Osteoarthritis
Evaluation update

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Disclosures

- Nothing to disclose.

Part 1: Evaluation:
Probing the puzzle of OA
Epidemiology of OA

- Most common form of arthritis worldwide
- OA affects about 12% of the US population; the incidence ↑ with age
- Big time underestimate!

MSK Cost
Back pain, Injuries, OA

- 950 billion (7.4% of US GDP)
- Annual direct & indirect costs for bone and joint health
All cause and disease specific mortality in patients with and without walking disability.

- Etiology
  - Low grade systemic inflammation
  - Long-term use of NSAIDS
  - Lack of physical activity

Eveline Nüesch et al. BMJ 2011;342:bmj.d1165

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Pathophysiology: OA

Destructive forces > rebuilding forces

Biomechanical Forces & Cytokines (IL-1, TNF-α)  >  Growth Factors (TGF-β, IGF)
Role of Trauma?

- Does knee & hip trauma in youth lead to OA later?
- What is the research revealing?

Last Decade
- Due to an elbow injury suffered during his playing career, he had only very limited use of his right hand
- Bil knee replacements

Female soccer players with ACL tears, radiographic findings and symptoms 12 years after injury - Roos & Odenberg

Swedish study:
- Subjects
  - 106 female soccer players with an ACL injury
  - Mean age = 19y
  - ACL reconstructive surgery - 62%

Results: Swedish study
- What percentage had OA on x-ray?
  - Answer: 34%
  - Grade I or II joint space narrowing with osteophytes
- What % could no longer play soccer?
  - pain
  - function/limitations
  - sports & recreational activities
  - lower quality of life
  - Answer 11%
- Did surgery reduce OA?

Prevalence of radiographic OA
ACL reconstructed vs non-reconstructed subjects
Implications: Swedish study→ injury leads to OA at young age

→ ACL repair may have limited effect on development of OA.

Does exercise lead to OA?

→ Long distance running and OA
→ Retrospective, case controlled
→ 30 long distance runners and 27 nonrunners
→ Median period of running = 40 years
→ Results
→ No difference in pain, ROM
→ No X-ray difference

Sports and OA: Uncontrolled cross-sectional studies

→ Wrestling and discus
→ Cross-country, tennis, and elbow
→ Boxing
→ Judo
→ Shooting
→ Squash
→ Swimming
→ Football
→ Everything!
Risk vs Exercise

Neuroanatomically normal joints
- ↑ risk in the absence of adequate exercise
- ↑ risk upon exposure to repetitive, high-impact exercise → football

Neuroanatomically abnormal joints
- ↑ risk with repetitive, low-impact, recreational exercise

The role of Knee alignment in OA

- Sharma et al., JAMA 2001
- Prospective longitudinal cohort study
- 237 pts, 18-month study
- Varus alignment at baseline
  - OR 4.09 (95% CI 2.2-7.6)
- Valgus alignment
  - OR 4.89 (95% CI 2.13-11.2)

Clinical Features of OA

- Symptoms
  - joint pain
  - morning stiffness lasting <30 minutes
  - joint instability or buckling
  - loss of function
Clinical Features of OA

- Signs
  - ↓ ROM
  - TTP-joint line
  - Crepitus (Not specific [PFPS])
  - Pain with motion
  - Bony enlargement at affected joints/Deformity
  - Instability

Pattern of involvement

- Axial:
  - Cervical and lumbar spine

- Peripheral:
  - DIP, PIP, IPJ, 1st CMC, knees, hips, ankles, feet

OA of Hands
Symptomatic joints?

- The knees, hips, ankles are the most symptomatic.
- 1st CMC, 1st MTP
- AC joint, DIP and PIP are rarely significantly symptomatic.

Clinical features of OA thumb → 1st CMC

- Difficulty pinching and grasping
- ~50% also have CTS
- PC
  - Painful grind test
  - Swelling and crepitus

Pain Location

- E- Gemini
- Gastrocnemius
- Quadriceps femoralis
- Posterior

Location?
Weight Bearing
Rosenberg
Merchant

Value of Tunnel View in OA!

AP view:
- Sclerosis
- Cysts
- Osteophytes

Tunnel view:
- Joint space loss in LCL tibiofemoral OA

Tunnel (Notch) View
Alpha Angle

Advanced Imaging?

Is MRI helpful?

- Other pathology
  - Meniscal
  - Ligaments
  - OCD
  - synovium
  - Earlier dx
  - Bone marrow edema for full thickness cartilage defects
Osteoarthritis with CPPD?

Erosive OA?
- Uncommon
- Pain, TTP, warmth, soft tissue swelling more pronounced
- Lateral instability of interphalangeal joints

Diff Dx?: Gout
Diff Dx: Hemochromatosis

RA vs OA

- Pattern
- Radiographs
- Stiffness
- At night
- Throbbing vs long
- Swelling joints
- OA: hard and bony
- RA: soft, warm, boggy, and tender

Low back pain and Spine OA: Are they related?

- What is OA
  - disc space narrowing together with vertebral osteophyte formation
  - bone pain: 0-6
  - only syndesmophytes seen in the spine that can be a hallmark of spine OA
- LBP: 80%
- OA spine
  - prevalence ranging from 40-85%
Summary OA: Clinical Manifestations and Dx

- Weakness, weight loss → Hemochromatosis
- Redness and warmth → Gout
- LBP vs X-ray
- Trauma, urinary system, history of cancer, osteoporosis, hypertension

Remember C sign and Rosenberg View

Key joints
- Spine, 1st cmc, knee and hips

OA is not only common but associated with decreased exercise and ↑ mortality.

Osteoarthritis Rx: Evidenced-based approach to OA

Part 2: What is the best first line RX for knee OA

1. Exercise
2. Weight loss
3. NSAIDS
4. Topical nsaids
5. Insoles
Should all patients with knee OA be counseled on exercise

- Yes/No
- All patients with knee OA should be counseled on exercise irrespective of age, radiographic disease severity, pain intensity, functional levels, and comorbidities.

Cochrane review of 54 trials

- 19 studies/low risk of bias
- High quality evidence suggesting that land-based exercise improves pain and function with moderate effect size
- No strong evidence on modality and dosage
- Magnitude effect: ns (ns)
- Walking, cycling, rowing, and deep-water running
- Lower extremity strengthening


What about running or jumping exercises?

- Consider avoiding, although evidence for joint damage is scarce.
- Meta-analysis suggested a protective effect of running against surgery due to OA: pooled odds ratio 0.46 (95% CI, 0.30-0.71)

What% of pts with knee OA receive opioids? ▶40%

Should we use opioids to Rx pain before knee replacement

Prospective cohort of 158 pts
- Brigham and Women’s scheduled for knee replacement
- Questionnaires including WOMAC, and opioid use
- 223 had at least 1 opioid within 2 years prior to surgery
- Most common oxycodone, hydrocodone, tramadol
- After surgery 150pts were given at least one opioid, 94% multiple

Results

Womac pain reduction scores
- Opioids before TKA had a mean 6-month WOMAC
  - 21pts mean 68.0 (44.7-91.3) vs
  - Non-Opioid group
  - 21pts mean 68.0 (44.7-91.3) for the non-opioid use group.
Mild vs Mod/Severe Knee OA?

- **Mild**
  - Low levels of or intermittent knee pain
  - Relatively well-preserved joint function and quality of life

- **Moderate knee osteoarthritis**
  - Persistent pain
  - Significantly impairs functionality, activity participation, and quality of life

Rx concepts based on level

- **Mild**
  - Non-pharmacologic
  - Exercise
  - Weight loss
  - Topical therapies prn

- **Mod/Severe**
  - 1st line: non-pharmacologic
    - Aquatic exercises
  - 2nd line: limited use of NSAIDs
    - Celecoxib
    - Non-selective NSAIDs with PPI
    - IA CSI/HA/PRP
    - Capsaicin
    - Steroids
    - Surgery
  - Behavioral (non-articular factors)
    - Mind-Body
    - Pain catastrophizing
    - Sleep problems

Tai Chi

- Limited # of large trials
- Effective after 12 weeks
- Knee pain
- Physical function
- Reduction in analgesic use
- Improved depression scores
- Improved balance and less falls

IDEA trial
> 464 overweight/obese pts with knee OA
> D + E, D, E
> D + E (11.4% weight loss)
> 18 months
> > > pain SIS
> > > 38% no pain!

Weight loss!

Cochrane review
> 464 of pts – SIS
> Comparable to oral NSAIDS
> Low risk of GI/CVD
> Reduced systemic absorption (5-17 fold for diclofenac)
> Mild skin rash (tolerable)
> OBD
> Mild burning & itching
> Why not OTC (possibly)

Topical NSAIDS

Topical Capsaicin (old data?)
> Dose and application
> Skin reaction; 70% to 80% on responsive sensory nerves
> 30-60 minutes
> 2% capsaicin
> ~ 1.5 hrs
> Not good when uses eyes or ocular tissue
> Not good when uses eyes or ocular tissue
Duloxetine

- Studied in pts already taking nsaids
- Meta-analysis of three trials (~400 pts)
  - Mild pain: 30-50% improvement ~ 1.5-1.7 (95% CI 1.3-1.8)
  - No serious harms, mild and discontinuation 4-8%:

Insoles (mixed data)

- Medial wedged for patients with lateral tibiofemoral OA (one study)
- Lateral (no better than neutral soles)
- Don’t recommend → OK if helps

Hyaluronans

- Controversy
  - Yes
  - AAOS: No! (strongly against)
- Costly
- Flares
- No ultrasound study
- New agents coming on the market may be better
Rapidly increasing evidence
Data at 12 months
Better than HS or placebo
Who should we do this on?
Severe or less severe?
Real cost?


Acetaminophen (paracetamol)

Meta-analysis (10 trials, 3541 pts)
Small, non clinical benefits
Not superior to placebo!
Risks of intentional overdose
Risks in therapeutic level
GI bleeding
Liver toxicity
Renal failure
CVD


Glucosamine

Don’t encourage or discourage
Most major guidelines don’t recommend
Mixed data!
Strong placebo effect
Mixed data

- Nutritional supplements
  - Avocado soybean (ASU)
  - Vitamin D-no benefit
  - Fish Oil (benefit vs. placebo)
    - GI upset
    - Clinical benefits unclear
- TENS
  - Poor data, placebo effects

Comparison of intra-articular glucocorticoids for OA, based on joint size

<table>
<thead>
<tr>
<th>Compound</th>
<th>Concentration (mg)</th>
<th>Small</th>
<th>Medium</th>
<th>Large</th>
<th>Amount per joint (cc)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dexamethasone</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.1 to 0.5</td>
</tr>
<tr>
<td>Methylprednisolone</td>
<td>40</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>0.25 to 0.75</td>
</tr>
<tr>
<td>Triamcinolone</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>0.25 to 0.5</td>
</tr>
<tr>
<td>Prednisolone</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>0.25 to 0.5</td>
</tr>
<tr>
<td>Betamethasone</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>0.25 to 0.5</td>
</tr>
</tbody>
</table>


Duration of Effect or IA glucocorticoids?

- RA: longer duration of effect (up to 22 months in wrist)
- OA: shorter benefit
- All studies prior to ultrasound guidance
- 4 weeks or less
- Aspiration prolongs effect >6 months
- Frequent dosing > 4-6 weeks may have deleterious effects on bone and skin
- Cartilage loss?

Adjustable Valgus bracing: Non op Rx of Med Compartment OA

Evidence?
- Meta-analysis
- Lower incidence
- Valgus slightly > neutral sleeve
- CVI (valgus) > neutral
- Low compliance 45%
- Small benefits noted with PF brace or tape if > 7 hrs/day


Walking aids
- Opposite side
- RCT small improvements

Psychological interventions
- Do they help?
- Yes
- CBT and even internet based education helps!


### Adjunctive pharmacologic options for OA management

<table>
<thead>
<tr>
<th>Agent</th>
<th>Proposed Benefit</th>
<th>Risk</th>
<th>Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glucosamine/chondroitin</td>
<td>Potential pain improvement</td>
<td>Generally safe and well tolerated</td>
<td>GAIT, a multicenter RCT sponsored by NIH, found glucosamine alone did not reduce pain in patients with OA; patients with moderate to severe OA may experience some improvement with combination glucosamine/chondroitin as an adjunct therapy.</td>
</tr>
<tr>
<td>SD Adenosyl methionine (SAMe)</td>
<td>Symptomatic improvement in pain and functionality</td>
<td>Tolerability similar to placebo and better than NSAIDs</td>
<td>Meta-D analysis of 111 RCTs found SAMe improved OA pain and increased function at a rate comparable to NSAIDs, with fewer side effects.</td>
</tr>
<tr>
<td>Colchicine</td>
<td>Decreased frequency and intensity of OA attacks</td>
<td>Gastrointestinal upset/bleeding, gout</td>
<td>In RCTs, patients receiving adjunctive colchicine twice daily had greater symptomatic benefit at 12 and 20 weeks, compared with placebo group.</td>
</tr>
<tr>
<td>Dextrose prolotherapy</td>
<td>Symptomatic improvement in pain, functionality, and stiffness</td>
<td>Pain at injection site, risk of bleeding and infection appear similar to corticosteroid injections</td>
<td>Statistical improvement in pain, function, and stiffness compared with saline injection at 26 and 52 weeks; more data needed to assess efficacy.</td>
</tr>
<tr>
<td>Platelet-rich plasma (PRP)</td>
<td>Augmentation of tissue healing, symptomatic improvement in pain and function</td>
<td>Pain at injection site, risk of bleeding and infection appear similar to corticosteroid injections</td>
<td>Newer modality with limited clinical evidence; 2 RCTs showed better clinical outcomes 24 weeks after injection compared with hyaluronic acid (HA); meta-D analysis of 16 studies showed PRP more effective than HA at 12 months.</td>
</tr>
</tbody>
</table>

### Value of Ultrasound Guidance
- Improved accuracy
- Improved outcomes
- Decreased discomfort of the procedure

### IA Thumb
Co-morbidities

- Htn
- COPD
- CVD
- HIV

Excess mortality in patients with OA

OA of knee on imaging >17%

Excess mortality

DM

Avoid NSAIDS
- Especially in those with CVD or renal disease

Glucosamine may be safe
- Potentially lower glucose levels

IA CSI
- Isolated 1-2 day increase in glucose

Pts with OA and walking disability

- Increased death from CVD
- Rx
  - PT
  - Exercises
  - Medications
  - Exercise programs

Cardiovascular rehab programs effect on OA and CVD
- Use topical meds, intra-articular CSI
- Acetaminophen no longer preferred + risk
- Avoid long term opioid therapy + increase M I +40%

Avoid long term opioid therapy + increase MI +40%
PUD

- Avoid NSAIDs
- If using combine with PPI
- COX 2 may be safer but still have risk!

Older patients

- Acetaminophen metabolism variable
  - Reduce daily max to 2-3 grms

NSAIDs?

- Opioid risks (avoid!)
  - Cognitive impairment
  - Delirium
  - Injuries
  - CVD events
  - Pneumonia
  - Hospitalizations
  - Mortality!

Surgery

- Arthroscopy: no benefit, may make it worse
- Osteotomy: young patients
- Joint replacement
Specialized surgery

- Not helpful
  - ARTHROSCOPIC ABRASION ARTHROPLASTY
  - ARTHRPSCOPIC SYNOVECTOMY, partial meniscectomy, resection
- Helpful Sometimes
  - AUTOLOGOUS CHONDROCYTE IMPLANTATION
  - Local cartilage defect involving only one side of the joint
  - Unicompartmental arthroplasty

ACI

- 3 stage procedure
- 50% complications
  - arthrofibrosis and joint adhesions
  - graft overgrowth
  - chondromalacia or chondrosis
  - cartilage injury
  - meniscal lesion
  - graft denudation
  - osteoarthritis

1st CMC Surgery

- Joint fusion (arthrodesis).
- Osteotomy.
  - The bones in the affected joint are repositioned to help correct deformities.
- Trapeziectomy.
  - Trapezoid is removed.
- Joint replacement (arthroplasty).
  - All or part of the affected joint is removed and replaced with a graft from one of your tendons.
Practice recommendations

1. Weight loss and exercise are by far the best Rx for OA and can cure the symptoms!
2. Topical therapies are 1st line pharmacological Rx
3. Think about joint replacement before it is too late!

Questions

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