Osteoarthritis and Joint Replacement

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Disclosure

• Surgeon proctor for Medacta International
• All patients have signed authorization forms for any identifiable images
Introduction

- Pathology
- Epidemiology
- History & physical
- Conservative management
- Total joint replacement basics
- Conclusions
Pathology

• Osteoarthritis:
  ▪ Degeneration of the articular bearing surface
  ▪ Programmed senescence of chondrocytes

• Changes in articular cartilage from OA
  ▪ Increased water content of cartilage
  ▪ Loss of proteoglycans (polysaccharides that provide compressive strength)
  ▪ Disorganized collagen chains • Amount maintained

• Knee most commonly affected joint
Epidemiology

• Risk factors – Who gets OA?
  - Age
  - Family history (genetics)
  - Women > men
  - Sedentary lifestyle
  - Obesity
    - BMI 30-35 8x ↑ risk of TKA, 3x ↑ of THA
    - BMI 36-40 18.5x ↑ risk of TKA, 5x ↑ of THA
    - BMI >40 32x ↑ risk of TKA, 8.5x risk of THA (1)
  - Prior knee or meniscal injury
  - Occupational:
    - Excessive kneeling, working on knees
  - Hip – dysplasia, FAI

Running does NOT cause OA!

- Cumulative forces over same distance are same for walking and running
- Cyclical loading may cause chondrocyte division and growth
- Non-cyclical loading (obesity) may cause cell death without regeneration

Epidemiology

Effects of Running and Walking on Osteoarthritis and Hip Replacement Risk

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Abstract

Purpose—Running and other strenuous sports activities are purported to increase osteoarthritis (OA) risk, more than walking and less-strenuous activities. Analyses were therefore performed to test whether running, walking, and other exercise affect OA and hip replacement risk, and to assess BMI’s role in mediating these relationships.

Methods—Proportional hazards analyses of patients’ report of having physician-diagnosed OA and hip replacement vs. exercise energy expenditure (metabolic equivalents, METs).

Results—74,752 runners reported 2004 OA and 259 hip replacements during 7.1-year follow-up, while the 14,625 walkers reported 695 OA and 114 hip replacements over 5.7 years. Compared to running <1.8 MET/hr, the risks for OA and hip replacement decreased: 1) 18.1% (P=0.01) and 35.1% (P=0.03), respectively, for 1.8 to 3.6 MET/hr run; 2) 16.1% (P=0.03) and 50.4% (P=0.002), respectively, for 3.6 to 5.4 MET/hr run; and 3) 15.6% (P=0.02) and 38.7% (P=0.01), respectively, for ≥5.4 MET/hr run, suggesting that the risk reduction mostly occurred by 1.8 MET/hr. Baseline BMI was strongly associated with both OA (3.0% increase per kg/m², P=2x10^-9) and hip replacement risks (9.8% increase per kg/m², P=4.8x10^-7), and adjustment for BMI substantially diminished the risk reduction from running ≥1.8 MET/hr/d for OA (16.5%, P=0.01 to 8.6%, P=0.21) and hip replacement (from 40.4%, P=0.005 to 28.5%, P=0.07). The reductions in OA and hip replacement risk by exceeding 1.8 MET/hr/d did not differ significantly between runners and walkers. Other (non-running) exercise increased the risk of OA by 2.4% (P=0.009) and hip replacement by 5.0% per MET/hr/d (P=0.02), independent of BMI.

Conclusions—Whereas other exercise increased OA and hip replacement risk, running significantly reduced their risk due, in part, to running’s association with lower BMI.

Epidemiology

Primary and Revision TJA Procedures Performed in the US

750,000 TKR /year
350,000 THR/year in US
4x increase for primary
7x increase for revision
Hip and knee OA: Diagnosis

- History, PE, radiographs make most Dx
- Pain history
  - Type: dull ache c/w OA
  - Intensity 1-10
  - Location: GROIN pain is “real” hip pain
    - Knee – often feel posterior / medial
  - Exacerbating / relieving activities
    - $\uparrow$ pain after first moving, then slight $\downarrow$ with motion
    - Stiff in AM, after sitting
Joint pain: History

• Basic questions:
  - Limp
  - Assistive device
  - Stairs (railing, 2-1)
  - Distance
  - Shoes/socks
  - In/out car/chair
  - Clip toenails (hip)
  - Effect on sleep
  - Pain meds
  - Questionnaires (HOOS/KOOS)
Joint pain: Exam

- Gait – limp (Trendelenburg/antalgic)
- Inspection: effusion (knee)
- ROM:
  - Knee – lose terminal extension
  - Hip – lose internal rotation
- Palpation:
  - Knee – joint line tenderness, stability (often + ant drawer)
  - Hip - trochanteric discomfort
- Leg lengths
- Neurovascular status/muscle strength
**Imaging**

- Radiograph is modality of choice
- Weight bearing films
- Knee 4 views – notch view needed
- Hip AP / lat
- MRI rarely if pain and radiographs do not align
Figure 1. Anteroposterior (top) and lateral (bottom) radiographs of knees with Kellgren-Lawrence (KL) scores of 1-4.
Arthritis: X-ray appearance

OA

Joint space narrowing
Osteophytes
Subchondral sclerosis
Subchondral cysts

RA
Conservative treatment of knee OA – AAOS guidelines

• **Recommend for** based on strong to moderate evidence of effect
  - Low impact aerobic exercise, strengthening
  - Weight loss (BMI <25)
  - NSAIDs (topical or oral), tramadol
Conservative treatment of knee OA – AAOS guidelines

- Cannot recommend for or against
  - TENS unit, e-stim
  - PT
  - Unloader brace
  - Acetaminophen, opioids
  - Cortisone injection
  - PRP, growth factors
Conservative treatment of knee OA – AAOS guidelines

- Recommend against
  - Acupuncture
  - Shoe wedges
  - Glucosamine / chondroitin sulfate
  - Hyaluronic acid
  - Needle lavage
  - Arthroscopic lavage / debridement
Joint replacement basics

- NIH consensus statement:
  - Candidates for arthroplasty should have "radiographic evidence of joint damage and moderate to severe persistent pain or disability, or both."
Joint replacement: Indications

- **Indications**
  - Failure of conservative management with grade 3 or 4 OA
  - No strict appropriateness criteria in US (there is in Europe)
  - Data shows worse outcomes with prolonged disease with severe, progressive deformity
    - Don’t wait too long

- **Contraindications**
  - Skeletally immature
  - Joint sepsis

- **Relative contraindications**
  - Severe lymphedema (25% infection)
  - Severe peripheral vascular disease
  - BMI >50
  - Severe skin disease (psoriasis)
  - Severe medical comorbidities
  - Cognitive inability to participate in rehab
  - Non-ambulatory
Indications

- Optimized patient:
  - BMI <40 (35 in Kaiser system)
  - DM: Ha1C <7
  - No smoking

- Poor outcomes
  - Mental illness, depression, opioid dependency
  - Poor health, low socioeconomic status
  - L&I
  - >3 med allergies (TKR)
  - Not a strict correlation

*(Bone Joint J 2013;95-B:1359–65.)*
What are the benefits?

- All studies show significant increase in function with decreased pain scores
- Improved quality of life
- Correction of deformity
- No effect of age, gender, obesity on functional outcomes
  - Obesity is a risk factor for infection
- Surgeon measured outcomes show 85-90% satisfaction (TKR)
  - Patient reported satisfaction 82% TKR, 90% THR
- Overall, a reliable, safe procedure that improves function, relieves pain and improves quality of life
Joint replacement basics

Total hip replacement costs

*Cost / Additional Life Saved
• Total knee replacement cost
  - Statistical analysis of TKR in 50 year old
  - Compared conservative care to TKR including lost wages, complications, revisions
  - TKR more expense at 3.5 years, but over 30 years yielded $69,800 benefit (1)

Hip replacement basics

Femoral Stem
(inserted into femoral canal)

Femoral Head Attached

Artificial Hip
(in place)
Total Knee Replacement: Basics
Complications

- Overall 5.6% peri-op complication rate (w/in 6 months)
- Bleeding
  - Pre-op hct greatest determinant
- DVT/PE
  - DVT prophylaxis, early ambulation
  - PE <0.8%
- Nerve injury <0.1%
  - Incisional numbness common
- Cardiopulmonary
  - MI 0.8%
  - ↑ risk in bilateral TKA
- Post op ileus – narcotic related
- UTI – early foley removal
- Infection 0.5%
  - Superficial
  - Deep
Infection

• Diagnosis:
  ▪ Labs: ESR, CRP, CBC
    • ESR, CRP 99% sensitivity, 89% specificity
    • If ESR or CRP elevated → aspirate
  ▪ Aspiration – >2000 WBC and >80% polys

• Treatment:
  ▪ Biofilm resists antibiotics
  ▪ Gold standard: two stage removal with placement of antibiotic spacer, 6wks IV abx, replant at least 2 months later
Infection

- Infection risk factors:
  - Wound healing complications, drainage
  - Prior surgery
  - RA
  - DM
  - Psoriasis
  - Obesity
    - BMI > 40—3.3 x infection
    - BMI > 50—21 x infection
    - 22% wound complication rate compared 2% in non-obese
  - P/w pain at implant site, rarely fevers, chills
Hip complications

- Leg length discrepancy
  - Real or apparent
  - 22% of pts have >5mm lengthening after THA
  - >5mm is noticed
- Dislocation 1-2.5%
  - Risks: posterior approach, female, revision surgery, dx other than OA, neuromuscular disorder
- Heterotopic ossification
  - Men, prior HO
Survivorship

• How long will it last?
  - 90% at 10 years
  - 80% at 20 years
  - Roughly 1% revision rate per year
Revision total joint replacement

• Causes of revision
  1. Instability/dislocation (hip)
  2. Mechanical loosening
  3. Bearing surface failure
  4. Infection (#1 for knee)
  5. Pain of unclear etiology

• Revision surgery more complex
  ▪ Higher complication rates esp. infx, disloc

Conclusions

- Osteoarthritis is extremely common and becoming more common due to obesity and aging population
- Conservative care should be used prior to surgery in most patients (esp., KL3)
- Total joint replacement is very effective in relieving pain and restoring function