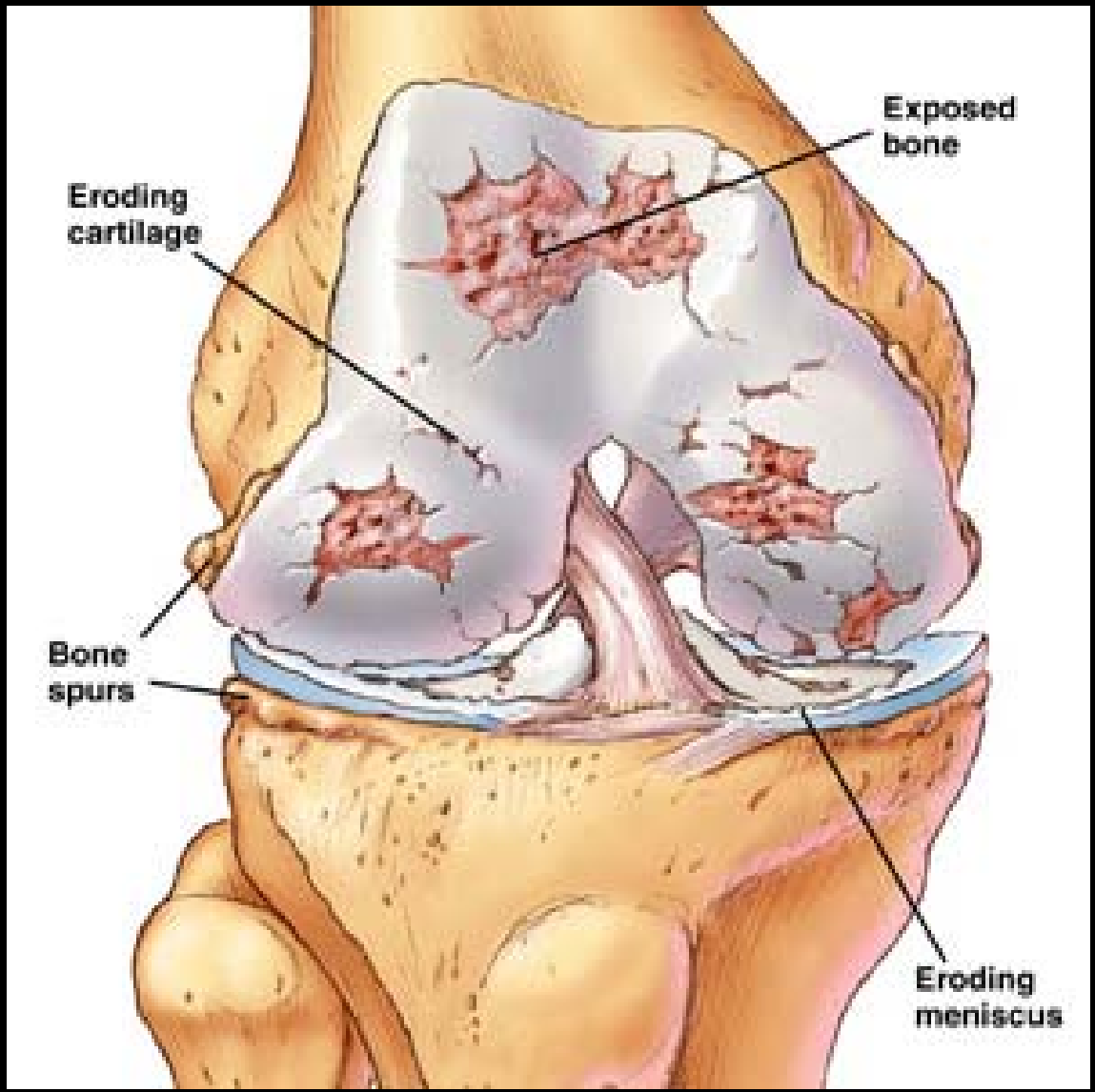
Osteoarthritis

OA

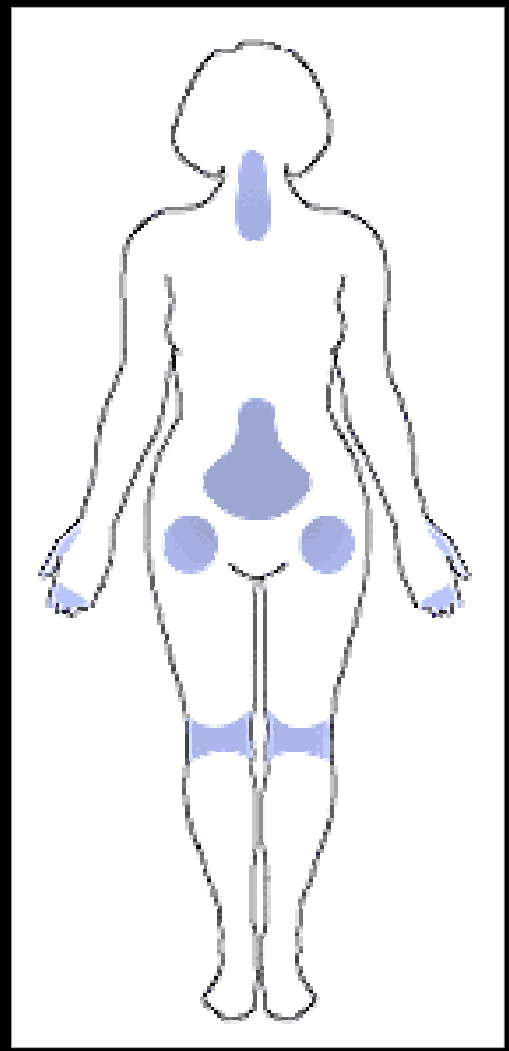


OA is a degenerative disease of joints that affects all of the weight-bearing components of the joint:

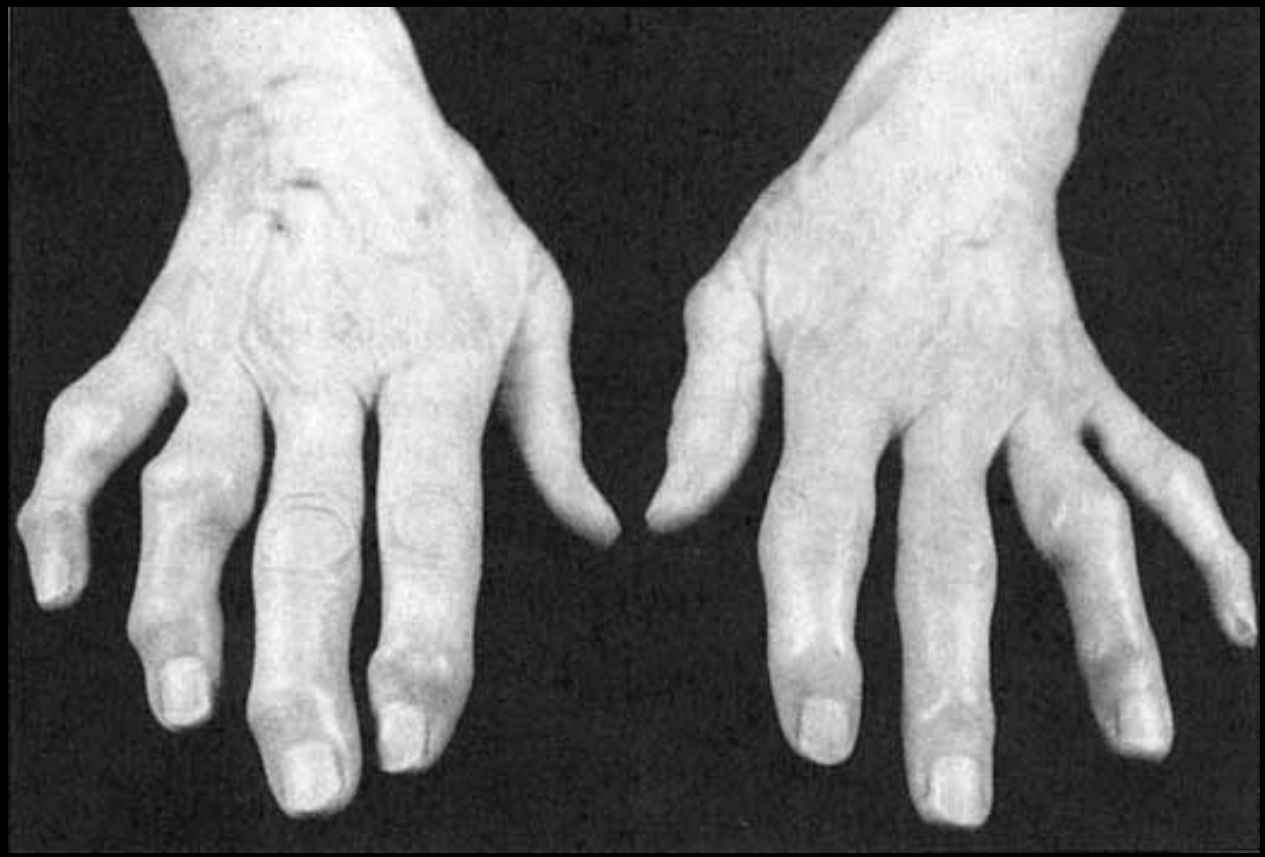
- Articular cartilage
- Menisci
- Bone

Osteoarthritis (OA)

- Most common form of arthritis
- Most common joint disease
- Over 10 million Americans suffer from OA of the knee alone
- Most OA patients > age 45
- Women > men.
- Most often appears at the ends of the fingers, thumbs, neck, lower back, knees, and hips.



OA



Nodal osteoarthritis
Bony enlargement of distal and proximal interphalangeal joints (Heberden's, Bouchard's nodes, respectively).

OA- Risk Factors

Age

- Strongest risk factor
- OA can start in young adulthood but risk increases with age

Female Gender

- Arthritis in general affects more women than men
- OA more common in men before age 45, women after age 45
- OA of the hand particularly common in women

Joint Alignment

- Abnormal alignment or motion predisposes joint to OA
  - Bow legs, dislocations, double-jointed

OA- Risk Factors

Hereditary gene defect

- Collagen component of cartilage is damaged
- Increased deterioration of cartilage

Joint injury/Overuse from physical labor or sports

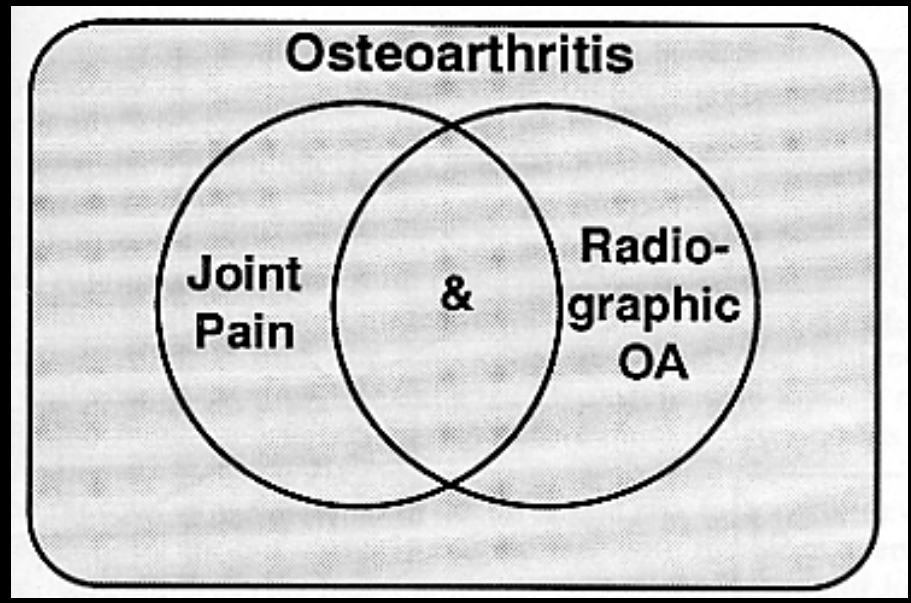
- Trauma to any joint increases risk of OA
- Ligament or meniscus tears
- Repeated movements in certain jobs increase risk

Obesity

- Joint overload is among strongest risks for knee OA

OA – Symptoms

- Gradual onset - It takes many years before the damage to the joint becomes noticeable
- Only a third of whose X-rays show OA report pain or other symptoms:



  - Steady or intermittent pain in a joint
  - Stiffness that tends to follow periods of inactivity, such as sleep or sitting
  - Swelling or tenderness in one or more joints
  - Crunching feeling or sound of bone rubbing on bone (called crepitus) when the joint is used

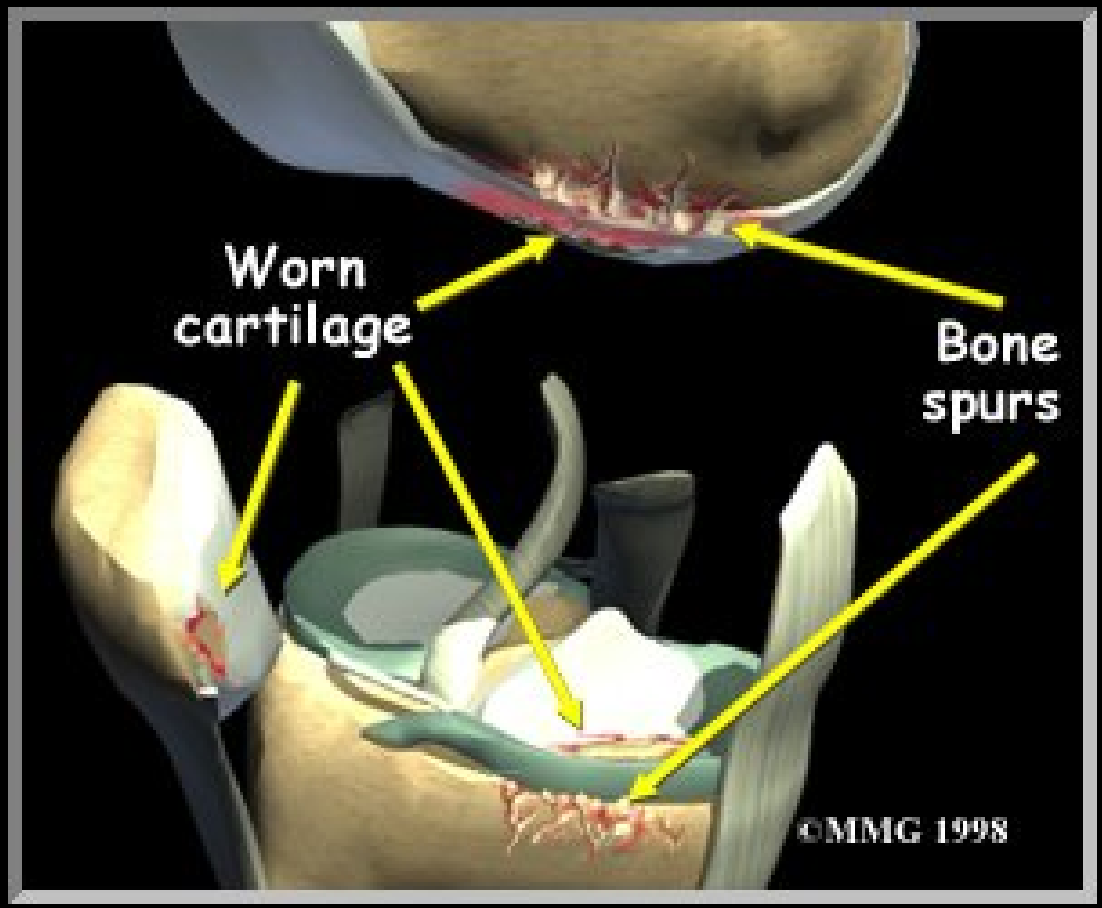
Osteoarthritis (OA) - Definition

Osteoarthritis may result from wear and tear on the joint

- The normal cartilage lining is gradually worn away and the underlying bone is exposed.

Osteoarthritis (OA) - Definition

•The repair mechanisms of rebsorption and synthesis get out of balance and result in osteophyte formation (bone spurs) and bone cysts

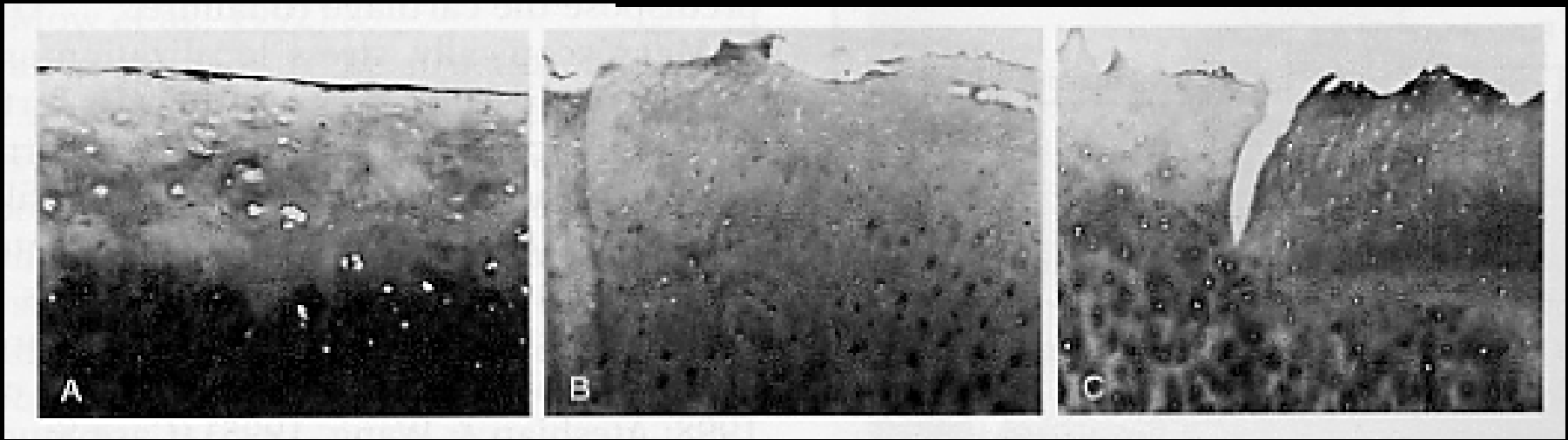


Osteophyte (spur) is formed when Osteoblast formation increases while resorption decreases

OA – Articular Cartilage

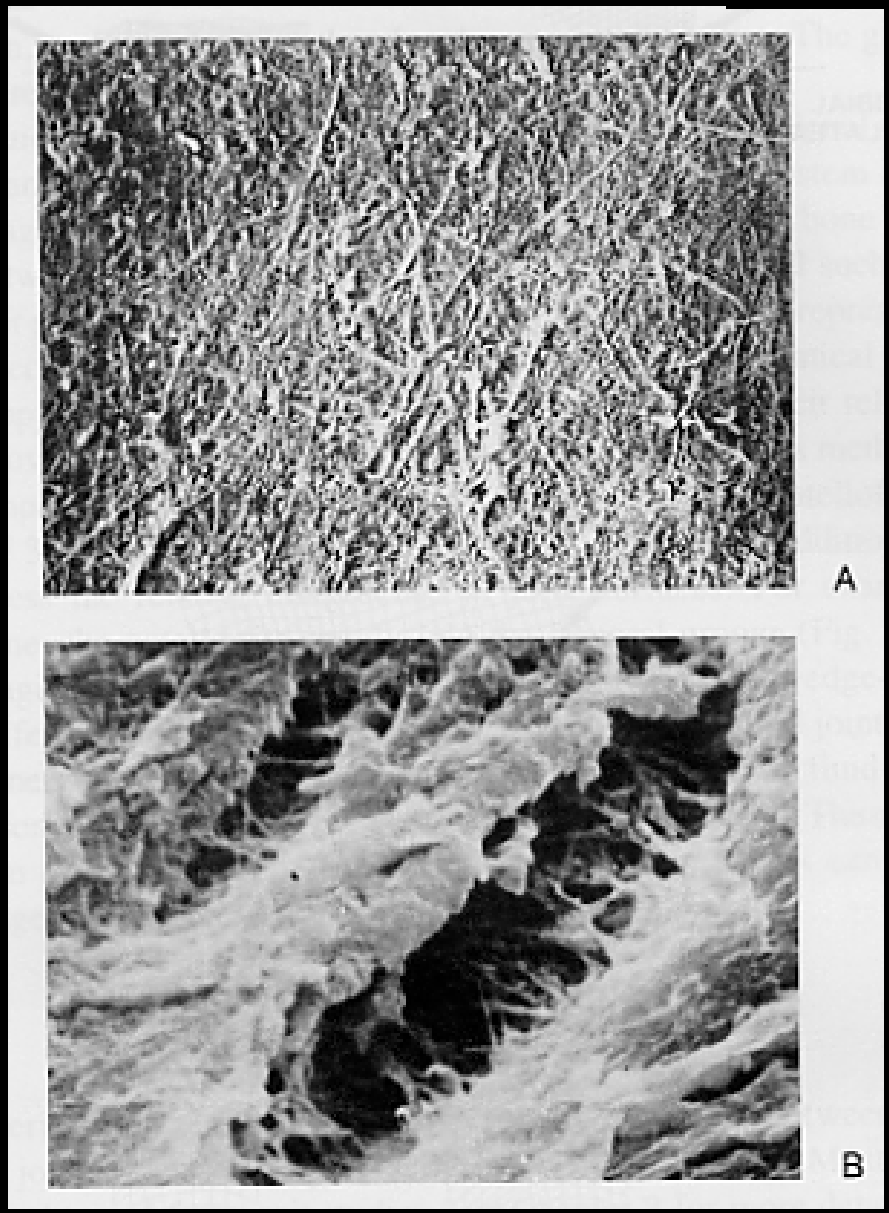
Articular cartilage is the main tissue affected

- Increased swelling
- Change in color
- Cartilage fibrillation
- Cartilage erosion down to subchondral bone



OA – Articular Cartilage Micrograph

OA – Articular Cartilage



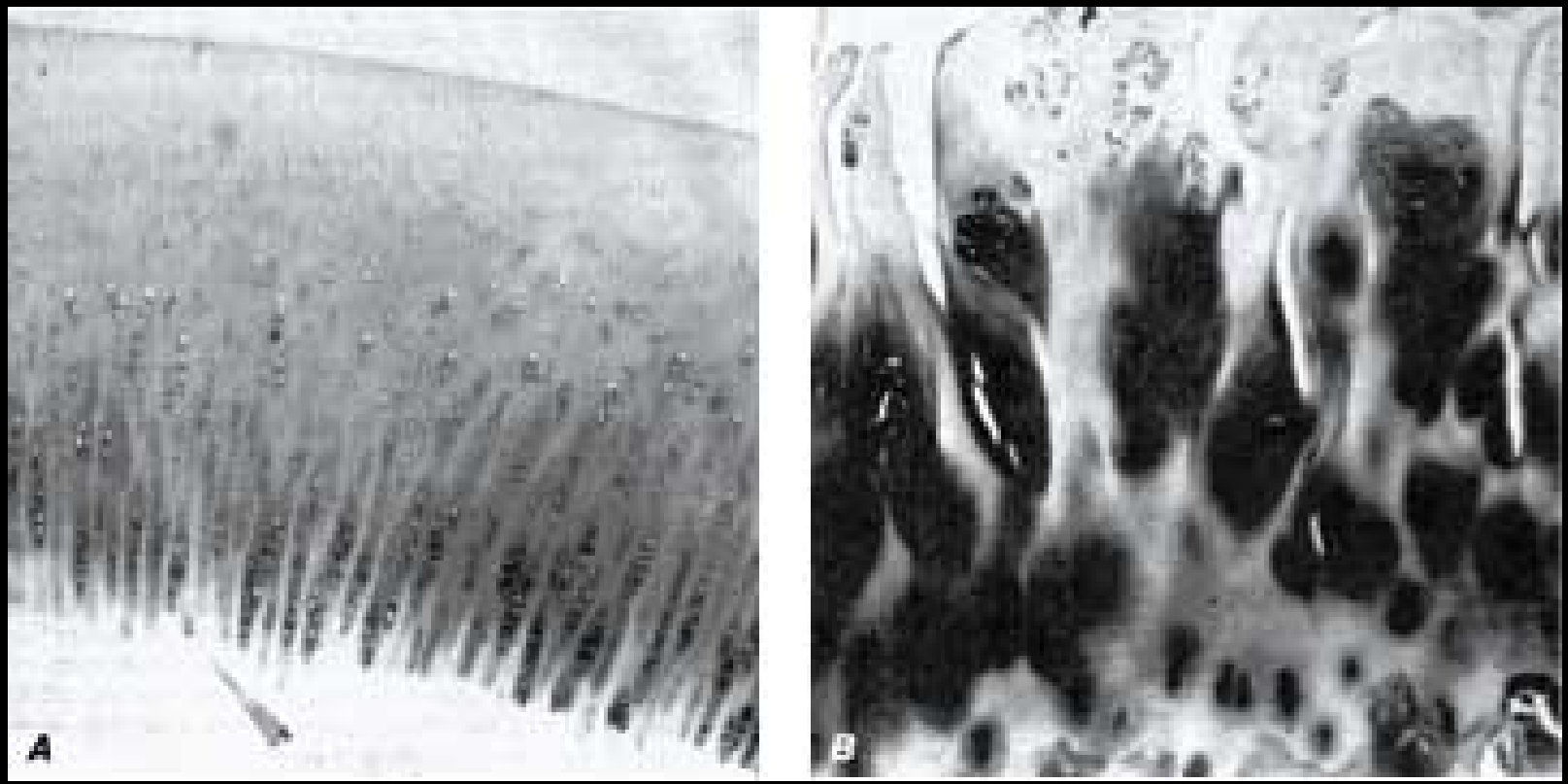
A) Normal articular cartilage from 21-year old adult (3000X)

B) Osteoarthritic cartilage (3000X)

- Surface changes alter the distribution of biomechanical forces
- This triggers active changes by the tissue

OA – Articular Cartilage

Chondrocyte cloning in an attempt to restore articular surface (Normal adult chondrocytes are fully differentiated and do not proliferate)



(A) Normal articular cartilage (B) Osteoarthritic cartilage

OA – Articular Cartilage

- Newly dividing cells do not differentiate fully
- Cannot effectively synthesize the elements needed for matrix maintenance
- Results in net loss of matrix components
- Collagen content stays constant but fibrils are thinner and more disorganized
  - Decreased tensile strength

TABLE 3. *Equilibrium tensile modulus (MPa) of human articular cartilage; dependence on depth and degeneration*

	Normal	Fibrillated	Osteoarthritis
Surface zone	10.1	8.5	1.4
Subsurface zone	5.9	8.4	0.9
Middle zone	4.5	4.0	2.1

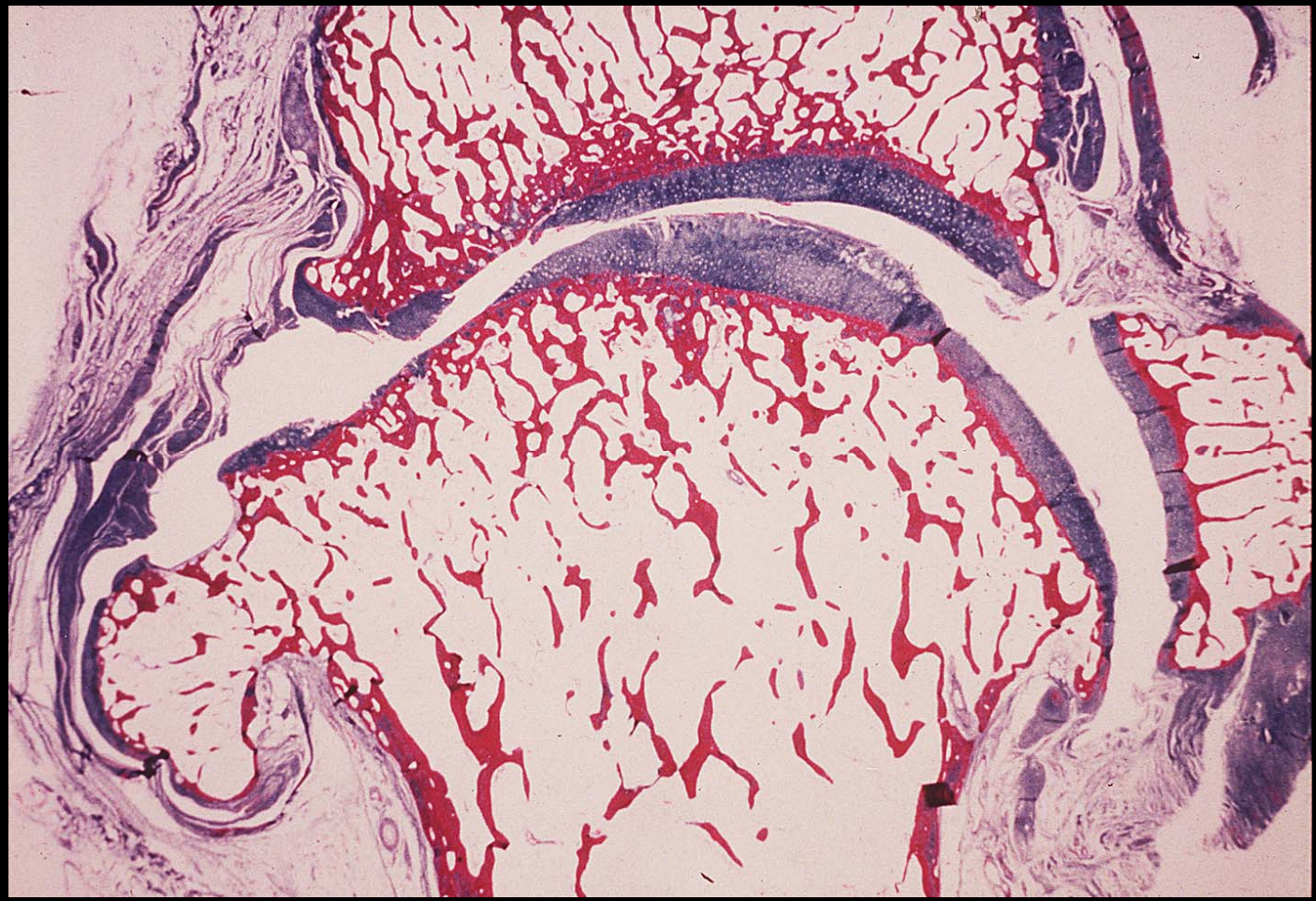
OA vs. Aging

Table 1 Main differences between osteoarthritis and aging

Osteoarthritis	Aging
Highly anabolic and synthetic process	Normal metabolism
Enzymatic destruction of hard tissue	Normal enzymatic remodeling
Remodeling all tissues about joint, articular and periarticular	Cartilage changes only
Chondrocyte mitosis	No mitosis
Intense increased synthesis, collagen and proteoglycan	Normal rates synthesis, collagen and proteoglycan
Increased water content cartilage	No change
Fibrillation, focal and progressive at weightbearing sites	Fibrillation nonprogressive, nonweightbearing sites
Eburnation, ivory-like	No eburnation
Osteophytes occur with other changes	Osteophytes only with excessive use
No increased collagen X link	Increased collagen X link
Inflammation	No inflammation
No pigment—cartilage	Pigment—cartilage

Unlike aging, OA is progressive and a significantly more active process

OA – Overall Changes



Osteoarthritis with osteophyte, loss of articular cartilage and some subchondral bony sclerosis.

OA – Radiographic Diagnosis

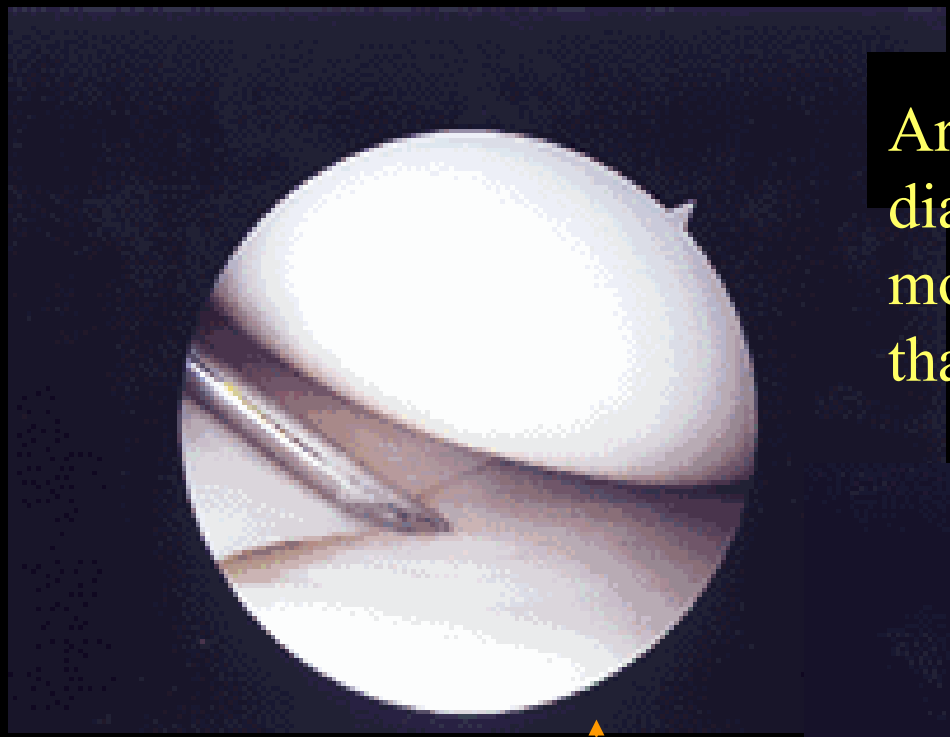
Asymmetrical joint space narrowing from loss of articular cartilage

- Medial (inside) part of knee most commonly affected by OA.

OA – Radiographic Diagnosis

- Asymmetrical joint space narrowing
- Subchondral sclerosis and cysts
- Osteophytes

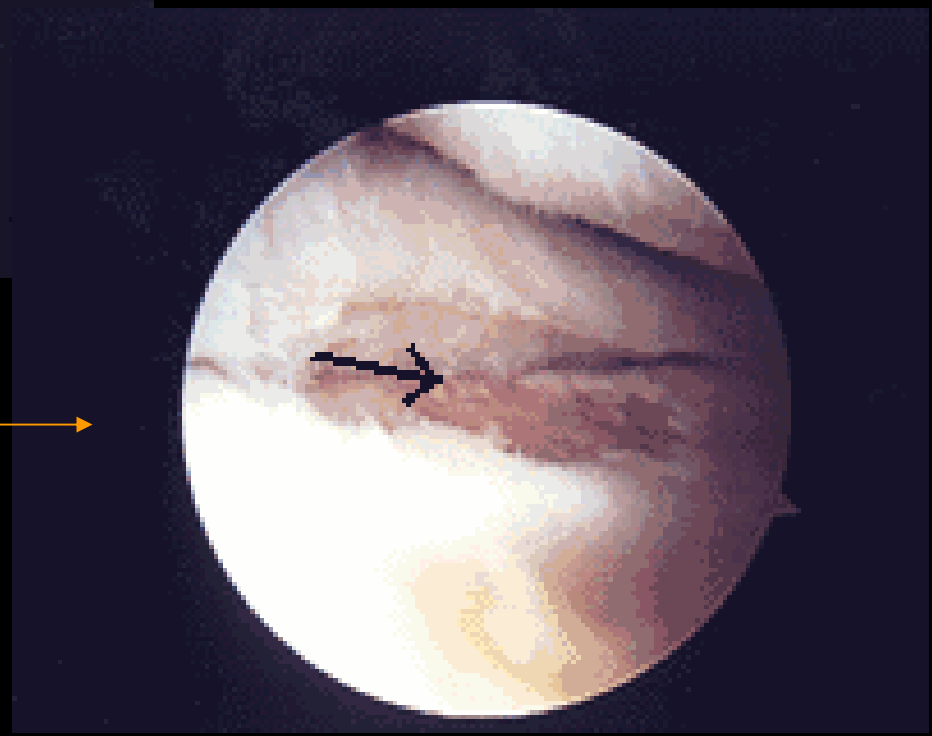
OA – Arthroscopic Diagnosis



Arthroscopy allows earlier diagnosis by demonstrating the more subtle cartilage changes that are not visible on x-ray

Normal Articular Cartilage

Ostearthritic cartilage with exposed subchondral bone



OA – Arthroscopic Treatment

- Most accurate way of determining stage of OA
- Debridement of the knee joint:
  - Cleaning out the joint of all debris and loose bodies.
  - Loose bodies of cartilage removed
  - Saline solution.
  - Micro-fracture techniques
    - Badly worn areas may be treated with sub-chondral holes (fracture) to promote growth of new cartilage
      - Fibro-cartilage that is scar tissue.
  - Usually offer temporary relief of symptoms
    - 6 months to 2 years.
- Graft-transplantation

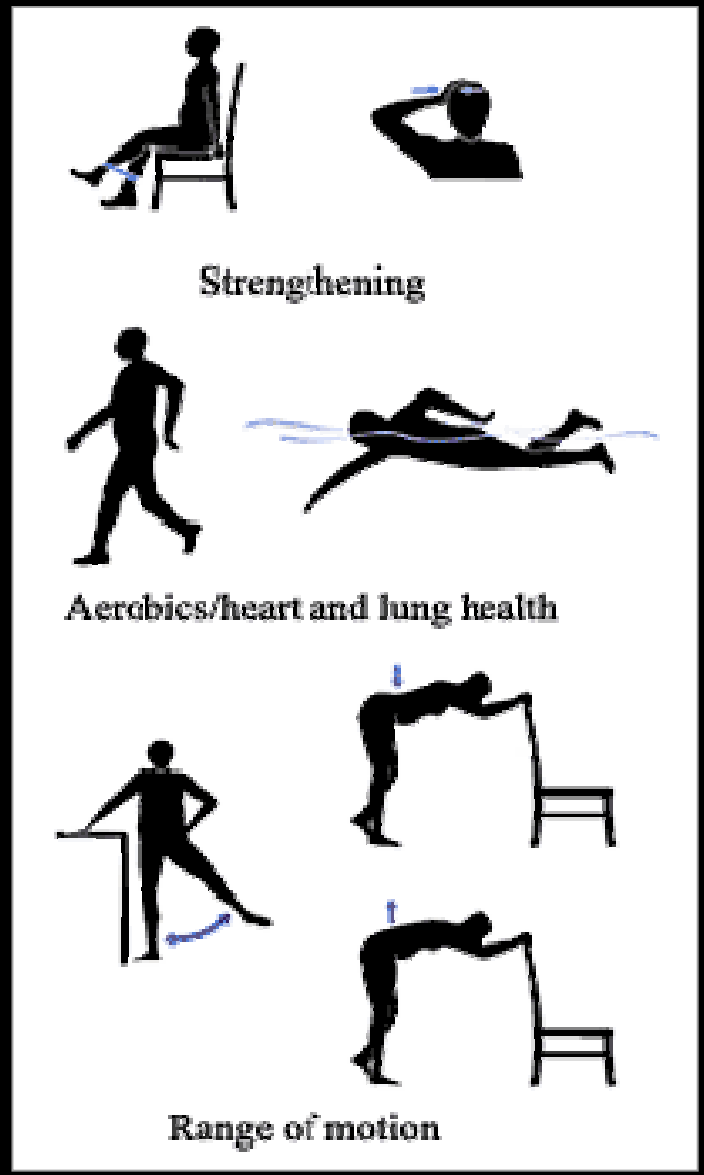
OA – Management

- Slow progression over many years
  - Cannot be cured
- Treatment directed at symptoms and slowing progress of the condition

- Goals:
  - Decreasing pain
  - Increase range of motion
  - Increase muscle strength

OA – Non-operative Treatments

- Pain medications
- Physical therapy
- Walking aids
  - Unloading
- Re-alignment
  - Orthotics and/or surgery



Physical Therapy

- Accomplishes all 3 goals : reduce pain, increase range of motion and strength
  - Heat, electrical stimulation, & ultrasound decrease pain
  - Manipulate muscles & tendons surrounding joint
    - Better strength means better weight support
  - Low impact (especially aquatic) exercises is both safe & effective
    - Improves balance and coordination of bones & muscles

Physical Therapy 2

- Increased activity decreases overall body weight
  - Decreases load & pain on joints
- Improves physical function due to increased strength
  - Also lowers forces and stress on joints
- Improves quality of life due to pain relief & wider range of movement
- Slows progression of OA

Pain Management

- Non-Steroidal Anti-Inflammatory Drugs (NSAID)
  - Drugs that reduce pain, inflammation and fever
    - Inhibit prostaglandins which play role in inflammation
  - Are not made from steroids or narcotics
    - No sedation, depression, addiction/dependence
- Examples:
  - Ibuprofen (Motrin/Aleve), Naproxen, Diclofenac (Voltaren)
  - Asprin

→ *Note: Acetamenophen (Tylenol) is NOT an NSAID because has no anti inflammatory use

COX-2 Inhibitors

- Some NSAIDs Inhibit COX-1 enzyme which acts as messenger molecule during inflammation
  - Results in gastrointestinal side effects
- COX-2 is secondary enzyme that selectively inhibit without disrupting GI system
  - Examples: Meloxicam (Mobic), Celecoxib (Celebrex), Rofecoxib (Vioxx)

Pain Management

- Steroid Injections: 2 types
  - Cortisone/Corticosteroid
    - Reduce inflammation response around joints
    - Tend to have more rapid effect than NSAIDs
  - Viscous supplement
    - Replace modified synovial fluid in joints
    - Increase viscosity & elasticity of fluid

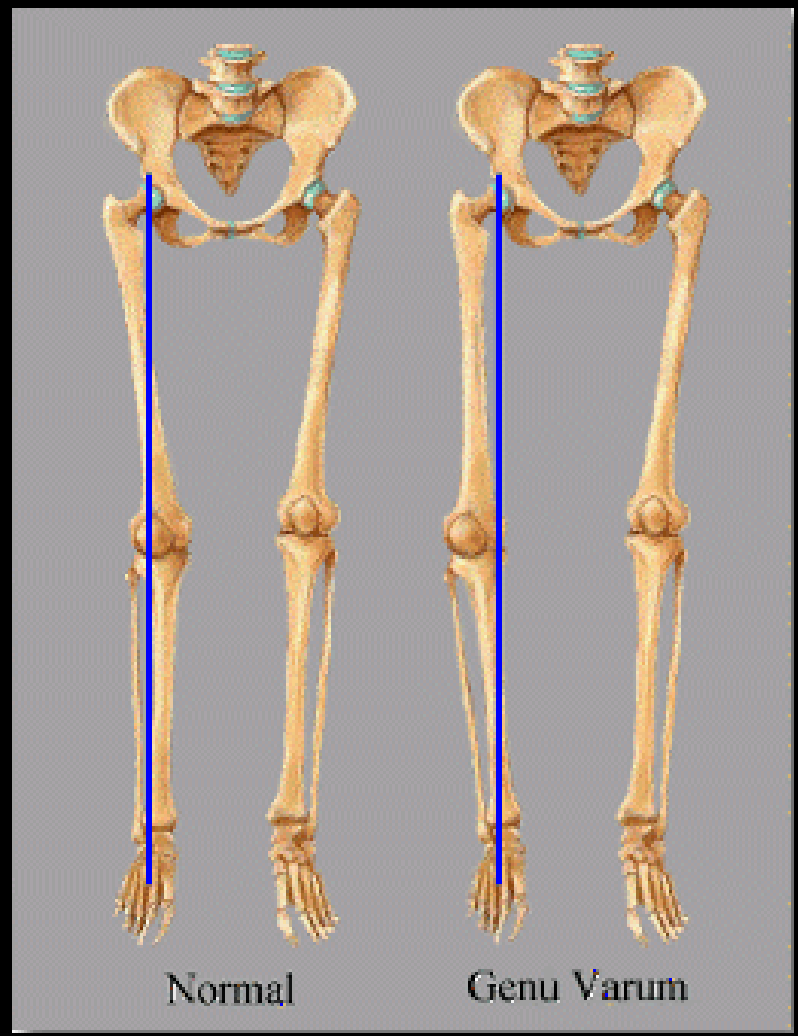
Pain Management

- Various Corticosteroids
  - Cortone
  - Depo-Medrol
- Visco-Supplements
  - Hyalgan
  - Euflexxa
  - Orthovisc
  - Synvisc

Realignment Surgery: Proximal Tibial Osteotomy

- Osteoarthritis usually affects the inside half (medial compartment) of the knee more often than the outside (lateral compartment).

- This can lead to the lower extremity becoming slightly *bowlegged* or a genu varum deformity



Proximal Tibial Osteotomy

- The problem:
  - The weight bearing line passes more medially (towards the medial compartment of the knee).
  - Increased pressures are transferred through the medial joint surfaces, which leads to more pain and deformity.

- The aim:
  - re-aligning the angles in the lower extremity by shifting the weight-bearing line towards the midline or lateral compartment of the knee. This places more of the weight-bearing force into a healthier compartment.

- The result is pain reduction and delay in the progression of the degeneration of the medial compartment.

Proximal Tibial Osteotomy

•In the procedure to realign the leg, a wedge of bone is removed or added to the upper tibia.

•A staple or plate and screws are used to hold the bone in place until it heals.

•The Proximal Tibial Osteotomy buys some time before needing to perform a total knee replacement. Pain relief usually lasts for 5-7 years.

Total Knee Replacement

Click HERE for link to TKA Lecture

…The End