

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.

Definition

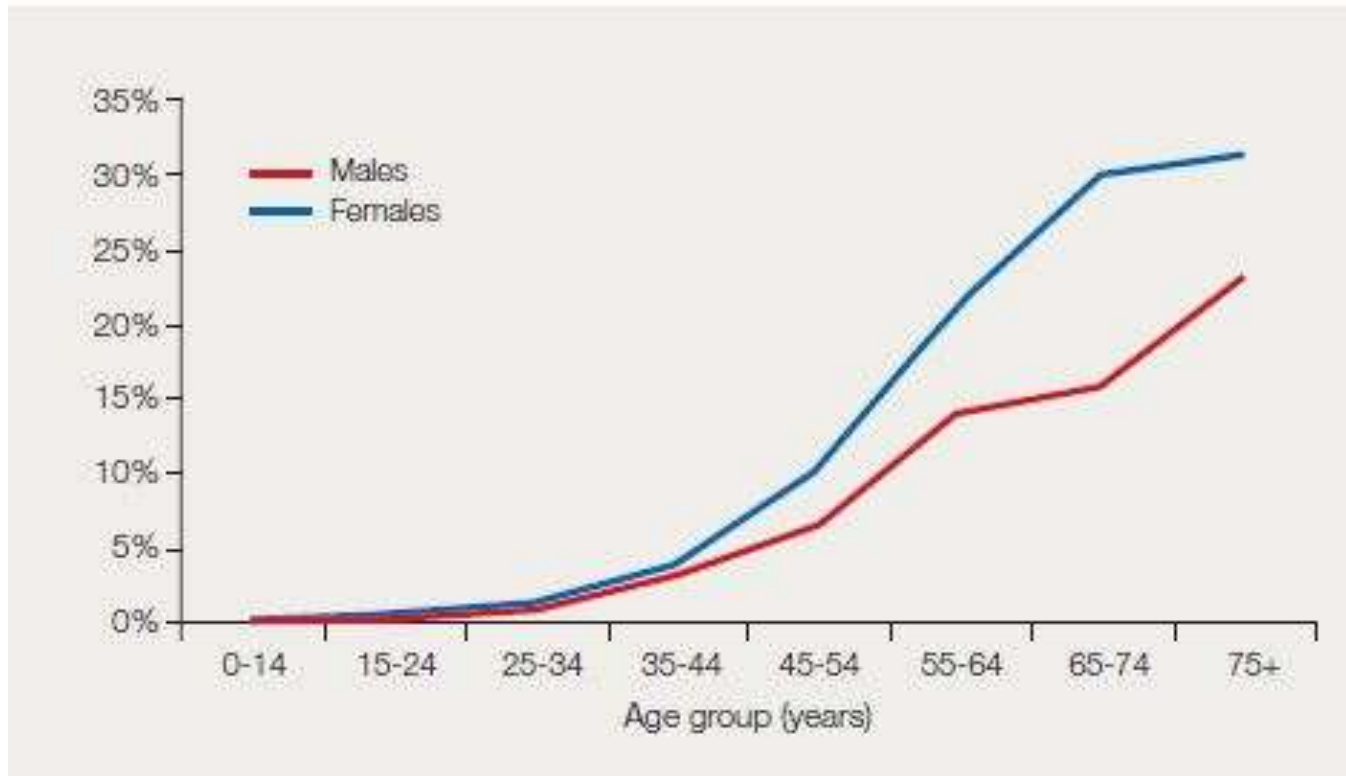
Osteoarthritis (OA) is the most common type of joint disease, that can be thought of as a degenerative disorder arising from the biochemical breakdown of articular (hyaline) cartilage in the synovial joints, however, it involves not only the articular cartilage but the entire joint organ, including the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

Epidemiology

- 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.
- 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.

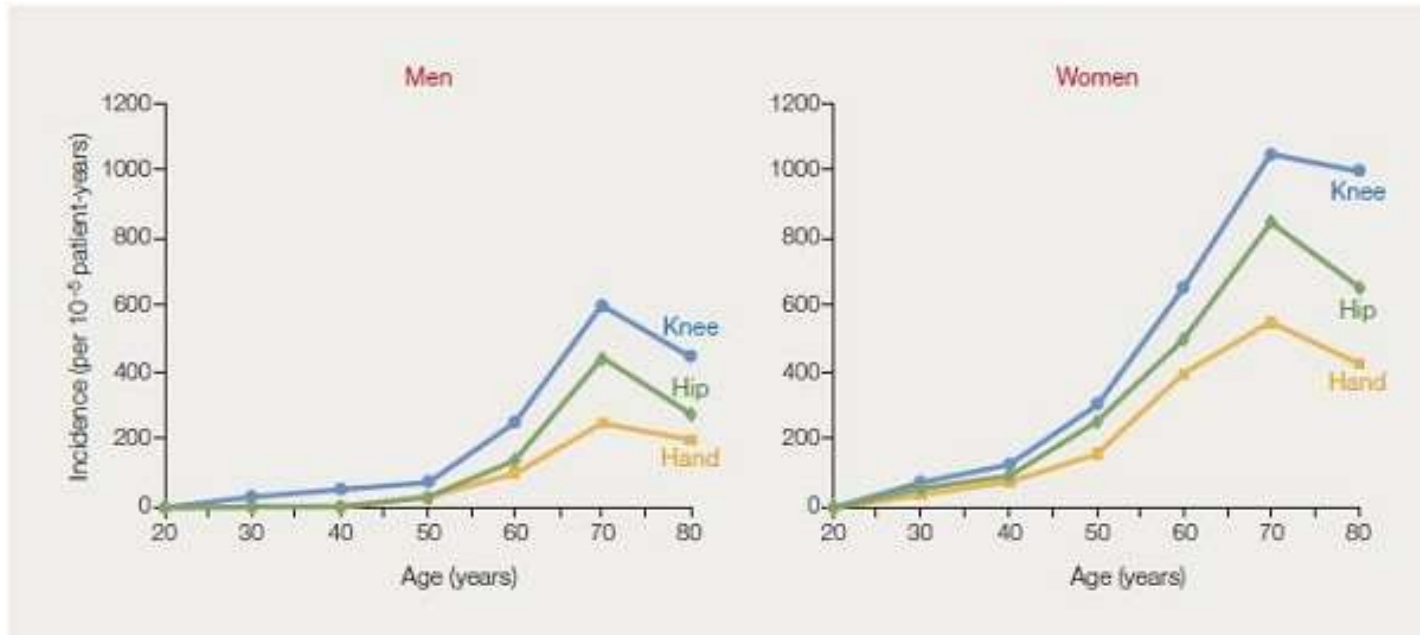
Epidemiology

(Age-specific prevalence of osteoarthritis)



Epidemiology

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



Risk Factors

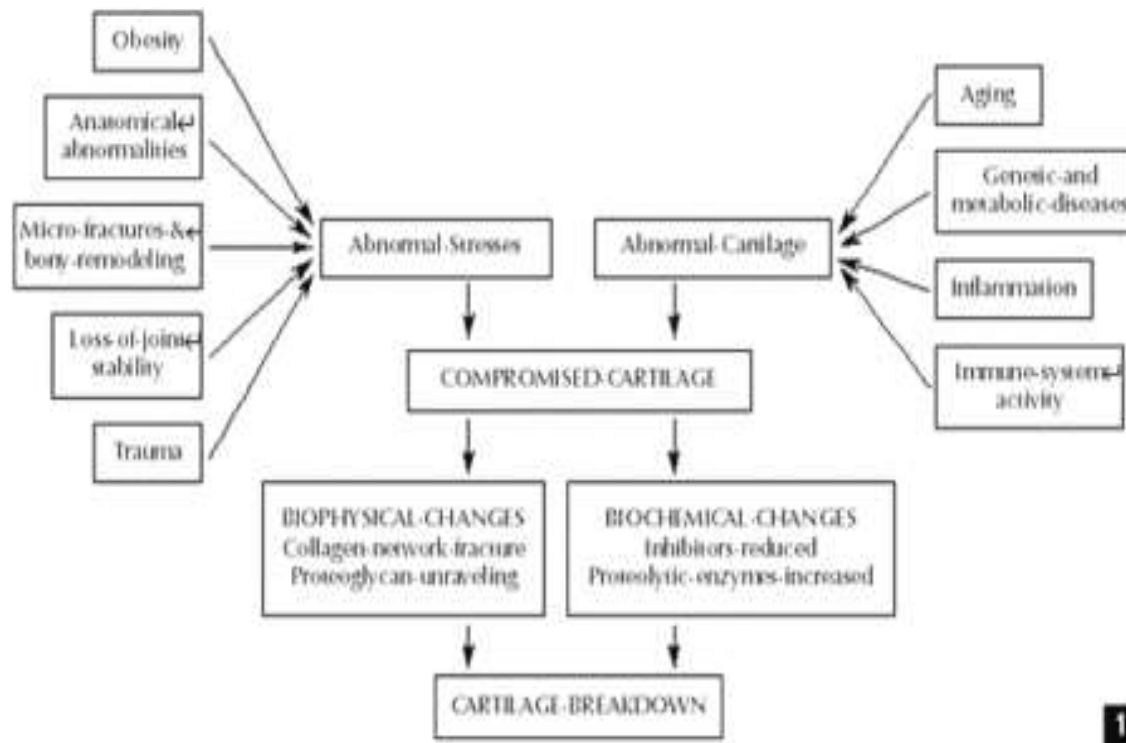
- AGE: symptomatic OA rise steeply after age 50 in men and age 40 in women.
- Sex: women are more likely to report pain in all affected joints, including the hip, than men.
- Obesity and metabolic disease.
- Local mechanical risk factors: a traumatic knee injury.
- Ethnicity and race: hip and hand OA are much less frequent among Chinese.
- Genetics: OA associated with a particular genetic syndrome, such as stickler syndrome or familial chondrocalcinosis.
- Nutrition (including vitamin D).
- Osteoporosis.
- Sarcopenia.
- Smoking.

Etiology

(Primary and Secondary)

- Primary (in the absence of an extrinsic cause).
- Secondary:
 - Chondrocalcinosis,
 - Posttraumatic,
 - Metabolic bone disorders,
 - Hypermobility syndromes,
 - Neuropathic diseases,
 - Marfan syndrome
 - Obesity
 - Joint infection

Risk Factors and Etiology (Factors Involved in Osteoarthritis)



Mechanisms

(Onset)

- 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.
- 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.

Mechanisms (Progress)

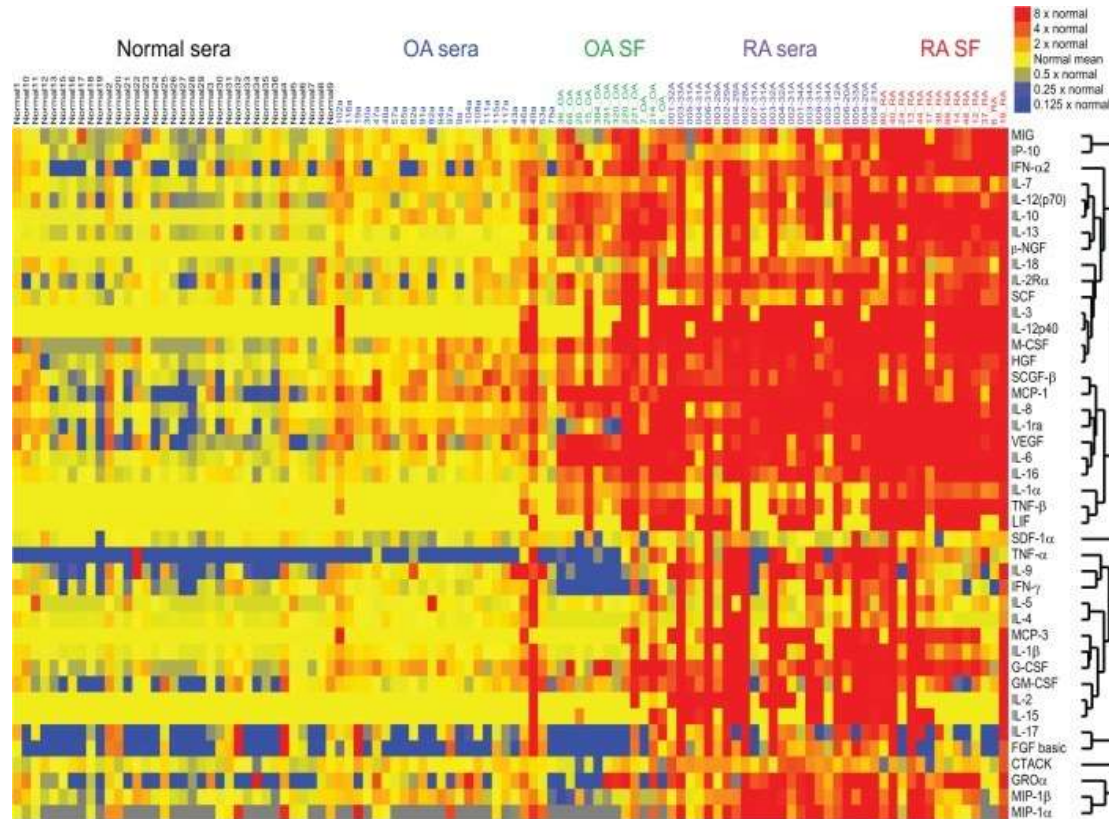
- As the disease progresses, reparative attempts are outmatched by progressive cartilage degradation.
- Fibrillation, erosion and cracking initially appear in the superficial layer of cartilage and progress over time to deeper layers, resulting eventually in large clinically observable erosions.
- OA, 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.
- 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.

Mechanisms

(Role of Inflammation)

- 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.
- 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.

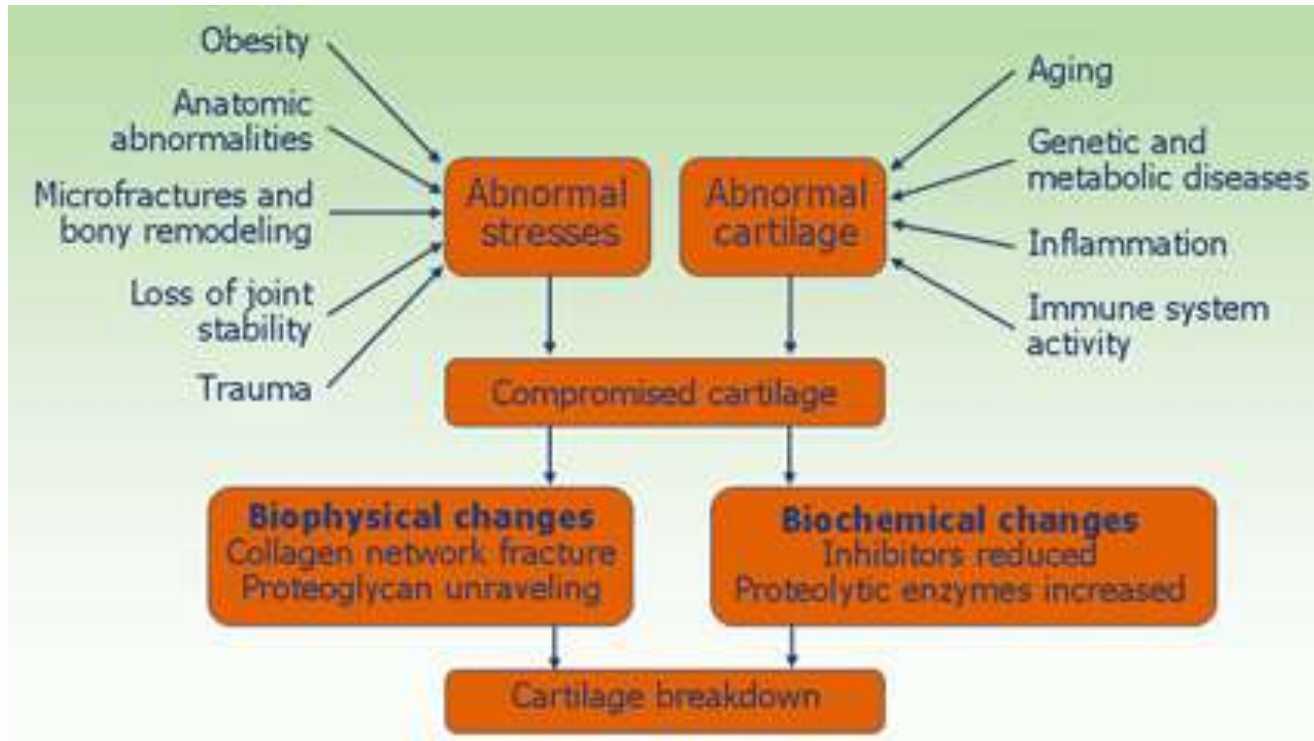
Mechanisms (Role of Inflammation)



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).

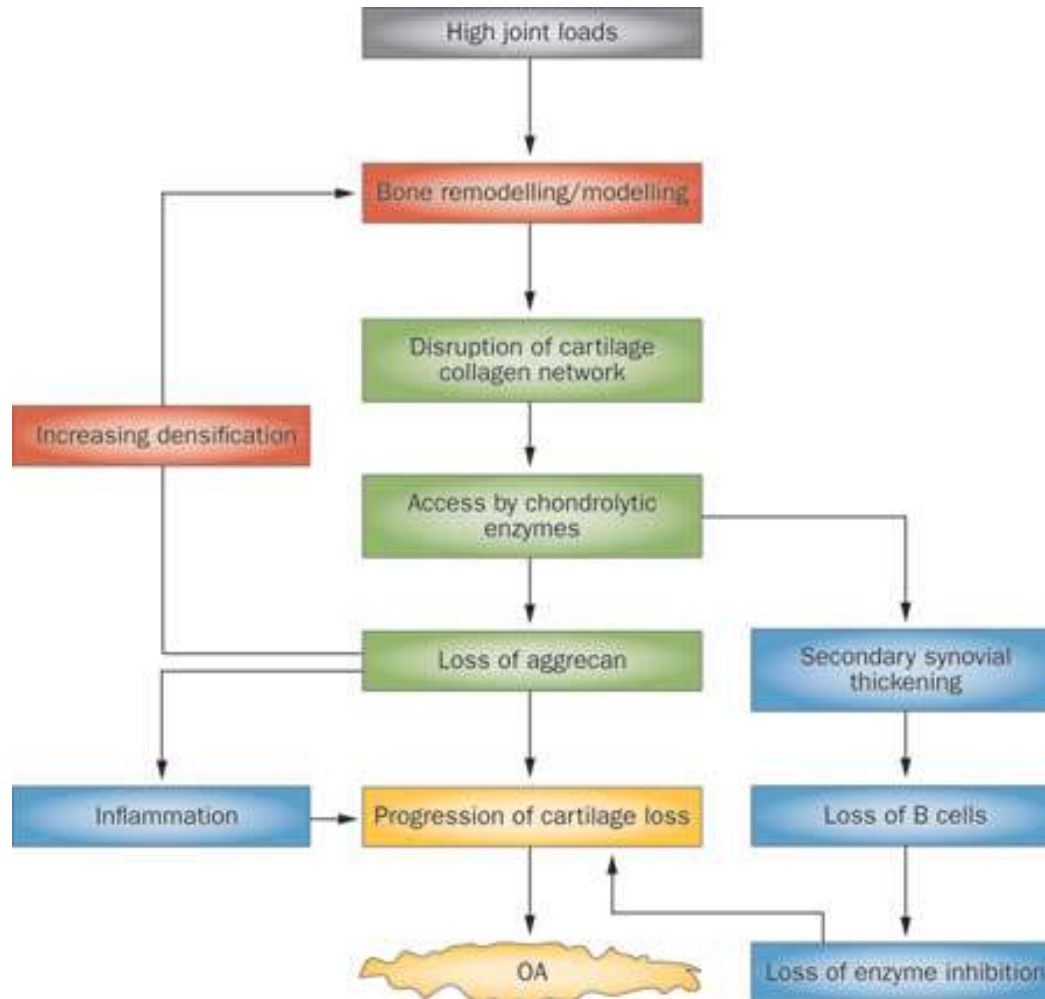
Mechanisms

(Pathogenetic Factors in Osteoarthritis)

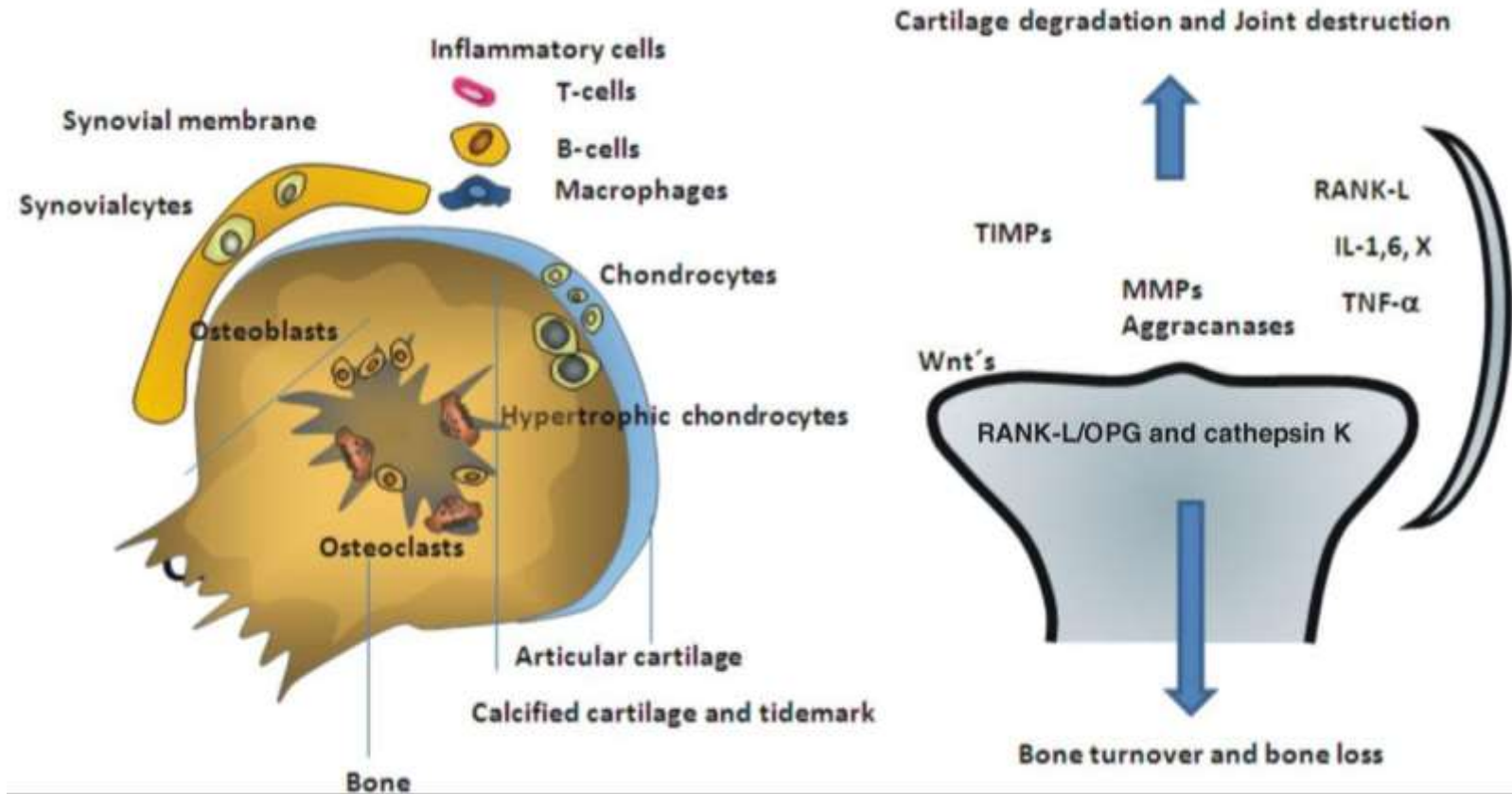


Mechanisms

(Bone Remodelling in Osteoarthritis)



Mechanisms (Role of Inflammation)



Classification

(International Classification of Diseases (ICD))

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

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

Clinical Investigation

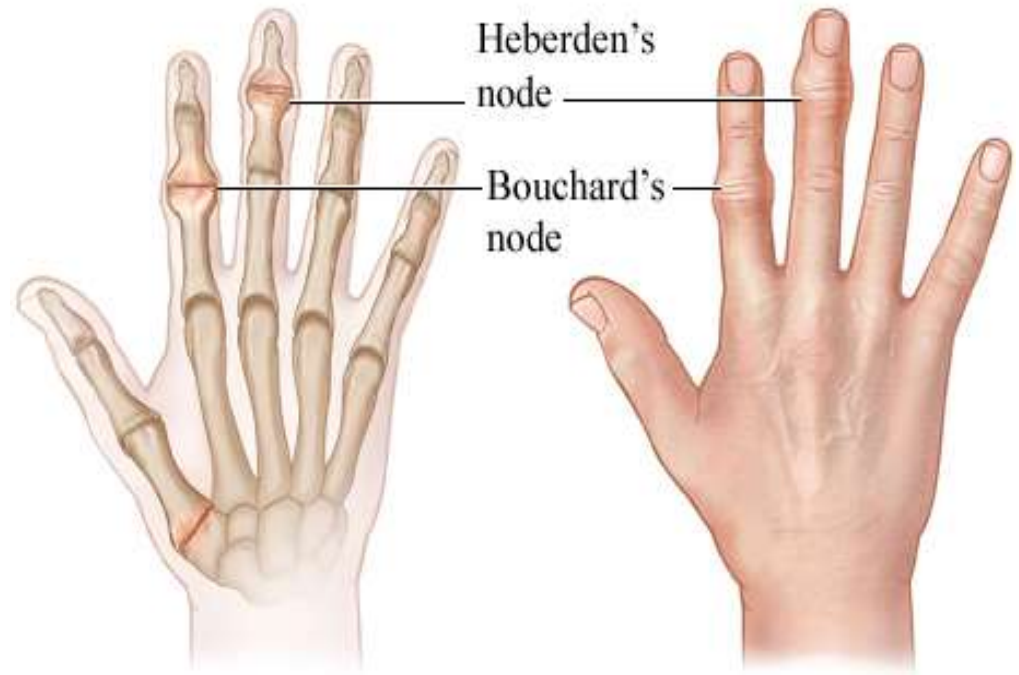
(Signs and Symptoms)

- 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.
- 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 fractures.
- Narcotic pain relievers can cause patient to feel dizzy and unbalanced.

Clinical Investigation

(Signs and Symptoms: Hand)

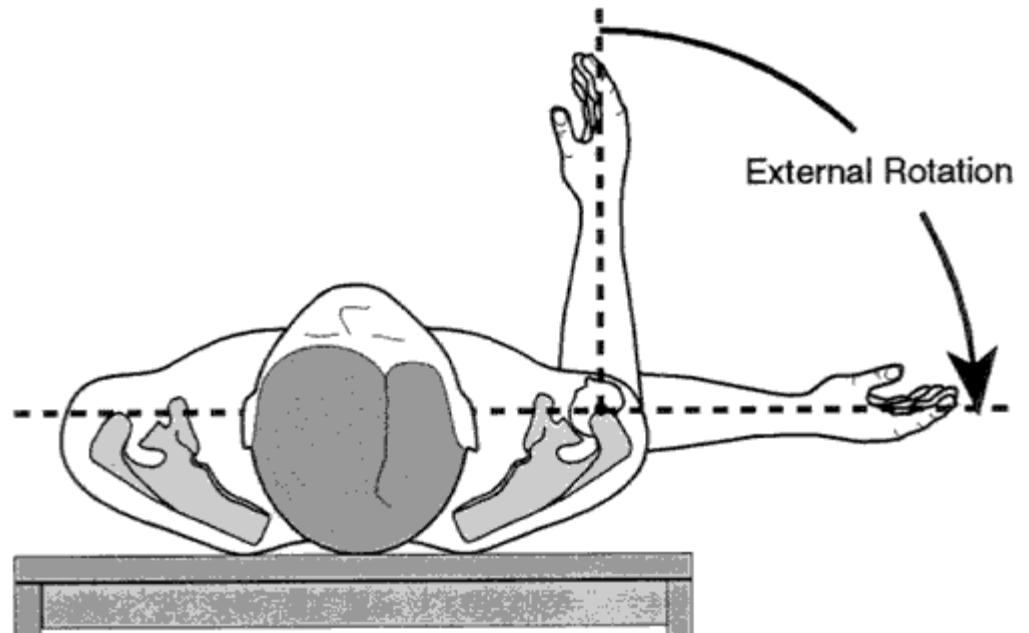
- Pain on range of motion.
- Hypertrophic changes at distal and proximal interphalangeal joints (Heberden nodes and Bouchard nodes).
- Tenderness over carpometacarpal joint of thumb.



Clinical Investigation

(Signs and Symptoms: Shoulder)

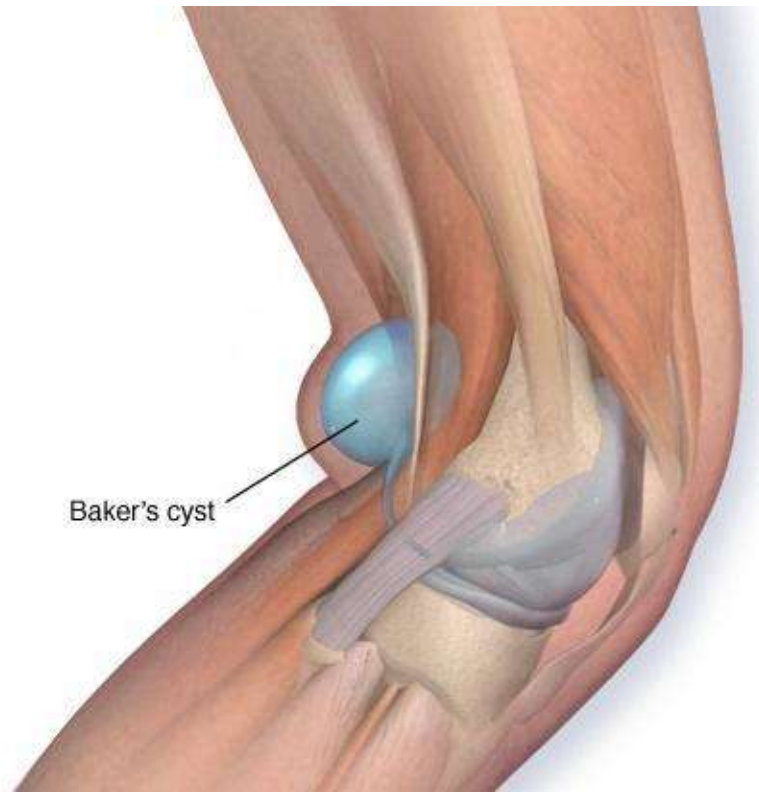
- Pain on range of motion.
- Limitation of range of motion, especially external rotation.
- Crepitus on range of motion



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



Clinical Investigation

(Signs and Symptoms: Hip)

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



Clinical Investigation

(Signs and Symptoms: Foot)

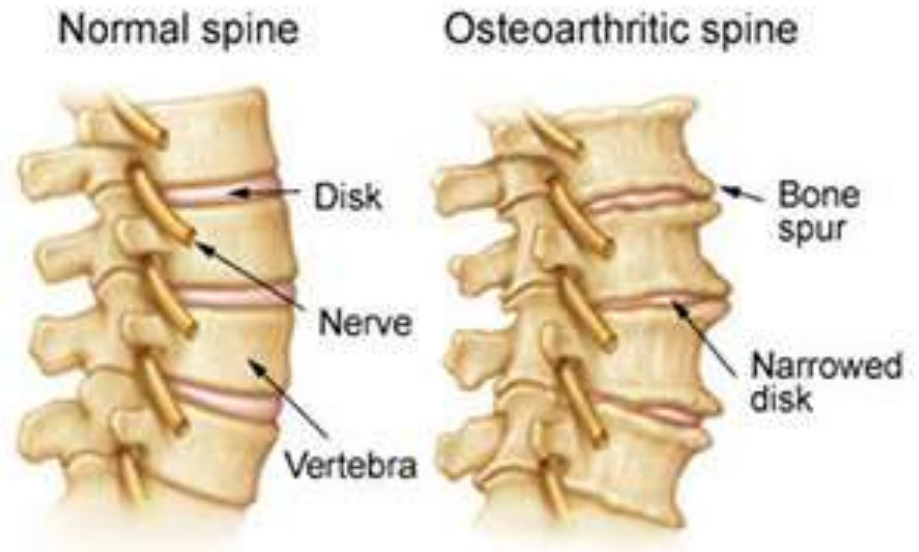
- Pain on ambulation, especially at first metatarsophalangeal joint.
- Limited range of motion of first metatarsophalangeal joint, hallux rigidus.
- Hallux valgus deformity.



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.



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.

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.

Diagnosis

(Radiograph the Hips)



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

Diagnosis

(Radiograph the Knee)



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

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.

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.

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.

Treatment

(Nonpharmacologic Recommendations)

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

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.



Treatment

(Pain and Anti-inflammatory Medications)

- 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.
- 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.

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

Treatment (Surgery)

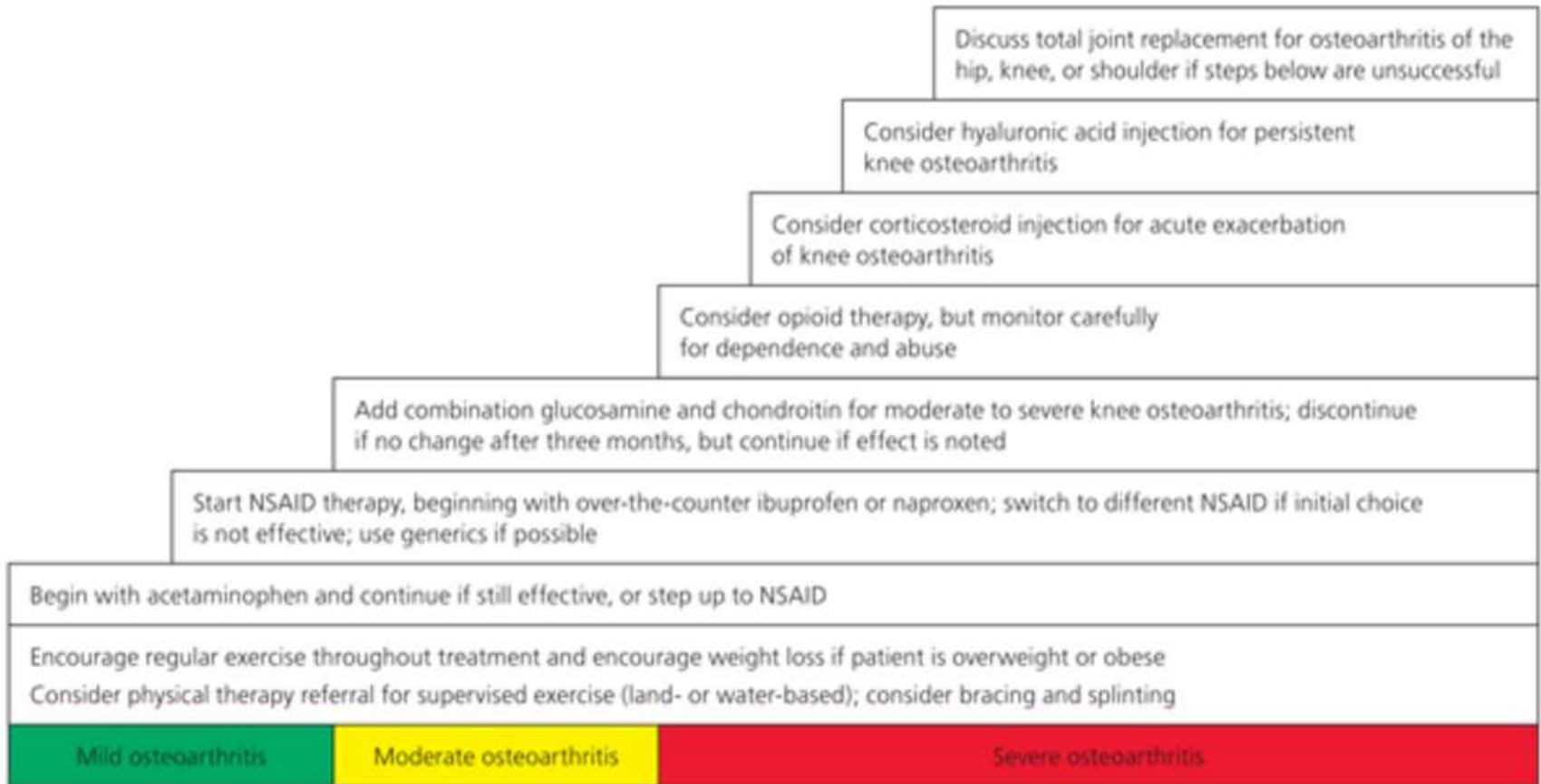
- Arthroscopy.
- Osteotomy.
- Arthroplasty
(particularly with knee
or hip osteoarthritis).
- Fusion.



Total Knee Replacement.

Treatment

(Stepped-Care Approach)



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%.

Prophylaxis

Control Weight.

Exercise.

Avoid Injuries or Get Them Treated.

Diet.

Reducing Osteoarthritis Pain.

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](#)