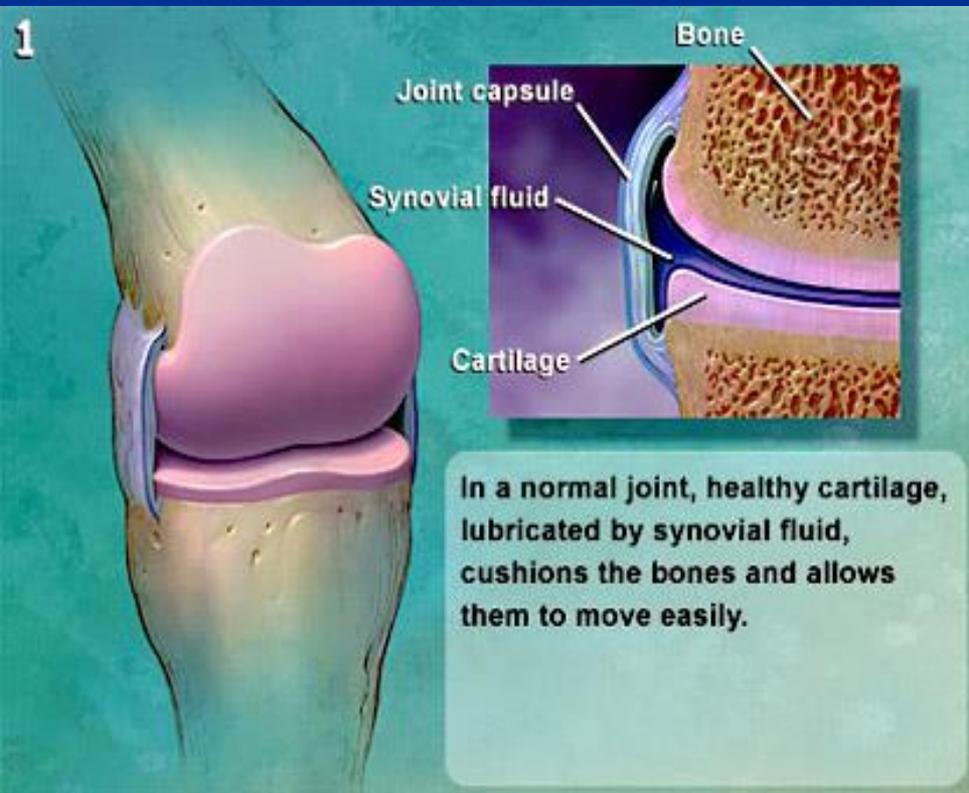




*IN THE NAME OF GOD*

- Osteoarthritis is a common and disabling condition that represents a substantial and increasing health burden with notable implications for the individuals affected, health-care systems, and wider socioeconomic costs
- OA is joint failure, hyalialan cartilage loss, sclerosis, osteophyte,
- First step: failure chondroprotective mechanism

# OSTEOARTHRITIS: disease of whole joint organ



# EPIDEMIOLOGY

# EPIDEMIOLOGY

- Most common type of arthritis
- Most common musculoskeletal disease
- A leading cause of disability in elderly
- ↑ Prevalence:
  - ↑ Aging
  - ↑ Obesity

- Aeing and increasing obesity in the global population, along with increasing numbers of joint injuries, this already burdensome syndrome is becoming more prevalent, with worldwide estimates suggesting that 250 million people are currently affected

# Epidemiology

- Clinically, the knee is the most common site of osteoarthritis, followed by the hand and hip

# EPIDEMIOLOGY

## ■ Symptomatic knee OA:

- >30y → 6%
- >60y → 12%

# EPIDEMIOLOGY

The most common cause of chronic knee pain in >45

Symptomatic hand OA:

- 10% of elderly

- Hip OA: one-third as common as knee OA

■ Correlate strikingly with age:

- <40y → Uncommon

■ Sex:

- More common in women (hand and knee)

- ↑ Sex differences with age

# JOINT PROTECTORS

# PROTECTORS

## ■ Capsule and ligaments:

- Limits excursion

## ■ Muscles and tendons:

- Key protector

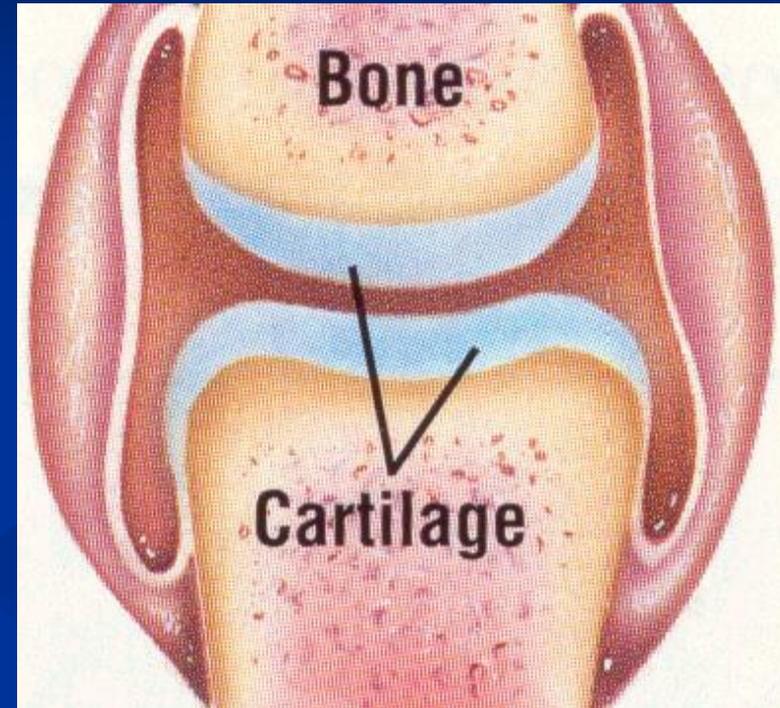
### ● Function:

- Appropriate power

-  Focal stress by:

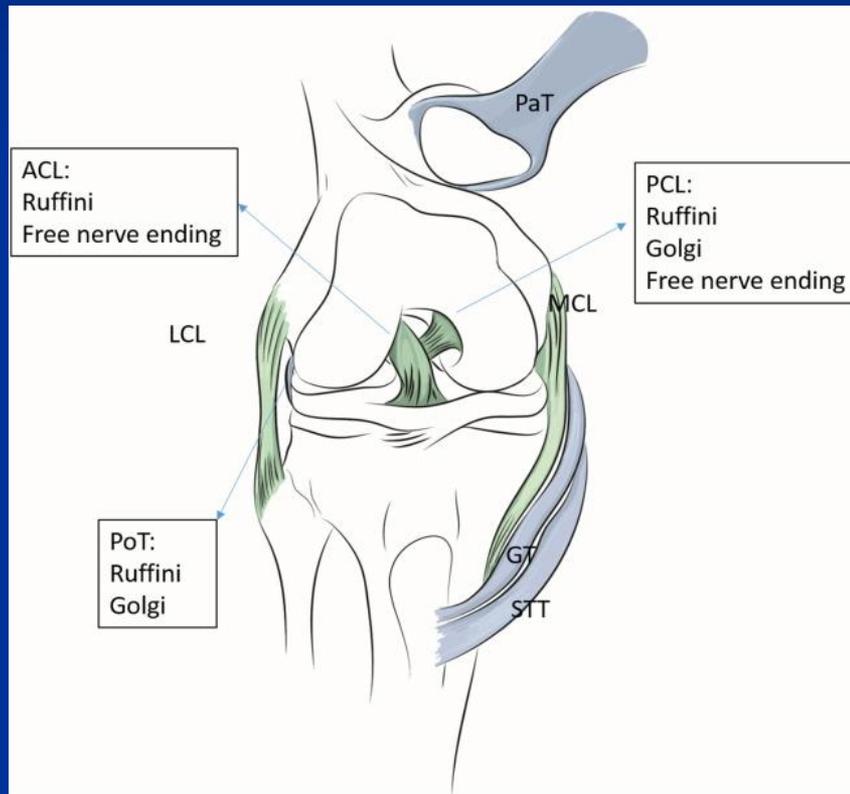
- Decelerate joint

- Distribute across joint surface



# Mechanoreceptors of ligament and tendon in knee

- Charcot's arthropathy
- Rupture ligament



# PROTECTORS

## ■ Mechanoreceptor:

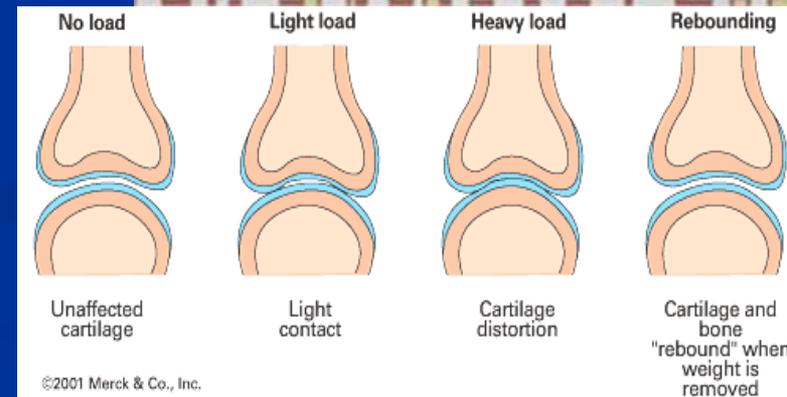
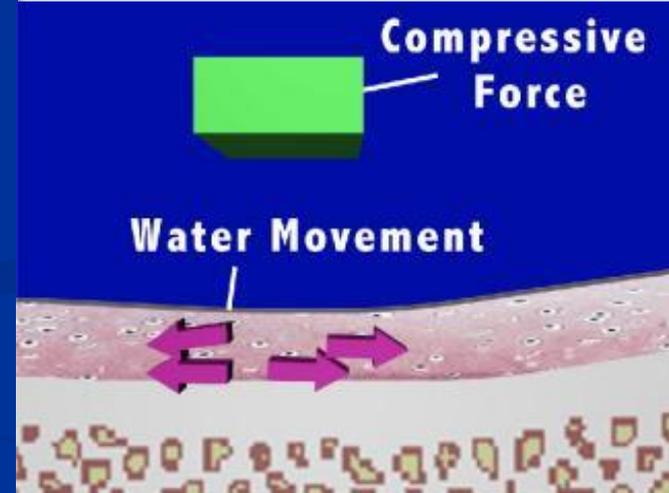
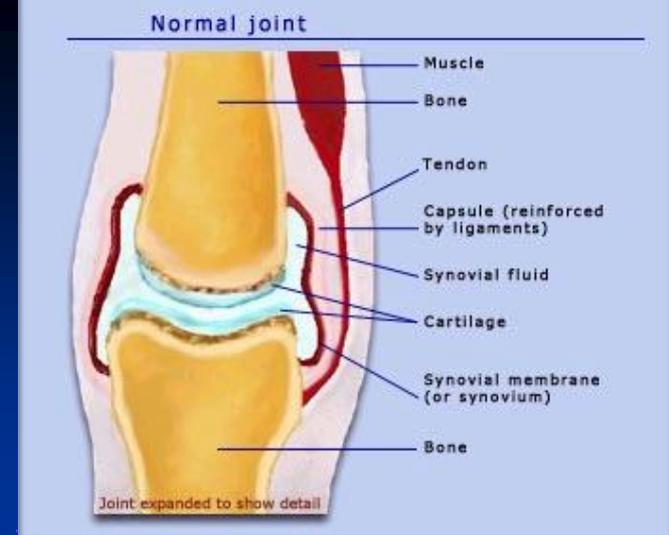
- In ligament, skin and tendon
- Assume appropriate tension

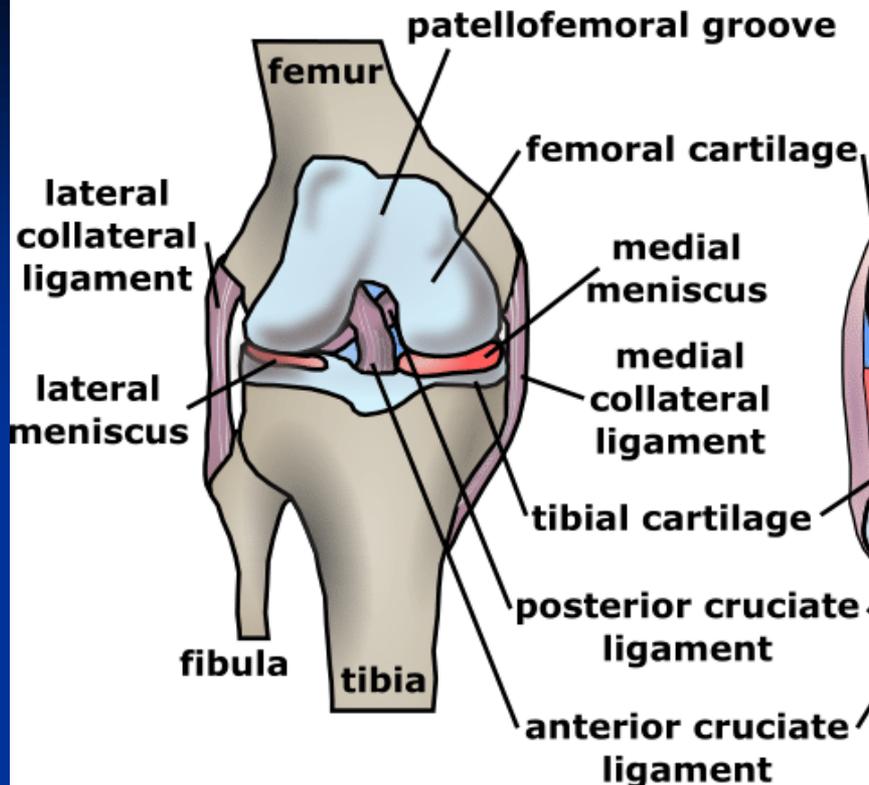
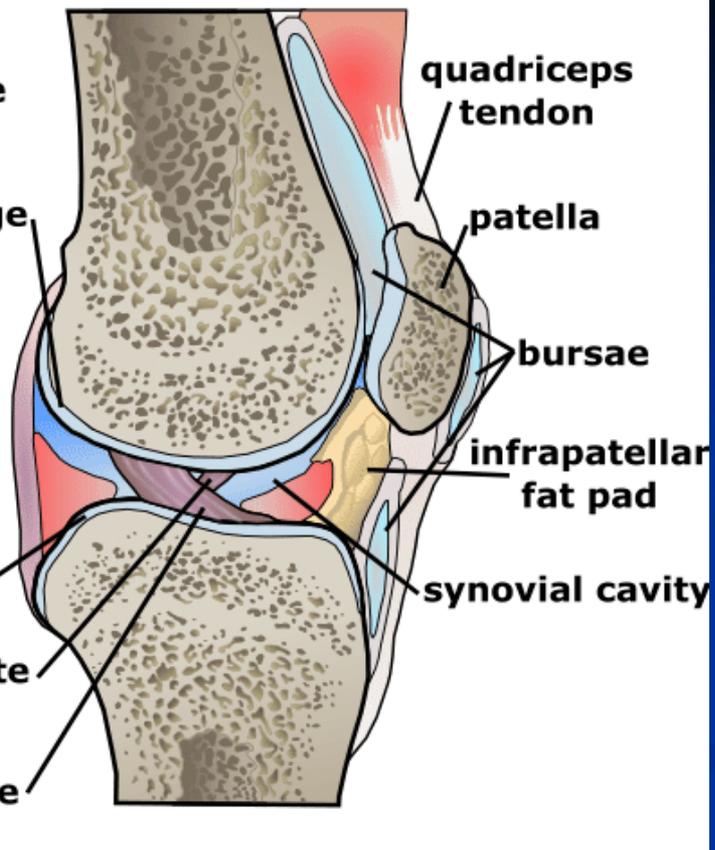
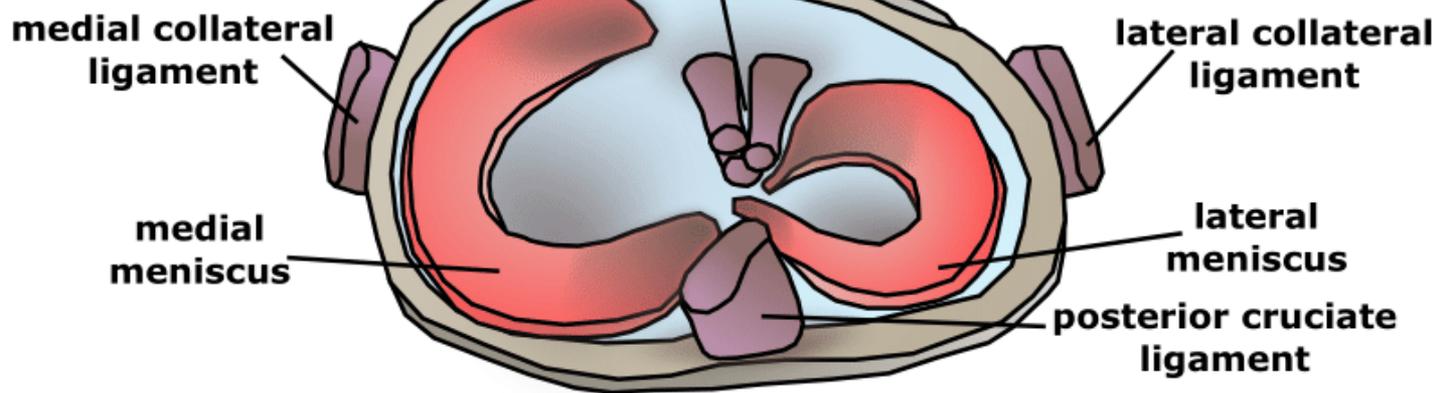
## ■ Synovial fluid:

- ↓ Friction

## ■ Subchondral bone

- Shock-absorber



**A)****B)****C)**

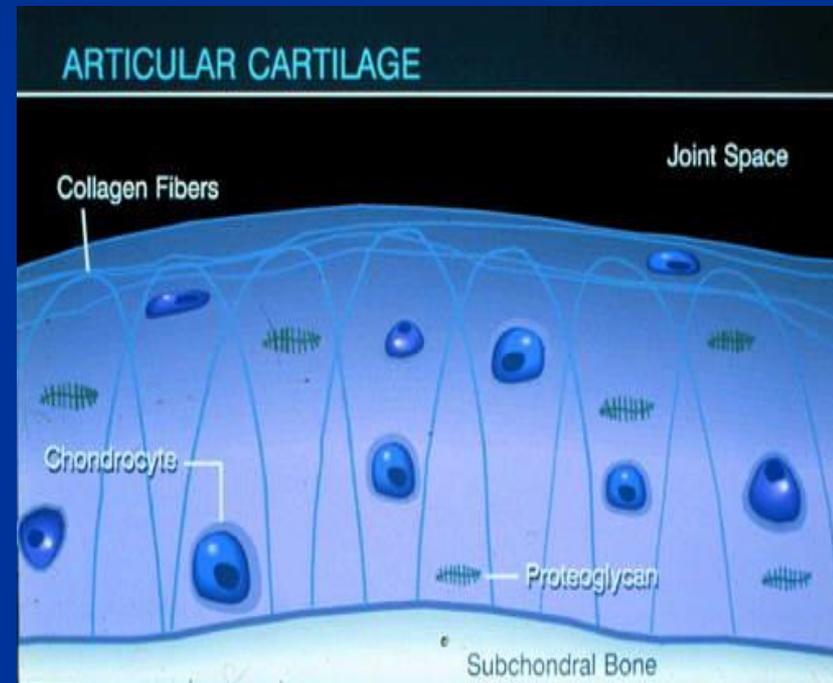
# PROTECTORS

## ■ Cartilage:

- A thin rim of tissue
- Lubricate by synovial fluid

## ● Function:

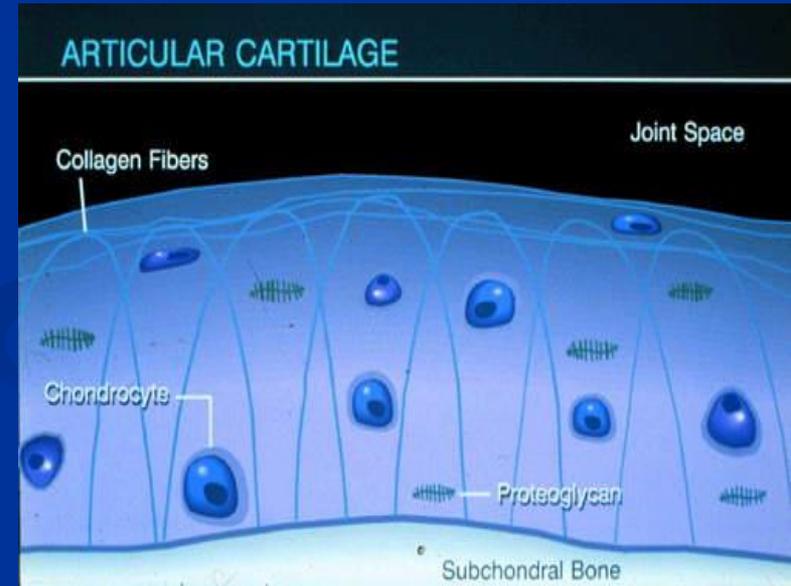
- Frictionless surface
- Absorbing capacity



# PROTECTORS

- Chondrocyte:
  - Synthesize all element of matrix
  - Secret:
    - Growth factors
    - Cytokines (MMP...)

Function in dynamic equilibrium



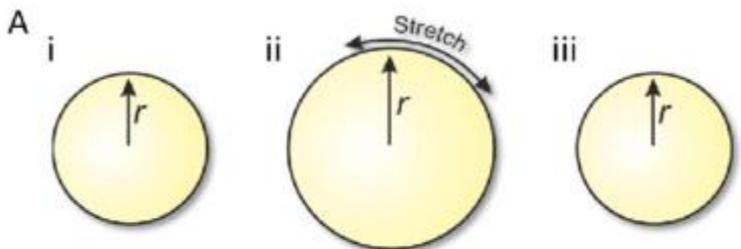
# PATHOPHYSIOLOGY

# PATHOPHYSIOLOGY

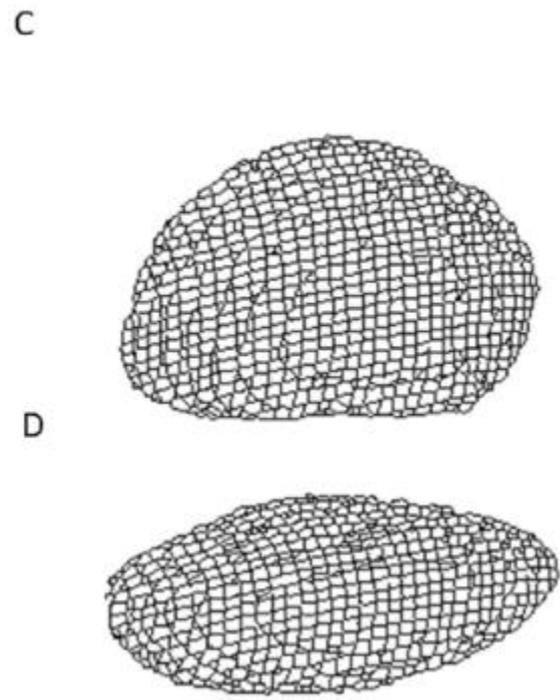
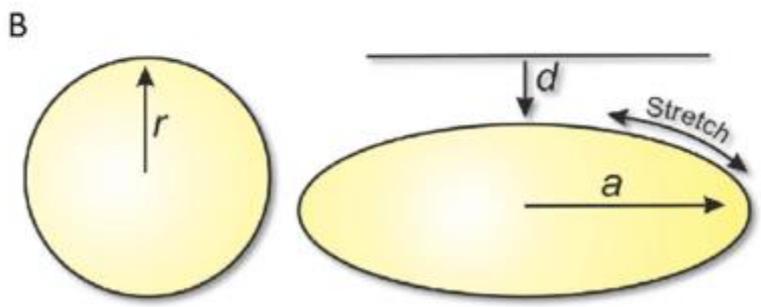
- Joint failure
- Initial step: failure of protective mechanisms
- Pathologic change in all structures of joint
- Hallmark: hyaline cartilage loss

# Mechanical and osmotic stress change chondrocyte:

Osmotic challenge (load, disease and ageing)



Compression (load)

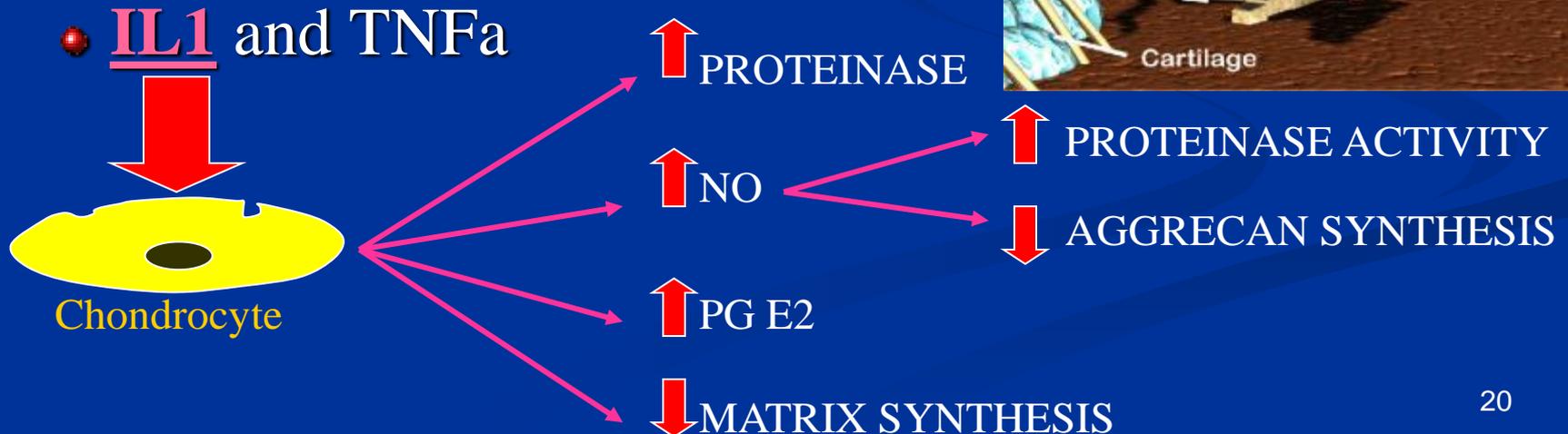


# PATHOPHYSIOLOGY

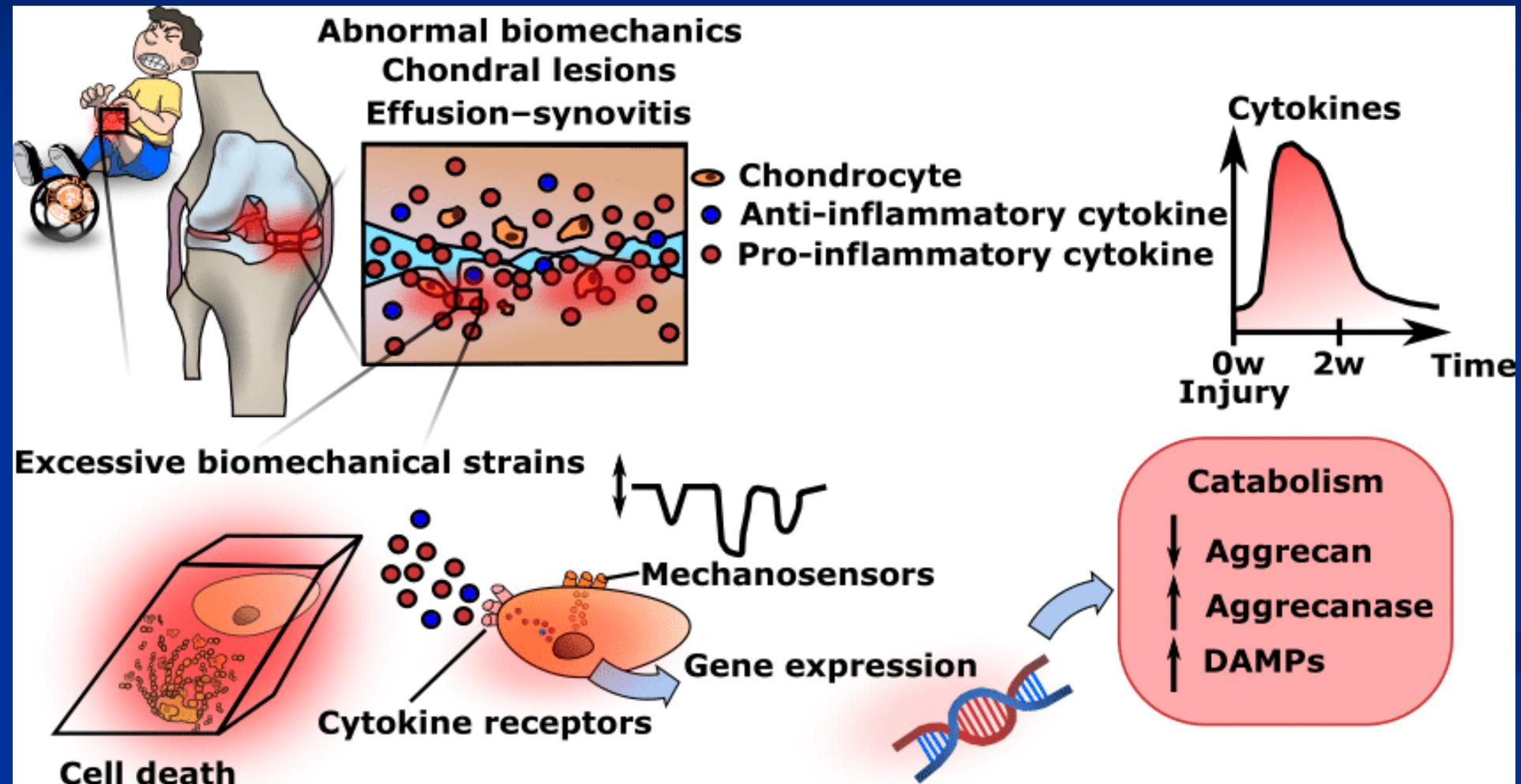
## ■ Chondrocytes:

- ↑ Metabolic activity, ↑↑↑ catabolic activity → ↓ PG
- ↑ Apoptosis

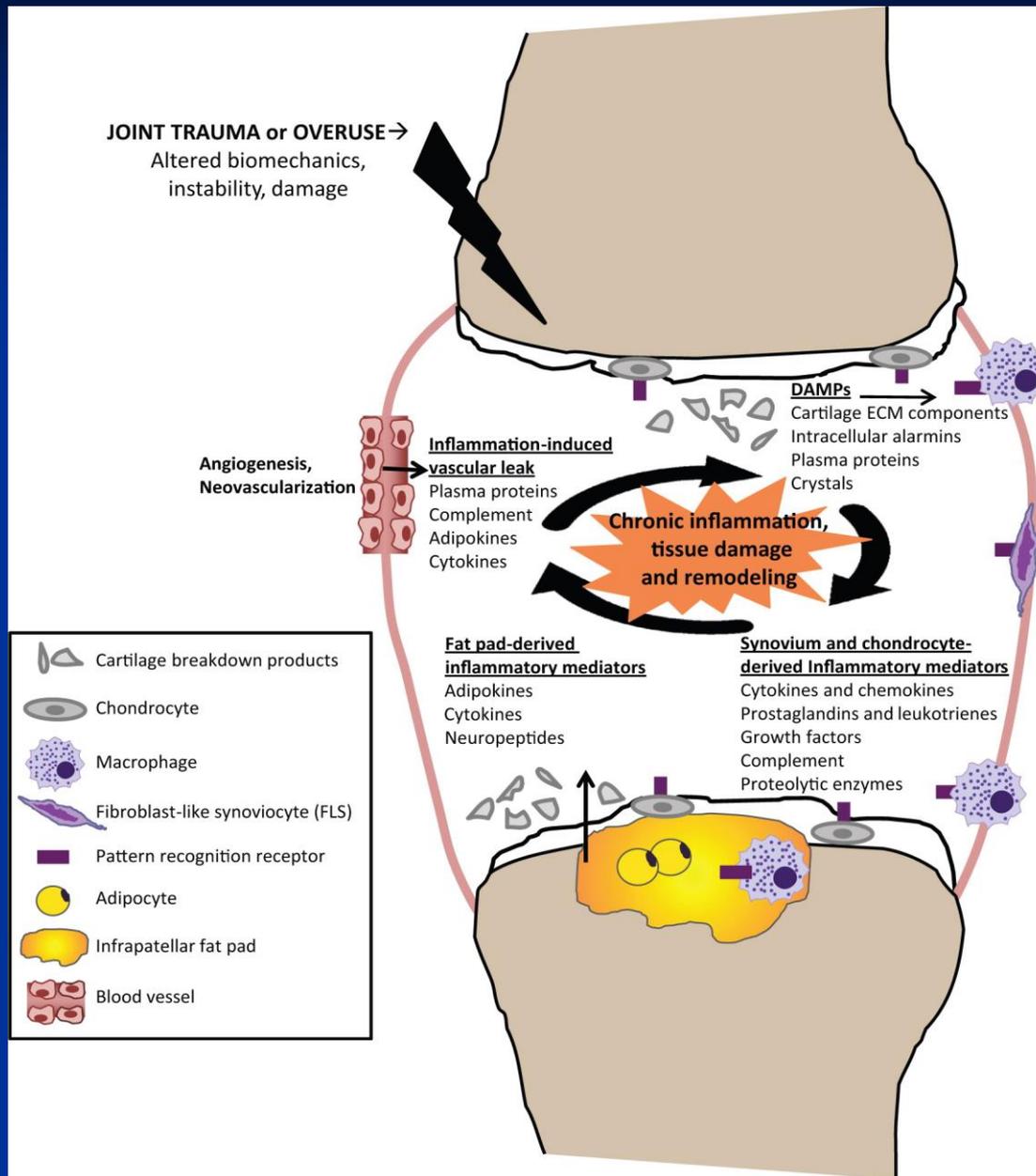
## ■ Chondrocytes and synovium:



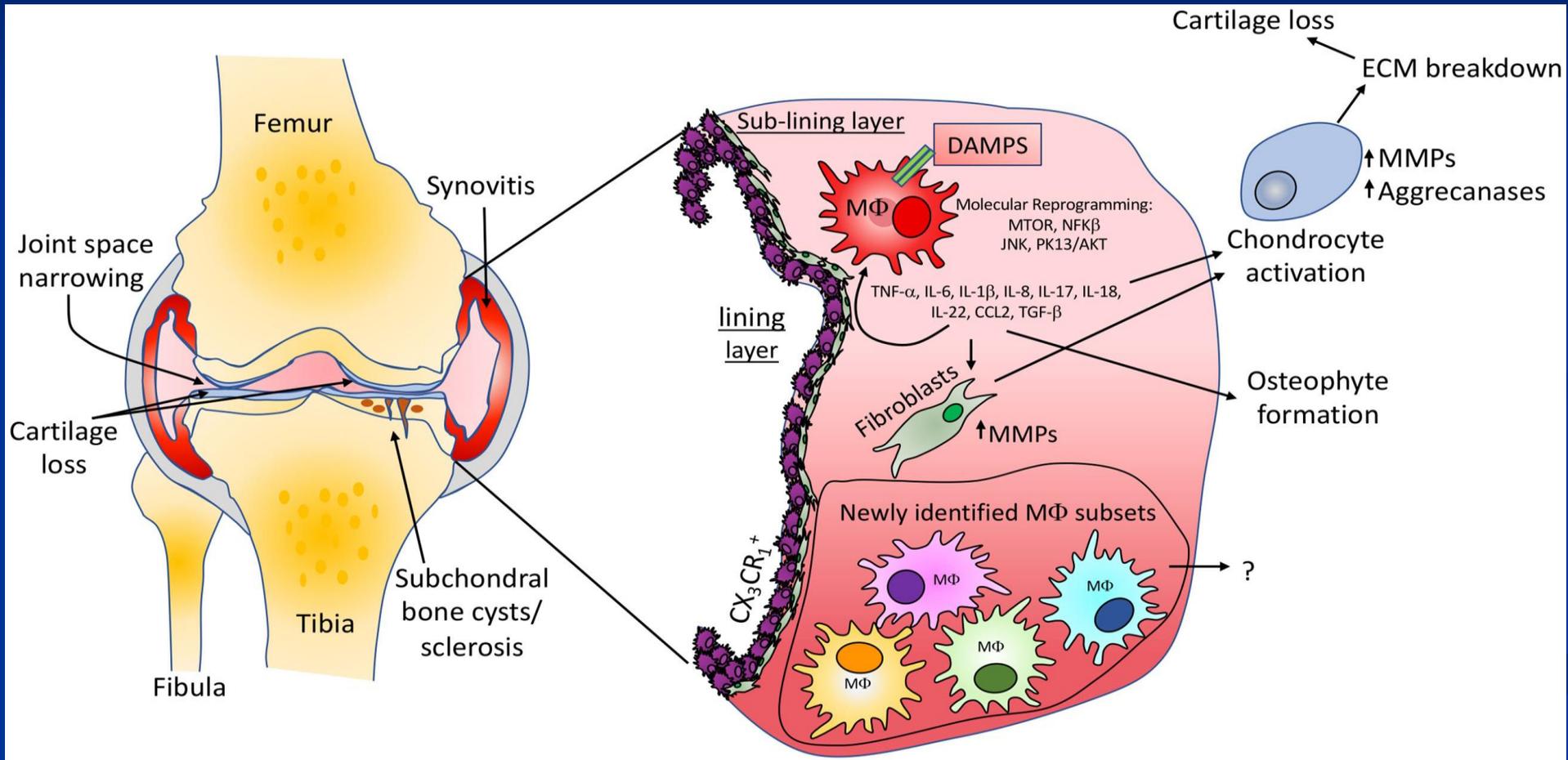
# Mechano-inflammation

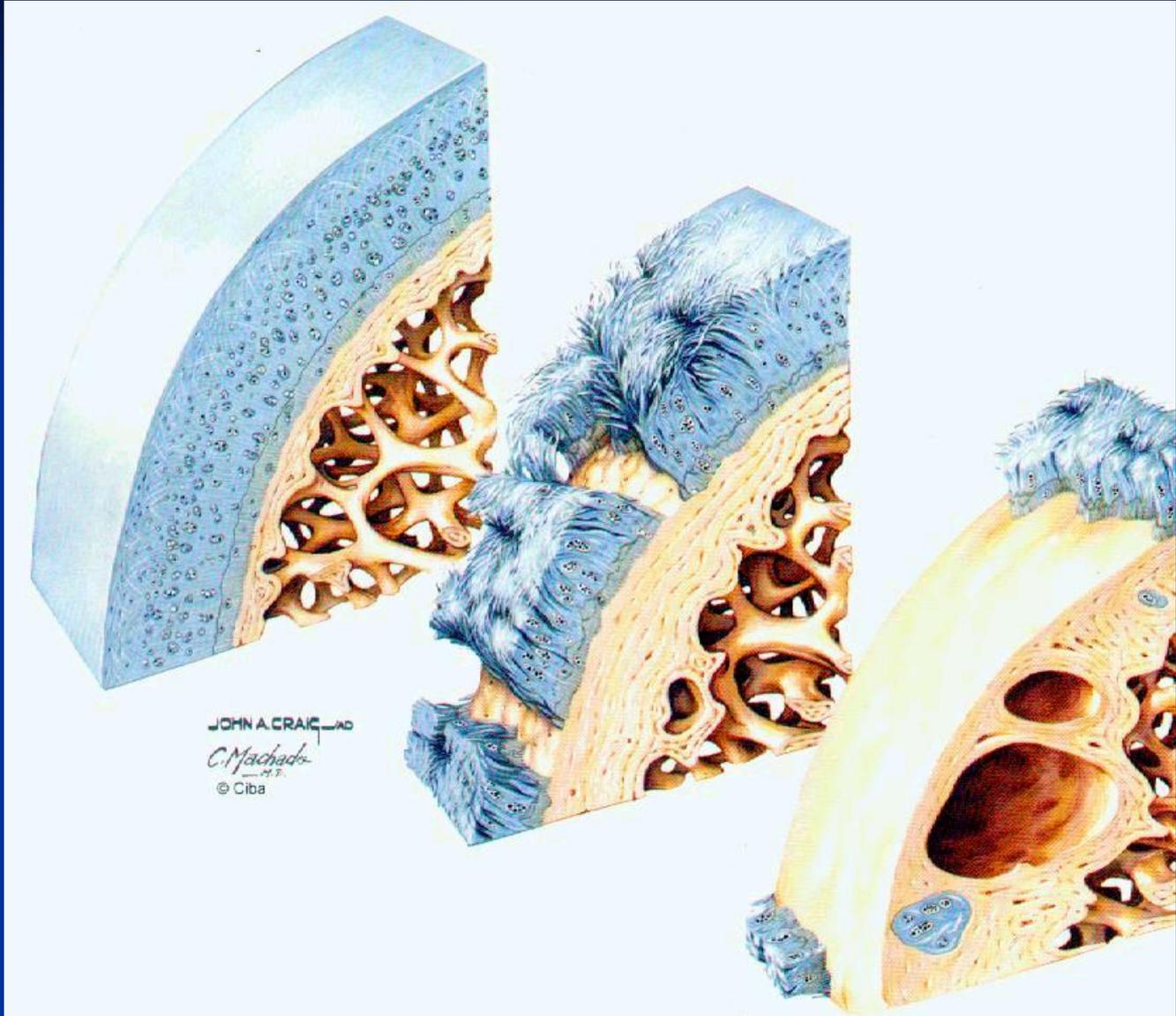


# Inflammation in osteoarthritis



# Inflammation in osteoarthritis





JOHN A. CRAIG, D.D.S.  
*C. Machado*  
M.D.  
© Ciba

# RISK FACTORS

# RISK FACTORS

## ■ AGE:

- Most potent      age more 70 years 50%
- Mechanisms:
  - × ↓ Matrix synthesis → Thin cartilage then shear stress
  - × Muscles:
    - Weaker
    - Less quickly response
  - × Slow sensory impute
  - × Ligament stretch make less absorb impulse

# RISK FACTORS

## ■ OBESITY:

- Knee in stance → 3-6 times of weight
- ↑ Knee OA and less for hip and hand OA
- Women: Stronger (linear)
- ↑ Symptom
- Mechanisms: - Loading  
- Low grade systemic inflammation<sup>27</sup>

# RISK FACTORS

## ■ FEMALE

## ■ GENETIC (OA in member):

- Hand & Hip → 50%
- Knee → 30%
- Polymorphism in growth differentiation factor 5 (GDF5)

# RISK FACTORS

## ■ JOINT:

- Developmental : Hip : congenital dysplasia more in girls, Legg-Perthes, slipped capital epiphysis
- Fracture : like ankle, wrist
- Tear of ligament and meniscus
- Malalignment

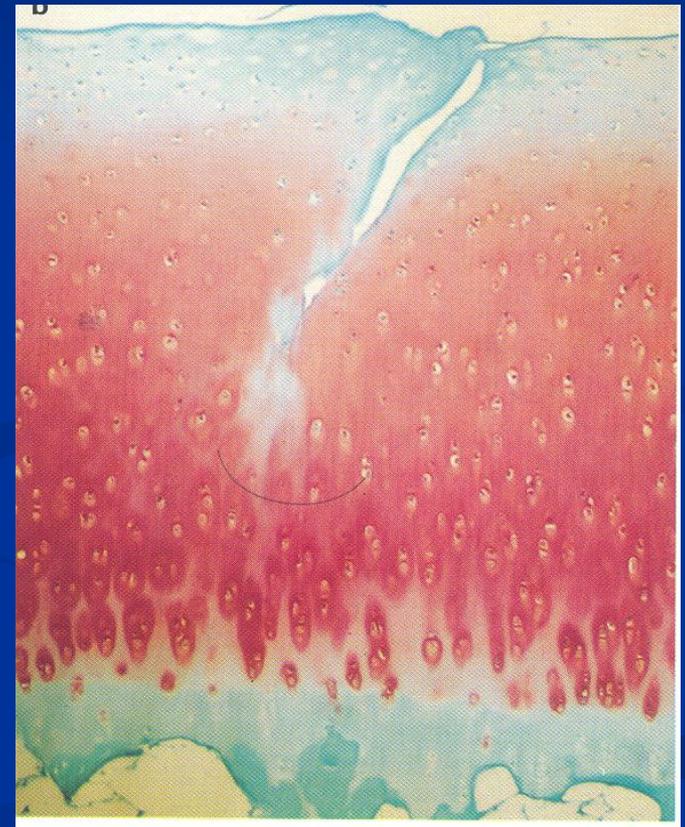
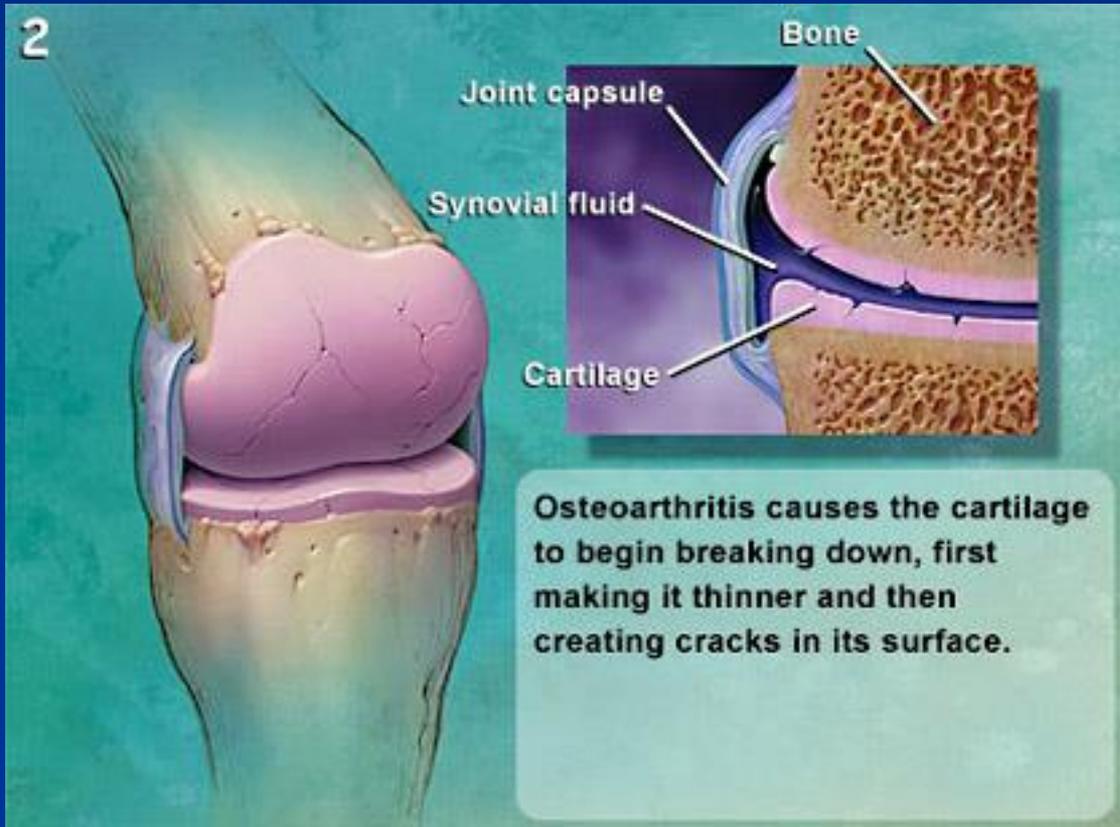
# RISK FACTORS

## ■ REPEATED USE:

- Farmers: Hip
- Miners: Knee and Spine
- Runners: Hip
- Elite runner: Hip and Knee

# PATHOLOGY

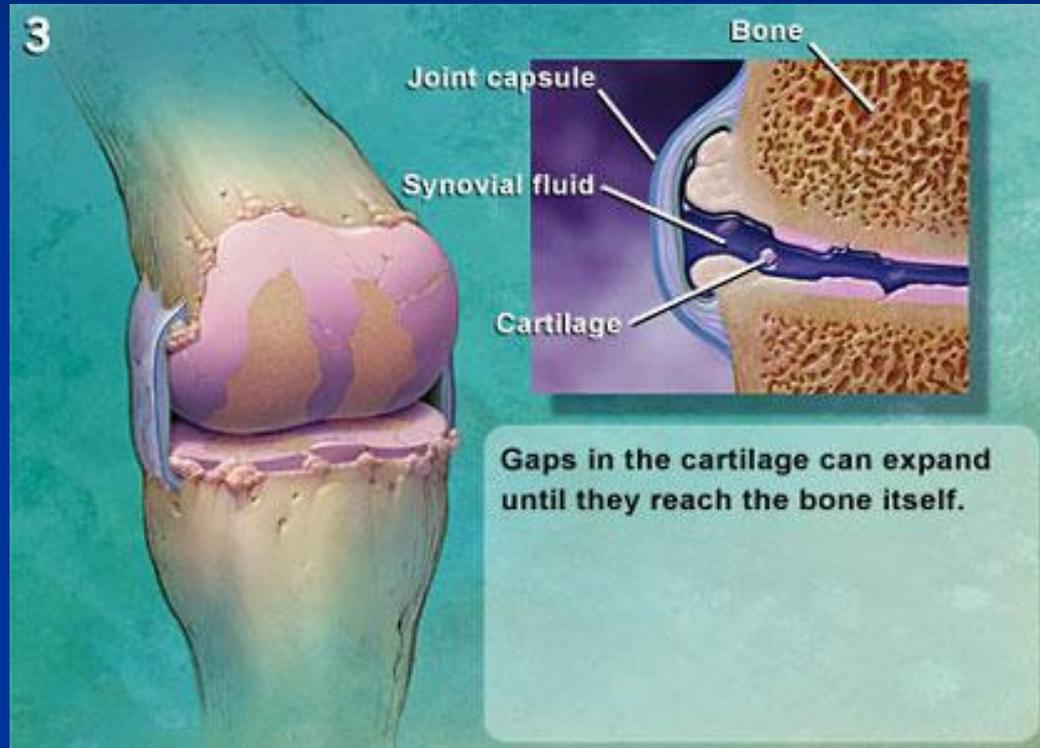
# PATHOLOGY



The earliest finding: fibrillation of superficial layer of cartilage.

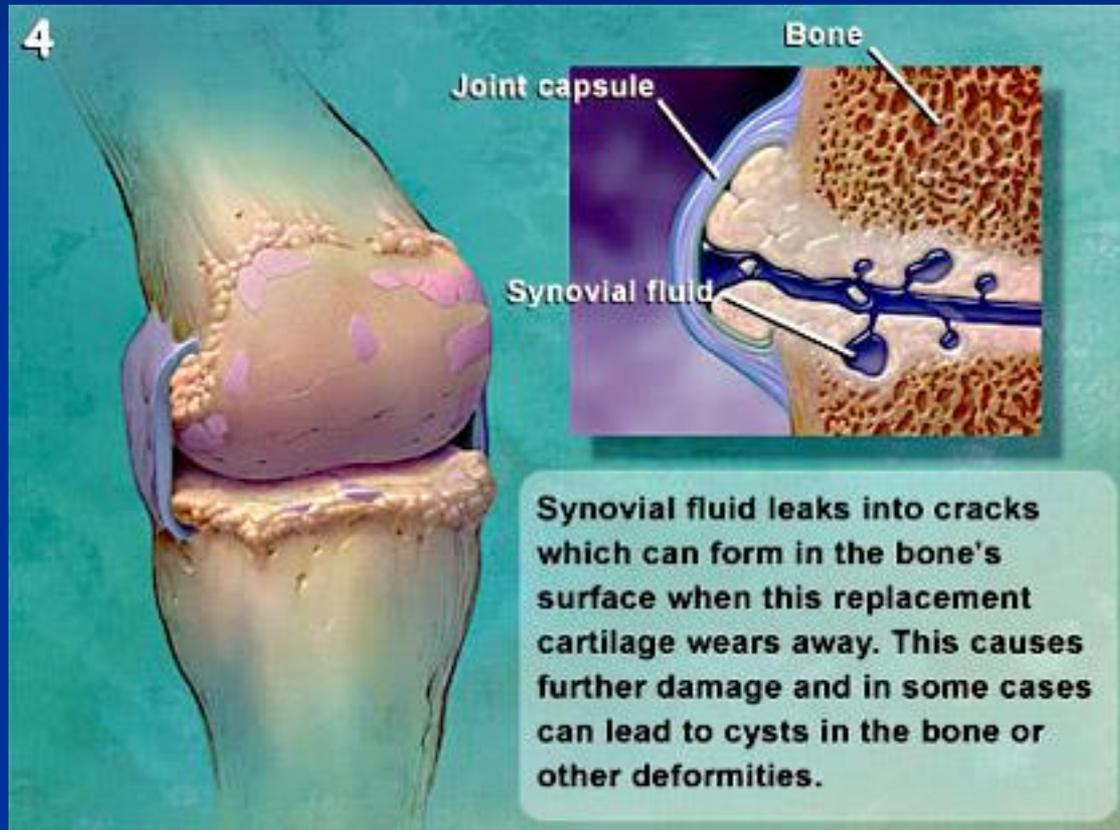
- Chondrocyte undergo mitosis and cluster
- Catabolic activity increase
- Negative charge PG get expose
- Cartilage swelling
- chondrocyte at basal layer apoptosis
- GF and cytokine stimulate OB and OC
- Bone formation and osteophyte form near area of cartilage loss

# PATHOLOGY



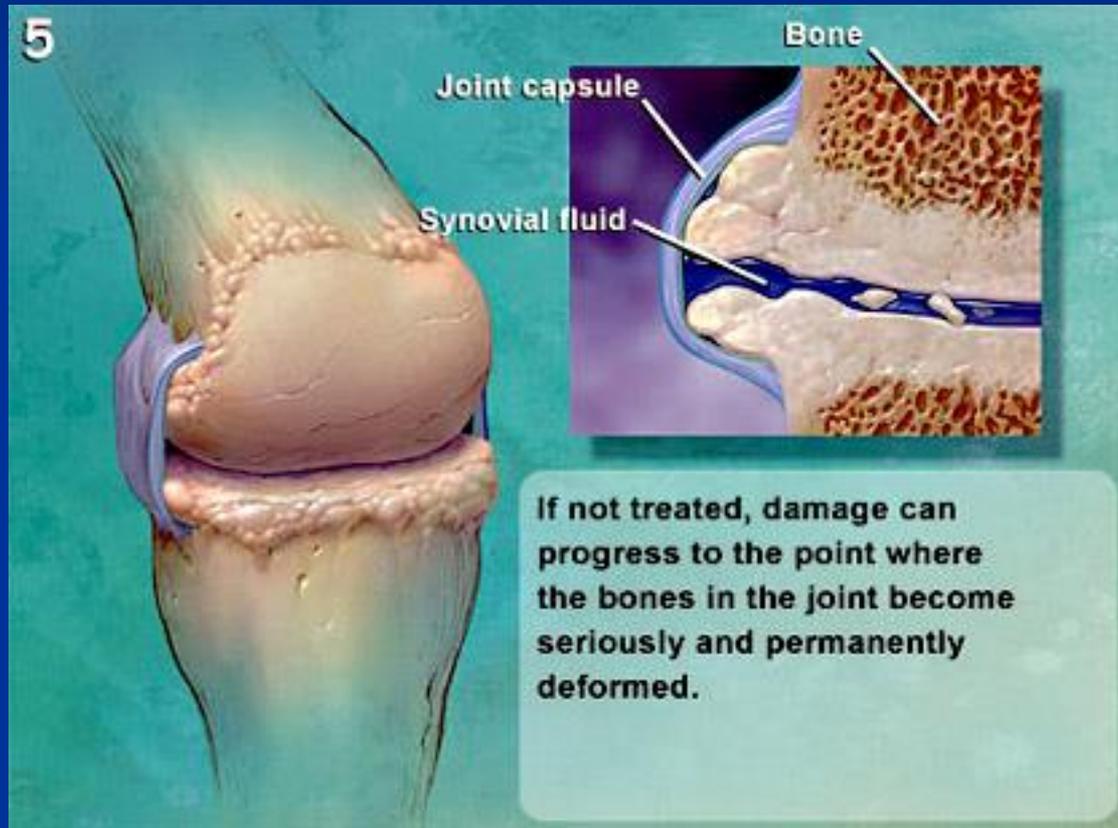
Disruption become deeper.

# PATHOLOGY



Fragmentation of cartilage with release into the joint .

# PATHOLOGY



Complete loss of cartilage, leaving only exposed bone.

- Synovitis and proliferation
- Capsule fibrosis
- Erosions
- End stage OA deposition CPPD

# SOURCE OF PAIN

# SOURCE OF PAIN

■ Cartilage → Aneural

■ Innervated structures:

● Synovium, Ligaments, Capsule, Muscle, Bone



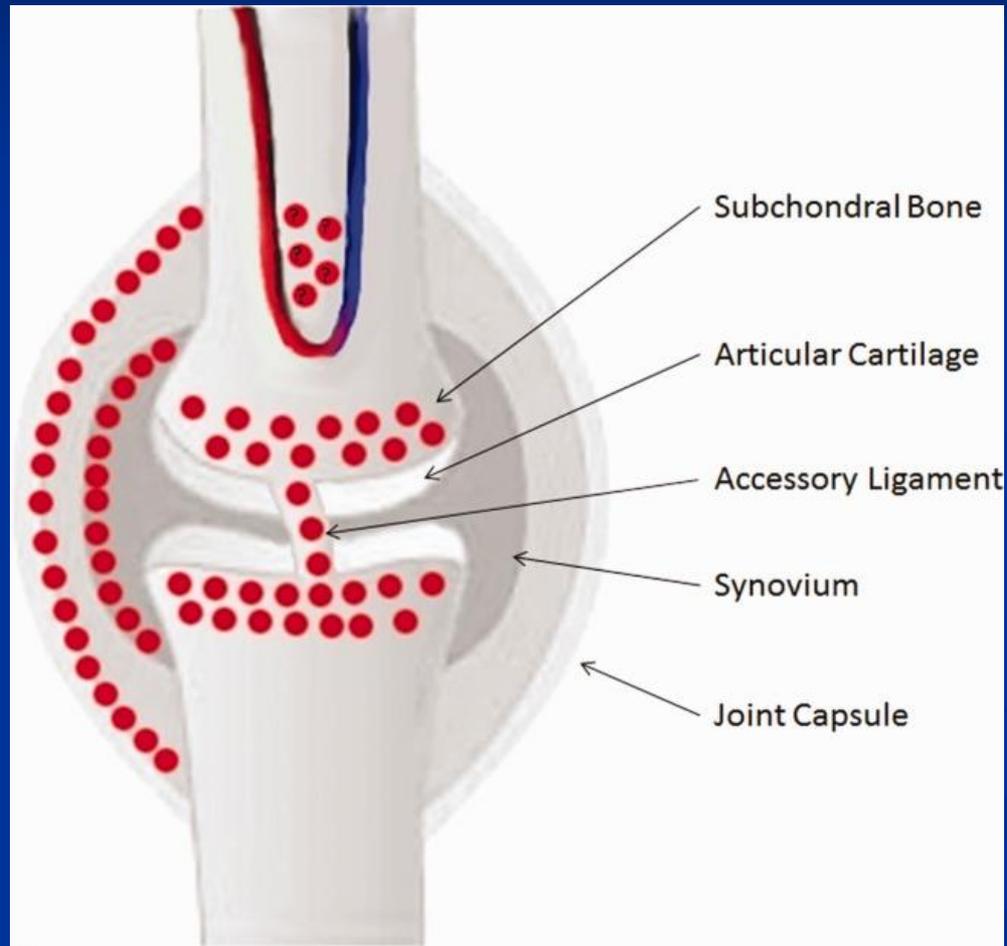
NOT VISUALIZED BY X RAY

*POORLY CORRELATION*



X RAY CHANGES AND PAIN SEVERITY

# Pain generators



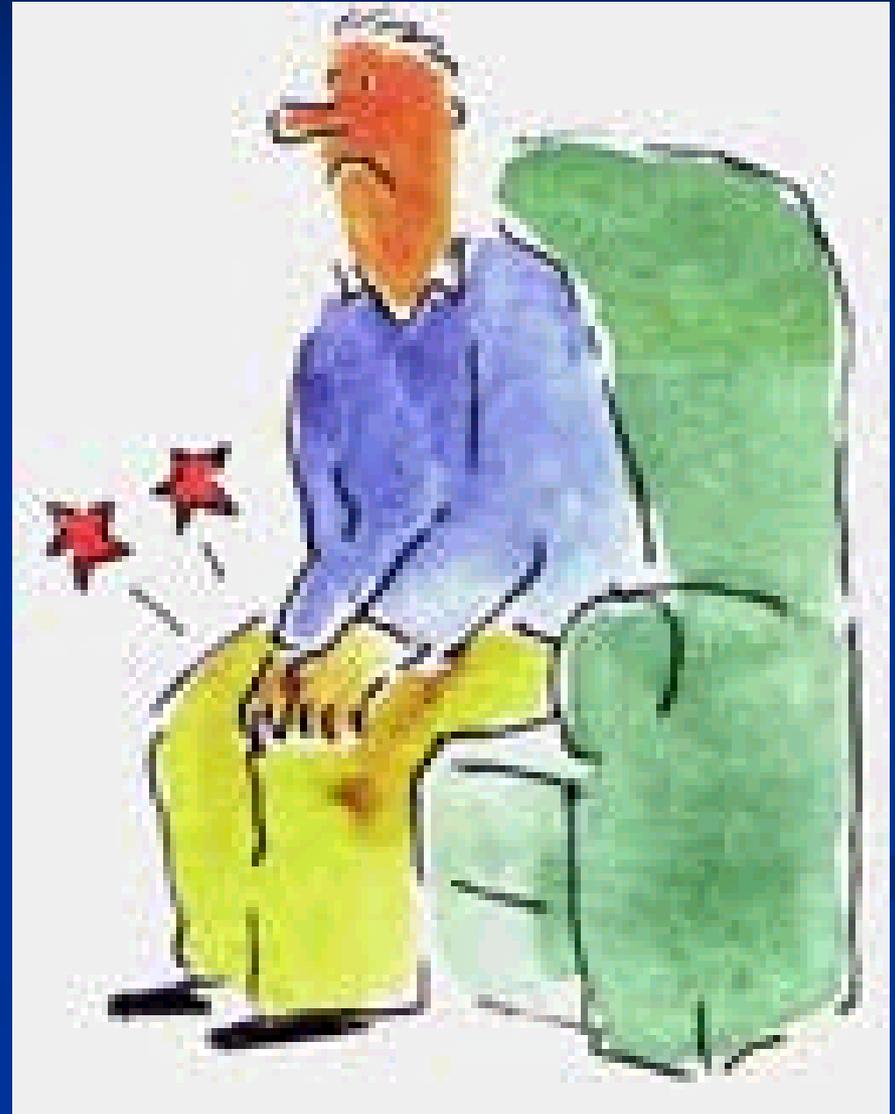
# CLINICAL FEATURES

# CLINICAL FEATURES

- Mechanical pain
  - Factors that affecting pain report:
    - Age
    - Sex
    - Socioeconomic status
    - Race
    - Cultural status

# CLINICAL FEATURES

- Mechanical pain
- Gelling pain
- Night pain
- Joint effusion



# CLINICAL FEATURES

- examination:
  - ✿ Tenderness
  - ✿ Bony enlargement
  - ✿ Crepitus with movement
  - ✿ Joint effusion

# CLINICAL FEATURES

## ■ examination:

- ✿ Limitation of joint motion
- ✿ Joint deformity
- ✿ Joint instability
- ✿ Muscle weakness and gait abnormality

# CLINICAL FEATURES

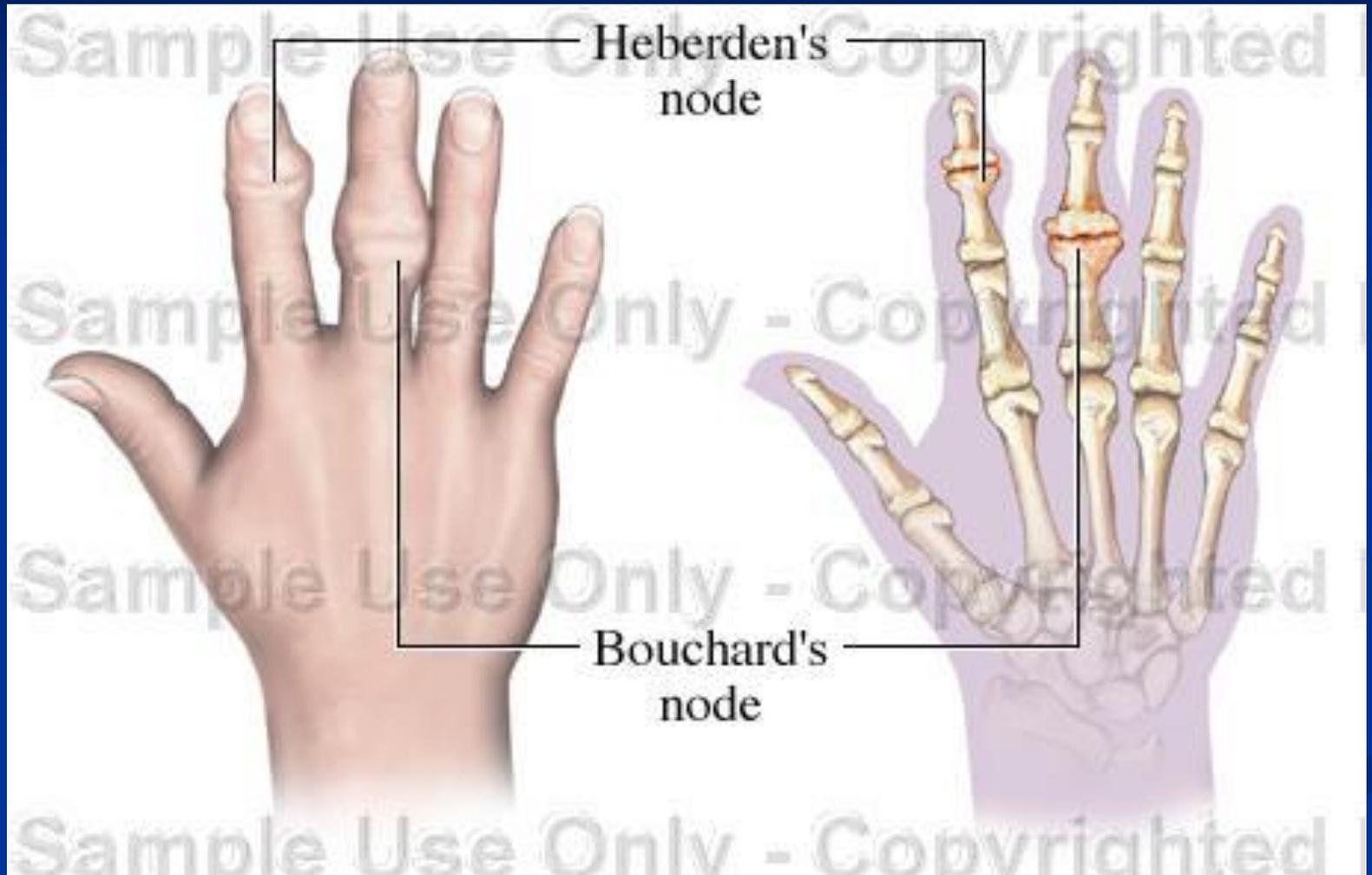
- KNEE:
  - ✿ Buckling
  - ✿ Locking

# CLINICAL FEATURES

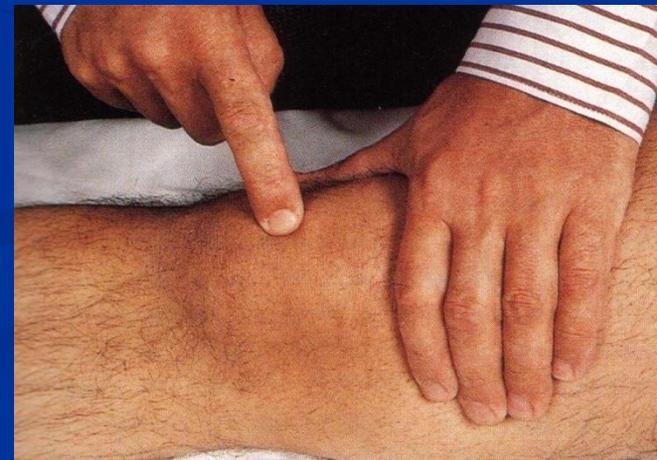
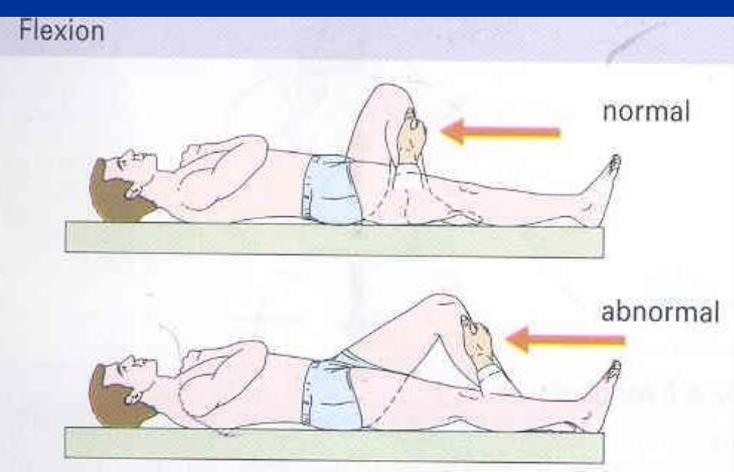
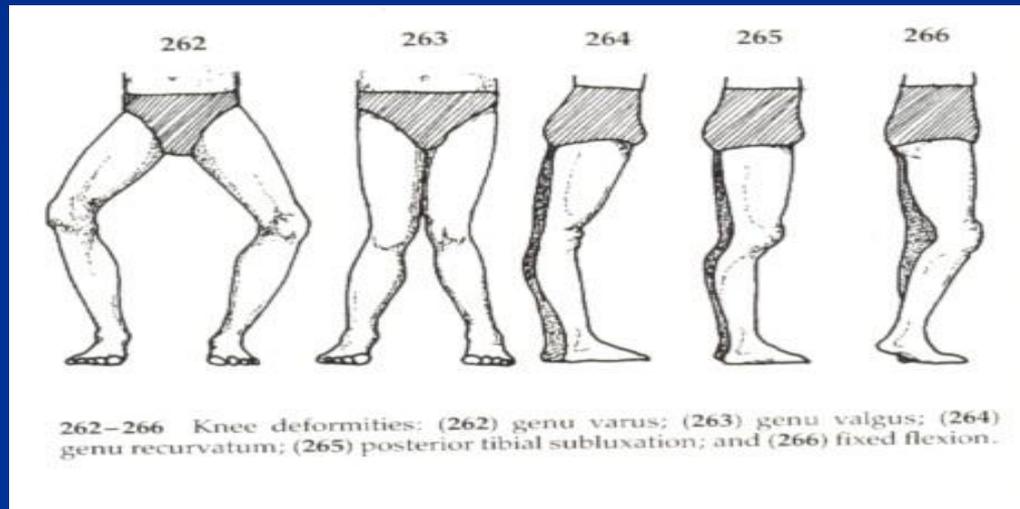
## ■ Hand OA:

- ✿ Most common in middle aged women
- ✿ Strong family history in first-degree relative

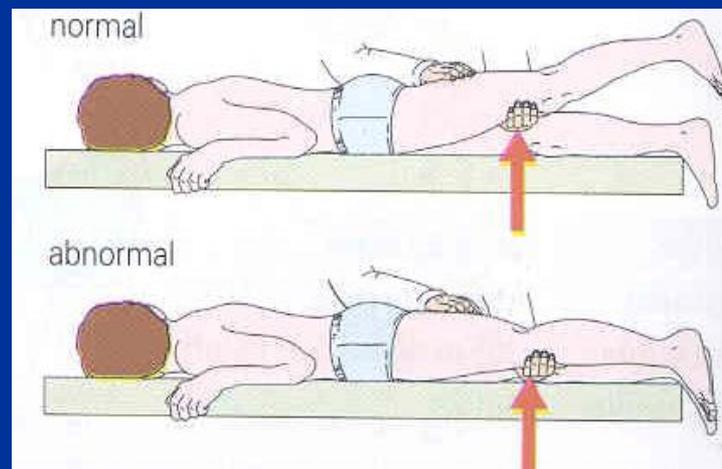
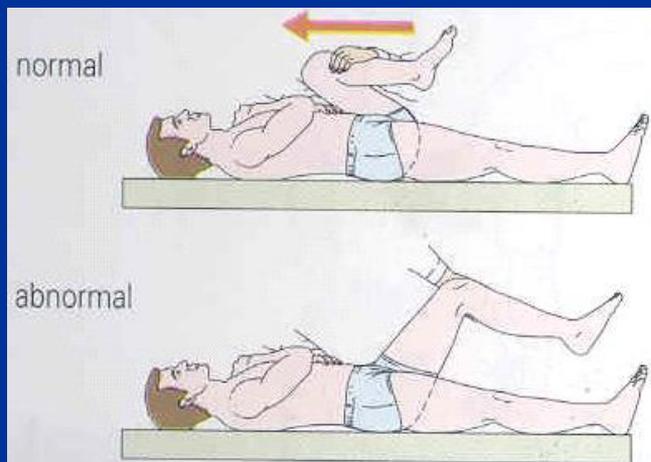




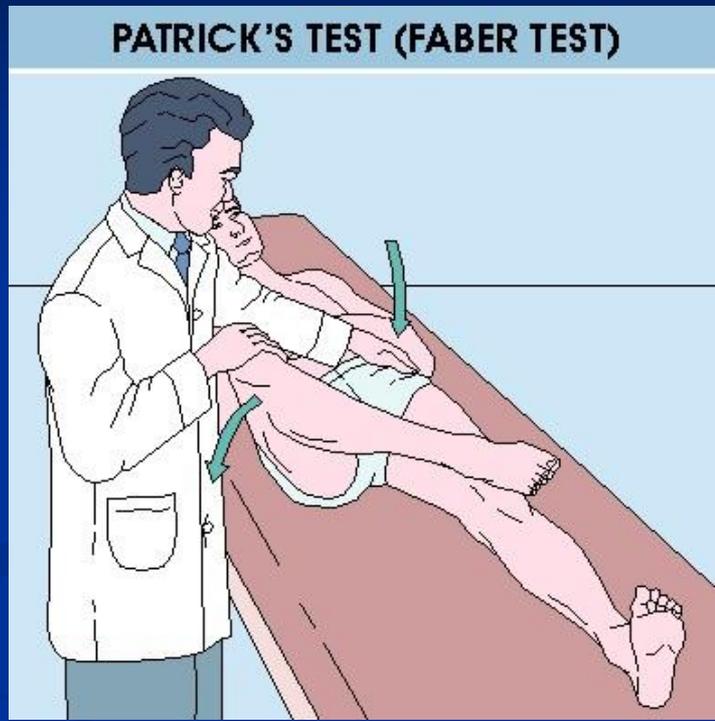
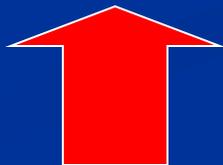
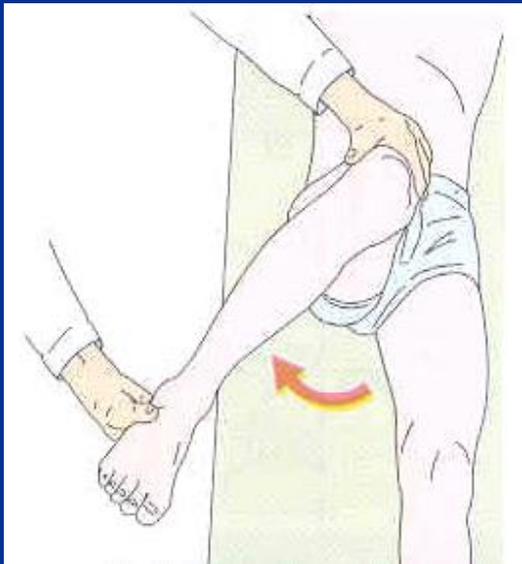
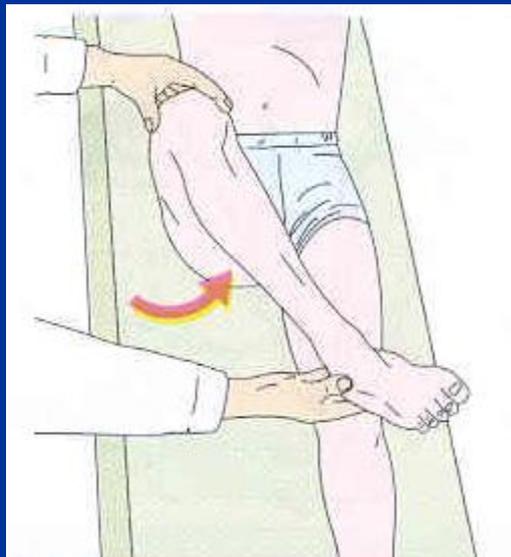
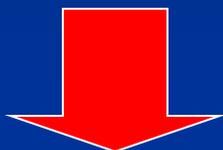
# PHYSICAL EXAMINATION



# PHYSICAL EXAMINATION



# PHYSICAL EXAMINATION



# DIAGNOSIS

- CLINICAL
- No blood test routinely indicated
- Synovial fluid

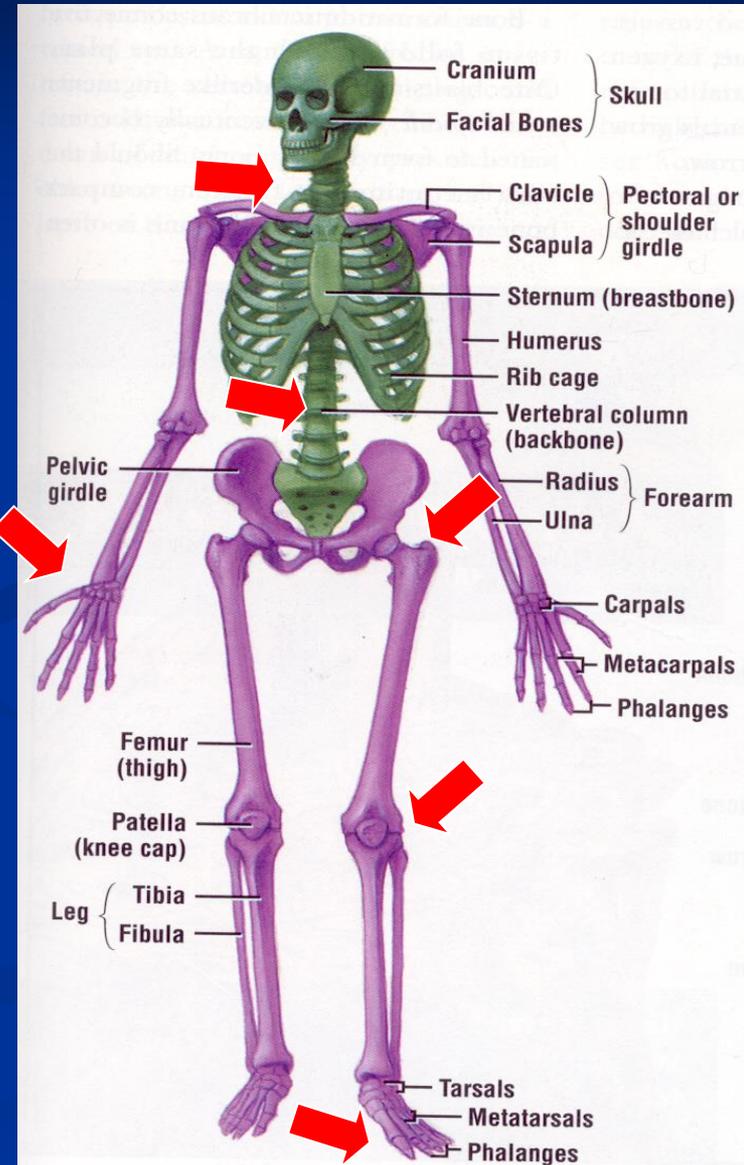
# DIAGNOSIS

- Common in:

- Knee, hand, spine...

- Spared:

- Wrist, elbow, shoulder, ankle



# DIAGNOSIS

## ■ X Ray:

- Hand and hip pain
- knee if:
  - Not typical symptom
  - Pain persists after effective treatment
- Poorly correlation with pain severity

## ■ MRI: Not indicated

# RADIOLOGY

# HAND OA



# HAND OA



# HIP OA



# KNEE OA



# SPINE OA



# HALLUS RIGIDUS



Before



After



# TREATMENT

# TREATMENT

- A multimodality approach
- Individualized

# TREATMENT

## ■ NON PHARMACOTHERAPY

- Mainstay of therapy:

- Altering loading across joint
- Improving joint protectors

- Weight loss:

- Each Kg of weight: ↑ Load in knee 3-6 fold

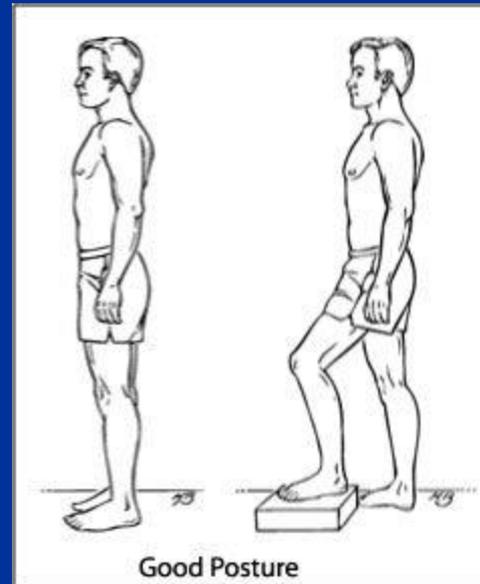
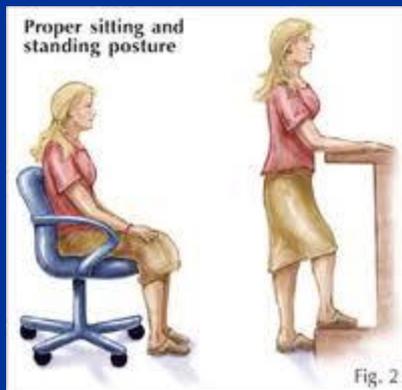
- ↓ Symptom



# TREATMENT

## ■ NON PHARMACOTHERAPY

- Avoiding overload the joint



- Knee & Hip → Cane in opposite hand

# TREATMENT

## ■ NON PHARMACOTHERAPY

### ● Exercise:

- Age
- Disuse
- Arthrogenous inhibition

# TREATMENT

## ■ NON PHARMACOTHERAPY

- Degree of weakness correlate strongly with:
  - Severity of pain and Physical limitation
  
- Most effective exercise:
  - Aerobic and/or resistance training
  - Individualized
  - Avoiding exercises that increase pain
  - Water aerobics training

# TREATMENT

## ■ PHARMACOTHERAPY

- Symptomatic relief but doesn't alter course of disease

# TREATMENT

## ■ PHARMACOTHERAPY

- Acetaminophen
- NSAID
- Injection
- Glucosamine and chondroitin

# TREATMENT

- Glucocorticoid injection:
  - Efficacy is variable
- Hyaluronic acid:
  - Controversy
- Recent guideline against glucosamine & chondroitin

# TREATMENT

## ■ Surgery:

- Arthroscopic debridement and lavage: as no treatment
- Arthroscopic meniscectomy: no effective
- Total knee or hip arthroplasty:
  - Remain in pain
  - Limitation of function
  - Compromise quality of life

# Key message

- Global prevalence of osteoarthritis is increasing and the burden of the disease will rise
- Osteoarthritis will become one of the most prevalent diseases in populations from high-income countries in the coming decades
- Imaging is not needed to diagnose osteoarthritis
- Key treatments are education, exercise, and weight loss if needed

# Key message

- Because of the heterogeneity of the disease and comorbidities involved, personalised treatment is essential
- • Disease-modifying treatment is not yet available
- • Pain-modifying treatment, especially which treats or prevents sensitised pain, is essential in the coming years
- • Inappropriate treatments including arthroscopy and opioids should be actively discouraged
- • Careful selection of appropriate candidates for surgical referral and joint replacement would optimise outcomes
- • Prevention of osteoarthritis is in its infancy, but lifestyle interventions seem promising

