Citation Key
for more information see: http://open.umich.edu/wiki/CitationPolicy

Use + Share + Adapt

{ Content the copyright holder, author, or law permits you to use, share and adapt. }

- **Public Domain – Government**: Works that are produced by the U.S. Government. (17 USC § 105)
- **Public Domain – Expired**: Works that are no longer protected due to an expired copyright term.
- **Public Domain – Self Dedicated**: Works that a copyright holder has dedicated to the public domain.
- **Creative Commons – Zero Waiver**
- **Creative Commons – Attribution License**
- **Creative Commons – Attribution Share Alike License**
- **Creative Commons – Attribution Noncommercial License**
- **Creative Commons – Attribution Noncommercial Share Alike License**
- **GNU – Free Documentation License**

Make Your Own Assessment

{ Content Open.Michigan believes can be used, shared, and adapted because it is ineligible for copyright. }

- **Public Domain – Ineligible**: Works that are ineligible for copyright protection in the U.S. (17 USC § 102(b)) *laws in your jurisdiction may differ

{ Content Open.Michigan has used under a Fair Use determination. }

- **Fair Use**: Use of works that is determined to be Fair consistent with the U.S. Copyright Act. (17 USC § 107) *laws in your jurisdiction may differ

  Our determination **DOES NOT** mean that all uses of this 3rd-party content are Fair Uses and we **DO NOT** guarantee that your use of the content is Fair.

  To use this content you should **do your own independent analysis** to determine whether or not your use will be Fair.
Case 1

77 year old man

- Bilateral knee pain
- Began insidiously ten years ago
- Pain worsens as the day goes on and with activity
- Denies any other systemic symptoms.
Case 2

59 year old woman

- Notes that her knuckles are changing shape over the past several years
- Difficulty opening jars, typing for prolonged periods of time on the computer because of pain
Osteoarthritis

Disease characterized by
• Loss of articular cartilage
• Increased bone formation
• Mild synovitis

Results in joint pain and dysfunction
Impact of Osteoarthritis

• Disables 10% of persons >60
  – 2\textsuperscript{nd} only to ischemic heart disease as cause of work disability in men > 50

• Economic impact >$60 billion (U.S.)

PERIOSTEUM

SUBCHONDRAL BONE PLATE

JOINT CAPSULE

SYNOVΙUM

ARTICULAR CARTILAGE

TENDON

© ACR MUSCLE

American College of Rheumatology
Normal Cartilage

- **Extracellular matrix**
  - Collagens (mainly II)
  - Hyaluronan
  - Proteoglycans (mainly aggrecan)

- **Chondrocytes**
  - Synthesize matrix
  - Generate degradative enzymes

- **Avascular**

For further review, see M1MS lecture on cartilage
Cartilage in Osteoarthritis

Altered chondrocyte phenotype

- Perpetuated by surrounding synoviocytes, osteoblasts
- Imbalance between matrix synthesis/ degradation
- Alteration in matrix composition
Inflammation in OA?

• Classically, OA has been considered a non-inflammatory, degenerative disorder
• There is increasing evidence that inflammation may be playing some role
  – Histologically: evidence of inflammation, elevated inflammatory cytokines
  – Radiographically: evidence of synovial thickening
  – Clinically:
    • Local response to injectable steroids
    • Clinical subset: inflammatory osteoarthritis
• Source of inflammation unclear
  – Crystals?
Risk factors for OA

• Age (75% of persons >70)
Age-Related Prevalence of OA: Changes on X-Ray

Source Undetermined
Risk factors for OA

- Age (75% of persons >70)
- Genetics (~50%)
- Biomechanical factors
- Trauma
- Obesity
- Female sex
- Neuromuscular dysfunction
- Metabolic disorders
Clinical features of OA

• Symptoms
  – Pain worse with use
  – Pain as day progresses
  – Minimal morning stiffness (<30 minutes) and after inactivity (gelling)
  – When severe, can have rest and nocturnal pain

• Signs
  – Pain with movement
  – Bony enlargement
  – Restricted movement
  – Crepitation
  – Joint instability
  – Joint deformity
OA: Laboratory Tests

- No specific tests
- No associated laboratory abnormalities; eg, sedimentation rate
- Investigational: Cartilage degradation products in serum and joint fluid
OA: Joint fluid analysis

<table>
<thead>
<tr>
<th>TABLE 2C-2: CLASSES OF SYNOVIAL FLUID.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>-------------------------</td>
</tr>
<tr>
<td>Color</td>
</tr>
<tr>
<td>Clarity</td>
</tr>
<tr>
<td>Viscosity</td>
</tr>
<tr>
<td>Mucin clot</td>
</tr>
<tr>
<td>WBC count</td>
</tr>
<tr>
<td>Differential</td>
</tr>
<tr>
<td>Culture</td>
</tr>
</tbody>
</table>

Assessments: PMN, polymorphonuclear leukocytes; NA, not applicable.

OA: Xrays

- Joint space narrowing
- Marginal osteophytes
- Subchondral cysts
- Bony sclerosis
- Malalignment
Xrays in OA

• Diagnosis is made clinically; xrays are supplementary/confirmatory
  – Early OA can be painful but without xray changes
  – Radiographic OA can be present but without pain, or not the source of patient’s pain
Hand OA
First CMC OA
Knee OA
Knee OA
Normal hips
OA of hips
What if the patient has OA in the “wrong” joint?

Then you must consider secondary causes of OA

- Ask about previous trauma and/or overuse
- Consider neuromuscular disease, especially diabetic or other neuropathies (lower extremity bias)
- Consider metabolic disorders, especially CPPD (calcium pyrophosphate deposition disease) (upper extremity bias)
Secondary OA: Diabetic Neuropathy

- MTPs 2 to 5 involved in addition to the 1st bilaterally
- Destructive changes on x-ray far in excess of those seen in primary OA
- Midfoot involvement also common
Differential Diagnosis

• Non-joint pain
  – Hip pain: ex. trochanteric bursitis, iliopsoas tendinitis
  – Knee pain: ex. pes anserine bursitis, patellar tendinitis

• Inflammatory arthritis
Treatment

• Goals
  – Patient education about disease and management
  – Pain control
  – Improving function and decrease disability
  – Altering the disease process and its consequences*

• Treatment modalities
  – Nonpharmacologic
  – Pharmacologic
  – Surgical
Nonpharmacologic

• Patient education
  – Heat/cold application
  – Weight loss

• Physical therapy: progressive exercise to
  – Increase function
  – Increase endurance and strength
  – Reduce fall risk

• Orthotics
  – Neoprene sleeves
  – Braces (unicompartmental knee OA)
  – Shoe inserts
Pharmacologic: Analgesia

- Acetaminophen: first line
  - Maximum dose 4 g/day
  - Hepatic toxicity
  - Caution with multiple acetaminophen containing compounds

- NSAIDs: if acetaminophen ineffective/signs of inflammation
  - Possibly more effective than acetaminophen but more toxicity (GI, renal, cardiovascular)
  - Lowest effective dose
  - COX-2 inhibitors
  - Topical NSAIDs (1% diclofenac gel)
Pharmacologic therapy

• Tramadol
  – Affects opioid and serotonin pathways
  – Nonulcerogenic
  – May be added to NSAIDs, acetaminophen
  – Side effects: nausea, vomiting, lowered seizure threshold, rash, constipation, drowsiness, dizziness

• Opioids

• Topical agents
  – Capsaicin
  – NSAIDs
OA: Intra-articular Therapy

- Intra-articular steroids
  - Good pain relief
  - Most often used in knees, up to q 3 mo
  - With frequent injections, risk infection, worsening diabetes, or CHF

- Hyaluronate injections
  - Symptomatic relief
  - Improved function
  - Expensive
  - Require series of injections
  - Predominantly used in knees
Other pharmacologic agents

- Nutraceutical: Glucosamine sulfate/chondroitin sulfate
  - Analgesia
  - Possibly reduced joint space narrowing?
Surgical

- Osteotomy: May delay need for TKR for 2 to 3 years
- Total joint replacement: When pain severe and function significantly limited
OA: Management Summary

• First: Be sure the pain is joint related (not a tendonitis or bursitis adjacent to joint)

• Initial treatment
  – Muscle strengthening exercises and reconditioning walking program
  – Weight loss
  – Acetaminophen first
  – Local heat/cold and topical agents
OA: Management Summary (cont’d)

• Second-line approach
  – NSAIDs if acetaminophen fails
  – Intra-articular agents
  – Other agents
  – Opioids

• Third-line
  – Osteotomy
  – Total joint replacement
Additional Source Information
for more information see: http://open.umich.edu/wiki/CitationPolicy

Slide 4: Help Your Bilateral Knee Osteoarthritis by soni2006, Hubpages.com,
http://hubpages.com/hub/Advice-for-patients-suffering-from-osteoarthritis-both-knees
Slide 5: American College of Rheumatology
Slide 6: Source Undetermined
Slide 8: American College of Rheumatology
Slide 10: Source Undetermined
Slide 14: Source Undetermined
Slide 17: Source Undetermined
Slide 20: Source Undetermined
Slide 22: American College of Rheumatology (both Images)
Slide 23: American College of Rheumatology
Slide 24: American college of Rheumatology (Both Images)
Slide 26: American College of Rheumatology
Slide 27: American College of Rheumatology
Slide 28: Source Undetermined
Slide 29: American College of Rheumatology
Slide 31: Goldman: Cecil Medicine, 23rd ed., 2007
Slide 34: Regents of the University of Michigan; Aqua Fit by GWSA, Flickr, http://www.flickr.com/photos/33346162@N07/3218960556/, CC:BY-NC-SA, http://creativecommons.org/licenses/by-nc-sa/2.0/deed.en