OSTEOARTHRITIS

Rocky Samuel, MS III
Gillian Lieberman, MD

July 21, 2008
General considerations
Definition
Pathophysiology, risk factors and etiology
Clinical features and physical exam findings
Menu of imaging studies
- Plain radiography
- MRI
- MSUS
Treatment
Joint Replacement
Future Directions
General Considerations

- Most common form of arthritis
- Accounts for more functional limitation, work loss and physical disability than any other chronic disease
- Cost approaches 2-3% of GNP in developed countries
- Prevalence in the US estimated to increase by 66-100% by the 2020
Definition

- Disturbance of the normal coupling of degradation and synthesis of articular cartilage, extracellular matrix and subchondral bone
- Results from both mechanical and biological events
- Discrete disease but represents the final common pathway of several conditions
Pathophysiology

Decreased Synthesis
- IGF-1, OP-1, TGF
- Wnt, BMP-2

Increased Degradation
- IL-1, IL-6, IL-8, TNF
- Nitric Oxide
- Metalloproteinases
- Aggrecanase

Risk Factors

Systemic Factors
- Increased age
- Female gender
- Ethnic background
- Genetic susceptibility
- Nutritional factors

Mechanical Factors
- Obesity
- Joint deformity
- Joint injury
- Bone density
- Muscle weakness
- Proprioception

Adapted from Reginato Anthony. Osteoarthritis and Infectious Arthritis. HMS Lecture. 11/1/2007
Etiology

- Idiopathic osteoarthritis
  - No identifiable inciting event
  - Localized or generalized (>3 joints involved)
  - Risk factors

- Secondary osteoarthritis
  - Trauma
  - Congenital or developmental disorders
  - Other bone and joint disorders
  - Other diseases such as diabetes mellitus, acromegaly, hypothyroidism, neuropathic (Charcot) arthropathy, and frostbite
Clinical Features

- Joint pain brought on and exacerbated by activity and relieved with rest
- Stiffness that is self-limited upon awakening in the morning or when rising from a seated position after an extended period of inactivity
- Absence of prominent constitutional symptoms
- Examination notable for increased bony prominence at the joint margins, crepitus or a grating sensation upon joint manipulation, and tenderness over the joint line of the symptomatic joint
- Diagnosis supported by radiographic features
Common Sites of Osteoporosis

Physical Findings in the Hands

- **Heberden nodes**
- **Bouchard nodes**
- **CMC joint “boxing”**

Imboden J, Hellmann D, Stone J: Current Rheumatology Diagnosis and Treatment, 2nd edition

http://www.riversideonline.com/source/images/image_popup/r7_thumbarthritis.jpg
Accessed July 2008
Physical Findings in the Legs

- **Normal**
  - (Slightly Valgus)
- **Genu Varus**
- **Genu Valgus**


Plain Radiography
Magnetic resonance imaging (MRI)
Musculoskeletal Ultrasound (MSUS)
65 year old obese retired construction worker who presents with bilateral knee pain (10 years).

History of ligament and meniscal damage in the right knee

“Stiffness” in morning (~30 min) and when rising from his couch at night after watching TV.

Denies any recent fatigue, fever, rash or weight loss.
Narrowing of medial and lateral compartments
Subchondral sclerosis
Subchondral cysts
Marginal Osteophytosis
Let’s view some plain film images of the same radiological view in a patient who’s osteoarthritis has progressed over time.
Companion Pt #1
Plain Radiography: Knee Progression

SEPTEMBER 2000

DECEMBER 2006

PACS, BIDMC

PACS, BIDMC
Let’s view some plain film images of osteoarthritic changes in the hands of a different patient.
Narrowing of DIP and PIP joints compared to MCP joints

Subchondral sclerosis of DIP, PIP and 1st CMC joints.

Imboden J, Hellmann D, Stone J: Current Rheumatology Diagnosis and Treatment, 2nd edition
Let’s view some sagital MRI images of the knee in our first patient, LC, taken 7 years prior to the plain film radiograph from above
Patient LC
MRI: Sagittal Knee

- Thinning of hyaline cartilage
- Subchondral bone changes
Patient LC
MRI: Sagital Knee Cartilage Changes

- Thinning of hyaline cartilage

PACS, BIDMC
Patient LC
MRI: Sagital Knee Marrow Edema

- Marrow edema

PACS, BIDMC
Now, let’s view some ultrasound images showing some characteristic changes in osteoarthritis in several different patients.
MSUS: Progression

- Cartilage Loss

Normal

Early Osteoarthritis

Severe Osteoarthritis

MSUS: Bony Changes

- Osteophyte formation

Goal of Treatment

- Relief of symptoms
- Improve function
- Delay the progression to end-stage osteoarthritis and need for total joint replacement
Management of Osteoarthritis

- Physical Modalities
- Surgical
- Psychological
- Local Pharmacology
- Systemic Pharmacology

Goal

Adapted from Reginato, Anthony. Osteoarthritis and Infectious Arthritis. HMS Lecture. 11/1/2007
As osteoarthritis progresses, surgical joint replacement is the only treatment which has been shown to effectively decrease morbidity.
Patient #1: Severe Shoulder OA on Plain Film

- Flattening of the humeral head
Patient #1: Shoulder Replacement on Plain Film

PACS, BIDMC
Patient #2: Total Knee Replacement on Plain Film
Future Directions

- Biomarkers to assess progression before onset of clinical symptoms or radiographic changes
- Genotypic analysis as a predictor of prognosis
- Targeted therapeutics with further biomarker and genetic research
- Quantitative MRI techniques to more thoroughly assess progression
Acknowledgments

Gillian Lieberman
Mary Hochman
Corrie Yablon
Ernie Yeh
Kenny Lai
Maria Levantakis