarthritis from other causes of joint pain.

http://emedicine.medscape.com/article/330487-overview

Diagnosis
(Radiograph of the Hand)

The hand affected by osteoarthritis: *(1)* joint space narrowing, *(2)*osteophytes, and *(3)* joint destruction. Changes at carpometacarpal joint *(4)*, which are very common in osteoarthritis.

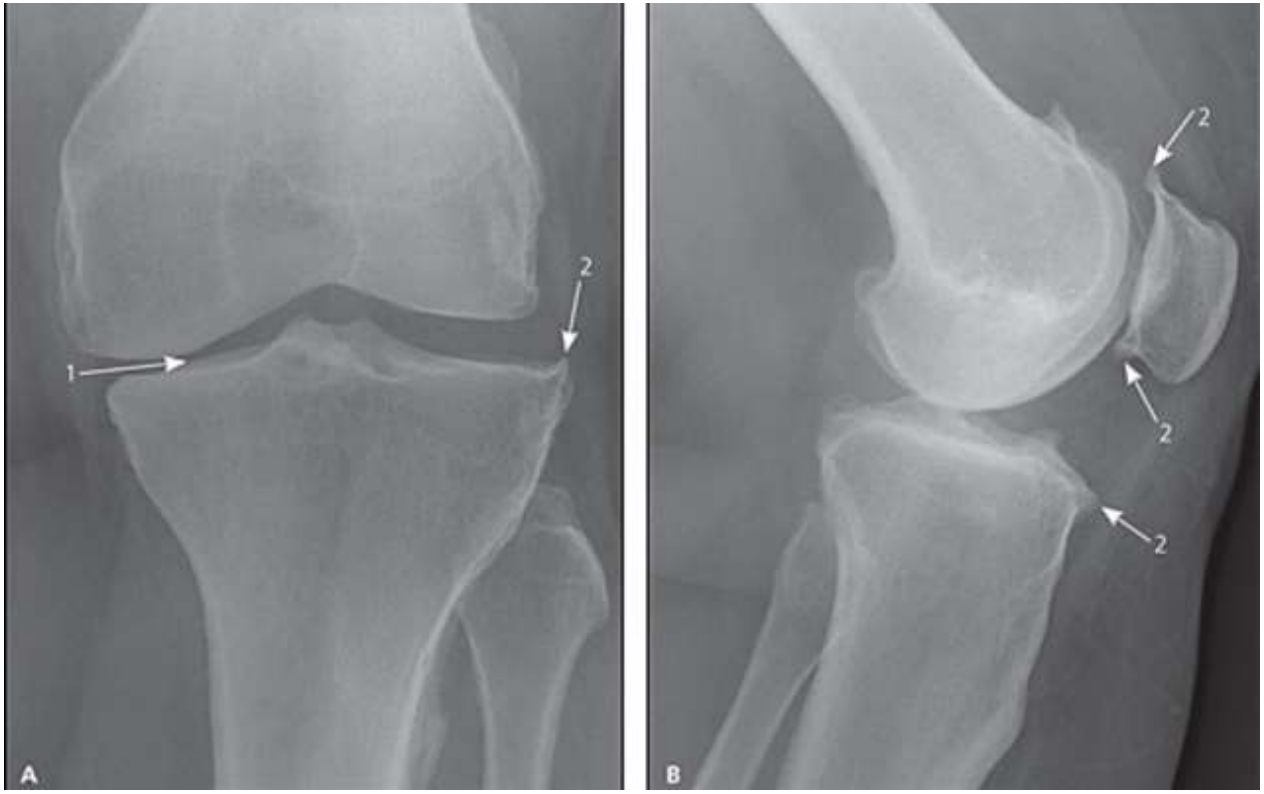
http://www.aafp.org/afp/2012/0101/p49.html

Diagnosis
(Radiograph the Hips)

The hips: *(1)* joint space narrowing and *(2)* osteophyte formation.

http://www.aafp.org/afp/2012/0101/p49.html

Diagnosis
(Radiograph the Knee)



The knee: *(A)* anteroposterior and *(B)* lateral views showing *(1)* joint space narrowing and *(2)* osteophyte formation.

http://www.aafp.org/afp/2012/0101/p49.html

Diagnosis
(Stages)

- Stage 1 – Proteolytic breakdown of the cartilage matrix occurs.
- Stage 2 – Fibrillation and erosion of the cartilage surface develop, with subsequent release of proteoglycan and collagen fragments into the synovial fluid.
- Stage 3 – Breakdown products of cartilage induce a chronic inflammatory response in the synovium, which in turn contributes to further cartilage breakdown.

http://emedicine.medscape.com/article/330487-clinical#b4

Diagnosis
(Kellgren–Lawrence Grading Scale)

Grade	Description
0	No radiographic features of osteoarthritis.
1	Possible joint space narrowing and osteophyte formation.
2	Definite osteophyte formation with possible joint space narrowing.
3	Multiple osteophytes, definite joint space narrowing, sclerosis and possible bony deformity.
4	Large osteophytes, marked joint space narrowing, severe sclerosis and definite bony deformity

Diagnosis
(Differentiation)

- Avascular Necrosis.
- Fibromyalgia.
- Gout and Pseudogout.
- Imaging in Ankylosing Spondylitis.
- Imaging in Neuropathic Arthropathy (Charcot Joint).
- Lyme Disease.
- Patellofemoral Arthritis.
- Psoriatic Arthritis., Rheumatoid Arthritis.

http://emedicine.medscape.com/article/330487-differential

Osteoarthritis

BMJ best practice

KP, a 60-year-old male, presented to his primary care physician with complaints of deep aching pain and stiffness in both of his knees. This pain was initially felt at work when lifting heavy materials, but more recently he had experienced pain in the absence of any physical activity or exertion. Past medical history is significant for diabetes, hyperlipidemia, obesity, and asthma. Medication history includes metformin 500 mg twice daily, glyburide 10 mg daily, simvastatin 10 mg daily, albuterol 2 puffs PRN and acetaminophen 325 mg daily for the last 3 months for pain. The patient is no longer able to walk his dog due to the severity of his pain. Past social history included 30 years as a construction worker and infrequent alcohol consumption (two drinks per week). The patient's age (>50 years old), radiographic identification of joint space narrowing and osteophyte formation, and past medical and occupational history supported a diagnosis of osteoarthritis.

https://primeinc.org/casestudies/pharmacist/study/807/Management_of_Osteoarthritis

Treatment
(Long-term Management)

- Managing symptoms, such as pain, stiffness and swelling.
- Improving joint mobility and flexibility.
- Maintaining a healthy weight.
- Getting enough of exercise.

http://www.arthritis.org/about-arthritis/types/osteoarthritis/treatment.php

Treatment
(Nonpharmacologic Recommendations) 1

- Cardiovascular and/or resistance land based exercise.
- Aquatic exercise.
- Lose weight (for persons who are overweight).
- Participate in self-management programs.
- Manual therapy in combination with supervised exercise.
- Psychosocial interventions.

https://farm1.staticflickr.com/319/18107546519_ea3509ee1a.jpg Http://www.rheumatology.org/Portals/0/Files/

Treatment
(Nonpharmacologic Recommendations) 2

- Be instructed in the use of thermal agents.
- Balance exercises, either alone or in combination with strengthening exercises.
- Tai chi.
- Manual therapy alone.

https://farm1.staticflickr.com/319/18107546519_ea3509ee1a.jpg Http://www.rheumatology.org/Portals/0/Files/

Treatment

(Nonpharmacologic Recommendations: Tai Chi)

- Tai Chi is a form of Chinese martial art widely practiced for its health benefits.
- Tai chi practice to improve balance, flexibility and cardiovascular fitness.
- Tai Chi is a popular exercise amongst those who wish to live a healthy and long life.

http://www.pingminghealth.com/wp-content/uploads/2012/08/taichi-park.jpg

Treatment

(Pain and Anti-inflammatory Medications) 1

- Analgesics: acetaminophen, opioids (narcotics) and an atypical opioid called tramadol.
- Nonsteroidal anti-inflammatory drugs (NSAIDs): aspirin, ibuprofen, naproxen, and celecoxib.
- Corticosteroids.
- Hyaluronic acid: hyaluronic acid occurs naturally in joint fluid, acting as a shock absorber and lubricant, the injections are done in a doctor's office.

http://www.arthritis.org/about-arthritis/types/osteoarthritis/treatment.php

Treatment

(Pain and Anti-inflammatory Medications) 2

- Opioids: may ease pain if paracetamol or NSAIDs do not work, but can also cause side effects such as drowsiness, nausea and constipation.
- Capsaicin cream: blocking the nerves that send pain messages in the treated area.

http://www.arthritis.org/about-arthritis/types/osteoarthritis/treatment.php

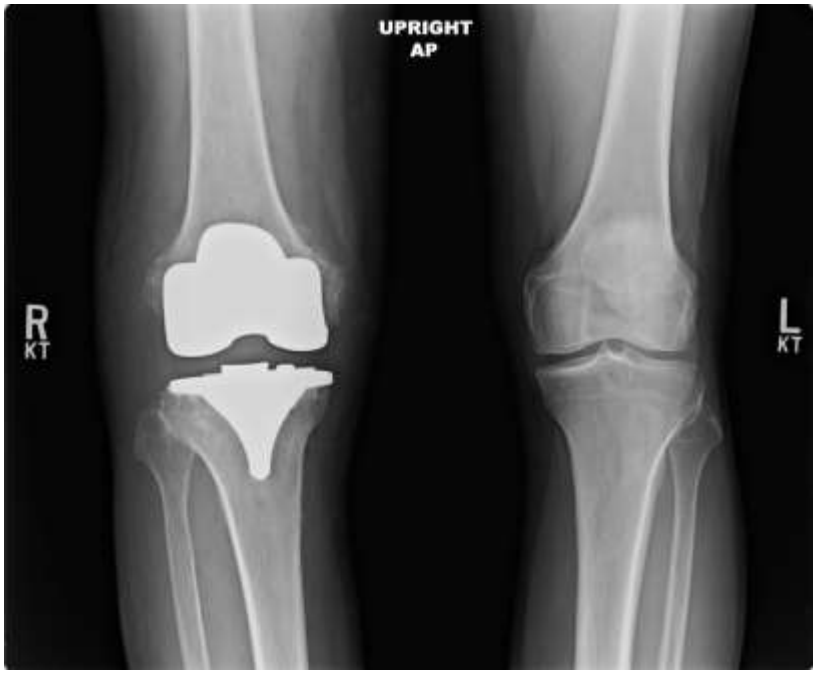
Treatment
(Commonly Used Medications)

Medication	Typical dosage
Acetaminophen	650 to 1,000 mg four times per day
Celecoxib	200 mg per day
Diclofenac sodium	50 mg two to three times per day
Diclofenac/misoprostol	50 mg/200 mcg two to three times per day
Ibuprofen, over-the-counter	400 to 600 mg three times per day
Meloxicam	7.5 to 15 mg per day
Nabumetone	500 mg two times per day
Naproxen, over-the-counter	220 to 440 mg two times per day
Naproxen	250 to 500 mg two times per day
Oxaprozin	1,200 mg per day
Sulindac	150 to 200 mg two times per day

http://www.medscape.com/viewarticle/821404

Treatment
(Surgery)

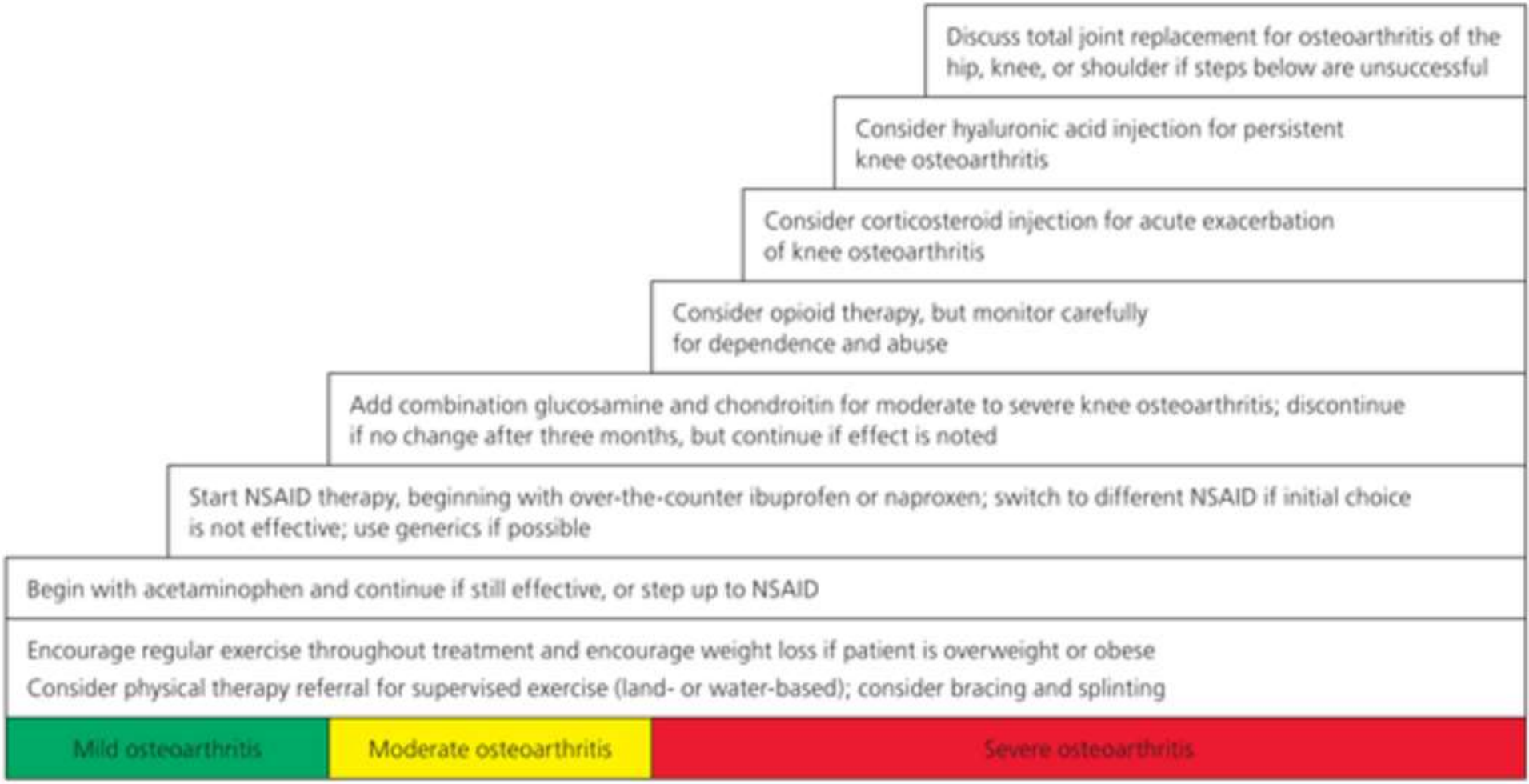
- Arthroscopy.
- Osteotomy.
- Arthroplasty (particularly with knee or hip osteoarthritis).
- Fusion.



Total Knee Replacement.

http://www.drmichaelwind.com/wp-content/uploads/2013/07/Total_Knee_Arthroplasty.jpg :http//emedicine.medscape.com/article/330487-overview

Treatment
(Stepped-Care Approach)



www.aafp.org/afp/2012/0101/afp20120101p49-f5.gifwww.aafp.org/afp/2012/0101/p49.html

Prognosis

- The prognosis in patients with osteoarthritis depends on the joints involved and on the severity of the condition.
- No proven disease- or structure-modifying drugs for osteoarthritis are currently known; consequently, pharmacologic treatment is directed at symptom relief.
- Patients with osteoarthritis who have undergone joint replacement have a good prognosis, with success rates for hip and knee arthroplasty generally exceeding 90%.

http://emedicine.medscape.com/article/330487-overview#a7

Prophylaxis

Control Weight.

Exercise.

Avoid Injuries or Get Them Treated.

Diet.

Reducing Osteoarthritis Pain.

http://www.webmd.com/osteoarthritis/guide/osteoarthritis-prev

Abbreviations

IL-1 - interleukin – 1

MMPs - matrix metalloproteinases

NSAIDs - nonsteroidal anti-inflammatory drugs

OA – osteoarthritis

CT – computed tomography

Diagnostic and treatment guidelines

ACR 2012 Recommendations for the Use of Nonpharmacologic and Pharmacologic Therapies in Osteoarthritis of the Hand, Hip, and Knee

Osteoarthritis: Diagnosis and Treatment

Osteoarthritis: care and management

American Academy of Orthopedic Surgeons clinical practice guideline on the treatment of osteoarthritis of the knee

Guideline for the non-surgical management of hip and knee osteoarthritis

Osteoarthritis