Osteoarthritis of the Knee:
Current Concepts in Conservative Management
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Osteoarthritis of the Knee: Conservative Management

- Pharmacologic
  - Oral Agents
    - Simple analgesics, NSAIDs, COX IIs
  - Topical Agents
  - Intra-Articular Injections
    - Corticosteroid
    - Hyaluronic Acid
- Non-pharmacologic
  - Heat & Cold Therapy
  - Weight Loss
  - Activity Modification & Joint Protection
  - Physical Therapy & Exercise
  - Complementary & Alternative Medicine

Knee Osteoarthritis: Conservative Management

What’s New?

- Pharmacologic
  - Oral Agents
  - Intra-Articular Injections
- Non-pharmacologic
  - Heat & Cold Therapy
  - Weight Loss
  - Activity Modification & Joint Protection
  - Physical Therapy & Exercise
  - Complementary & Alternative Medicine

Intra-Articular Injections

Intra-Articular Injections for Knee OA

- IA Injections
  - Indications
    - When joint not responsive to more conservative management
  - Types
    - Corticosteroid
    - Hyaluronic Acid (HA)
  - Technique
  - Post-injection activity guidelines
  - Clinical Efficacy
IA Corticosteroid Injections
- Introduced in 1951
- Widely accepted treatment for knee OA
- Goals
  - Reduce pain
  - Reduce inflammation
  - Restore ROM
  - Improve patient function
- Adjunct to other management in a comprehensive program

IA Corticosteroid Injections
- Indications
  - Moderate to severe pain
  - Inflammatory synovitis/effusions
  - Joint not responsive to more conservative methods
  - Patient cannot tolerate oral systemic therapy
- Contra-indications
  - Local or systemic infection
  - Anticoagulant therapy
  - Hemorrhagic effusions
  - Severe joint destruction/deformity

IA Corticosteroid Injections
- Complications
  - Infection
  - Post-Injection Flare/synovitis
    - Rare
    - Subsides in few hours
  - Charcot-like Arthropathy
    - Reduced pain \(\rightarrow\) overwork joint \(\rightarrow\) cartilage/bone destruction \(\rightarrow\) arthropathy

IA Hyaluronic Acid (HA) Injections
- What’s in a name?
  - Hyaluronan
  - Hyaluronate
  - Hyaluronic Acid
  - Viscosupplementation
  - Commercial names
    - Hyalgan®
    - Synvisc ®
    - Orthovisc ®
    - Euflexxa ®

What is HA?
- Compound found in synovial cells
- Functions
  - Lubricates joint
  - Viscoelastic shock absorber \(\rightarrow\) reduces cartilage wear
  - Binds to inflammatory mediators
  - Coats pain receptors
  - Modulates synovial cell and chondrocyte behavior
IA HA Injections
- HA in joint affected by OA
  - Molecular weight decreases
  - Functions noted reversed
    - Accelerated wear, disease progression
- HA replacement therapy (viscosupplementation)
  - Restore
    - Cushioning
    - Lubrication
  - Improve
    - Pain levels
    - Patient function
  - Efficacy
    - Research \(\rightarrow\) knee OA

IA Injections: Technique
- Local anesthetic
- Enter joint space
  - Supine or sitting
  - Medial or lateral
- Aspirate synovial fluid
  - Reduce effusion
  - Reduce dilution factor
  - Diagnostic aide
- Instill corticosteroid/HA
- Move joint through ROM to disperse medication

IA Injections of the Knee: Does Approach Matter?
- “Accuracy of Needle Placement into the Intra-Articular Space of the Knee” (Jackson, et al, JBJS, 2002)
  - Evaluated accuracy of needle placement via 3 approaches
    - anteromedial, anterolateral & lateral mid-patellar
  - 1 surgeon, 3 injections on 80 consecutive patients
  - Placement confirmed with fluoroscopic imaging
  - Accuracy Rates
    - Anteromedial \(\rightarrow\) 75%
    - Anterolateral \(\rightarrow\) 71%
    - Lateral mid-patellar \(\rightarrow\) 93%

IA Injections of the Knee: Does Sonography Improve Outcomes?
  - 148 patients with painful joint, randomized into 2 groups
    - Conventional palpation-guided anatomic injection
Sonographic image-guided injection
Sonographic guidance significantly improved outcomes
Procedural pain
Pain 2 weeks post-injection
Authors suggest more research required to assess
Long-term outcomes
Functional measures
Overall health-care costs

IA Injections of the Knee:
Does Sonography Improve Outcomes?
“Sonographic Needle Guidance and Cost-Effectiveness of Intraarticular Injections for Osteoarthritis of the Knee” (Chavez-Chiang, et al, ACR abstract session, Nov 2010)
- Evaluated longer term efficacy and cost-effectiveness of sonography
- 94 patients with non-effusive, OA knees randomized into 2 groups
  - Conventional palpation-guided anatomic injection
  - Sonographic image-guided injection
- Sonographic guidance significantly improved
  - Procedural pain
  - Pain @ 2 weeks & 6 months post-injection
  - Reduction in cost/patient/year

IA Injections: Frequency
- Corticosteroids
  - 1 injection, then reassess
  - OARSI evidence-based consensus guidelines (2008)
    - No more than 4/year
    - Systemic & catabolic effects
- HA
  - From 1-5 injections
    - 1-3 (Synvisc ®)
    - 3-5 (Hyalgan ®)

Post-Injection Activity Guidelines
- Physician-specific
  - No research examines post-injection activity protocols and effect on outcomes
  - Informal poll of HSS MDs
    - Rest the remainder of the day then no limitations
    - 2-5 days of light activity
      - Limit walking and prolonged standing
      - Light exercise only
Intra-Articular Injections For Knee OA: Clinical Efficacy

Are using IA steroids safe over the long-term?
  - Randomized, double-blind, placebo-controlled trial
  - 68 patients with knee OA randomized to 2 groups
    - IA steroid injections every 3 months up to 2 years
    - IA saline injections every 3 months for up to 2 years
  - Results
    - No adverse effects of repeated injections noted over 2 years
    - Radiologic assessment of joint narrowing → no difference @ 1 & 2 years

How do IA steroids compare to a placebo?
  - Analysis of 6 randomized controlled trials
  - Compare effectiveness of IA corticosteroids versus placebo for knee OA
  - Primary outcome = VAS
  - Results
    - Week 1 → statistically significant improvement in pain scales for steroid groups
    - Weeks 4-28 → no significant difference between groups

How does IA HA compare to a placebo?
- “Single, Intraarticular Treatment with 6 ml Hylan G-F 20 in Patients with Symptomatic Primary Osteoarthritis of the Knee: A Randomized, Multicenter, Double-Blind, Placebo Controlled Trial” (Chevalier, et al, Ann Rheum Dis, 2010)
  - Compare efficacy of single IA HA injection and placebo for knee OA
  - 253 patients with symptomatic knee OA randomized to 2 groups
    - Single IA HA or single IA saline injection
  - HA group → statistically significant improvements over 26 weeks
    - WOMAC pain and function scales
    - Patient Global Assessment
    - Clinical Observer Global Assessment

How does IA HA compare to IA steroids?
  - Analysis of 7 randomized controlled trials
  - Compare effectiveness of IA HA to corticosteroids for knee OA
  - Outcomes = WOMAC, VAS @ rest and with walking
  - Results
    - Week 2 → all outcomes significantly greater for corticosteroids
    - Week 4 → equal
    - Weeks 8-26 → all outcomes significantly greater for HA
IA Injections: Take Home Message
- Widely used
- Few reported complications
- Corticosteroids
  - Fast acting
  - Short duration of relief
- Hyaluronic Acid
  - Slower onset relief
  - Long lasting

Non-Pharmacologic Management of Knee OA
- Physical Therapy & Exercise
- Complementary & Alternative Medicine
  - Nutraceuticals
  - Tai Chi
  - Acupuncture

Physical Therapy & Exercise
Benefits of Exercise for Knee OA
- Strong evidence
- First line treatment
- Multi-modal exercise
  - Strength
  - Flexibility/ROM
  - Balance/Proprioception
  - Cardiovascular
  - Manual Therapy
  - Functional Training
  - Home Exercise Program
- Individualized to
  - Address specific patient impairments
  - Optimize patient function

Proprioception vs. Strength
- “Efficacy of 2 Non–Weight-Bearing Interventions, Proprioception Training Versus Strength Training, for Patients With Knee Osteoarthritis: A Randomized Clinical Trial” (Lin, et al, JOSPT, 2009)
  - 108 patients with knee OA randomized into 3 groups
    - Proprioceptive training (seated foot taps to targets)
    - Strength training (seated conc/ecc quad exercise)
    - Control – no exercise
  - WOMAC pain/function, timed walk on 3 surfaces (level, stairs, spongy surface), knee strength
- Results
  - Significant improvements in WOMAC pain/function in both exercise groups
  - Proprioception training group → significantly greater improvements in walking
Strength training group → significantly greater knee extension strength

**Hydrotherapy vs. Land**
- “Hydrotherapy Versus Conventional Land-Based Exercise for the Management of Patients With Osteoarthritis of the Knee: A Randomized Clinical Trial” (Silva, et al, Physical Therapy, 2008)
- 64 patients with knee OA randomized into 2 groups
  - 18 weeks of water-based exercise (3x/week)
  - 18 weeks of land-based exercise (3x/week)
- Similar exercises (land adapted to water)
- WOMAC pain/function & VAS @ rest/after 50 ft walk
- Results
  - Reductions in pain/improvements in WOMAC scores similar between groups
  - Water-based group experienced significantly greater decrease in pain before and after the 50 ft walk @ 18 weeks
  - Water-based exercises are an effective alternative for the management of OA of the knee

**Exercise for Knee OA**
- Create program that addresses specific impairments
- Compliance is key
  - Keep it simple
  - Choose interventions that patient enjoys
  - Connect the dots
    - Intervention → functional goal
  - Education
    - Modify based on symptoms

**Complementary & Alternative Medicine (CAM)**

**Growth of CAM**
- 2007 National Health Interview Survey
  - Approximately 38% of adults in US use CAM

**Patients with Knee OA**
- More active → want to stay that way
- Information-savvy
- Looking for alternatives
- Seeking guidance from health-care providers

**Nutraceuticals**
- Glucosamine & Chondroitin
  - Natural substances
  - Found in/around chondral cells
  - In US, sold as dietary supplements
  - 5 million users & $750 million in sales/year in US in 2004
- Glucosamine
  - Amino sugar → produced/distributed in cartilage and other connective tissue
  - Reduced in OA cartilage
- Chondroitin sulfate
Complex carbohydrate that helps cartilage retain water
Levels are altered in OA cartilage & synovial fluid

Clinical Efficacy of Chondroitin

- "Chondroitins 4 and 6 Sulfate in Osteoarthritis of the Knee: A Randomized, Controlled Trial" (Beat, et al, Arthritis and Rheumatism, 2005)
  - Determine whether chondroitin sulfate (CS) is effective in inhibiting cartilage loss in knee OA
  - Randomized, double-blind, placebo-controlled trial
    - 300 patients with knee OA
    - Received either 800 mg CS or placebo once daily for 2 years
  - Primary outcome
    - Joint space loss assessed by an A/P radiograph of the knee
  - CS group had significantly smaller change in mean joint space width

- Secondary outcomes
  - No statistically significant differences in WOMAC pain/function
  - No statistically significant differences in rates of adverse events

Efficacy of Glucosamine vs. Chondroitin vs. Cox II vs. Placebo

- "Clinical efficacy and safety of glucosamine, chondroitin sulphate, their combination, celecoxib or placebo taken to treat osteoarthritis of the knee: 2-year results from GAIT" (Sawitzke, et al, Annals of Rheumatic Disease, 2010)
  - Evaluate efficacy and safety of glucosamine, chondroitin sulphate, celecoxib and placebo over 24 months
  - Randomized, double-blind, placebo-controlled trial
    - 662 patients with moderate to severe knee OA
    - Glucosamine, chondroitin or combination of both/Celecoxib/Placebo
  - Results
    - All treatment groups experienced improvement in WOMAC pain and function scores
    - None of the treatments significantly better than placebo
    - Adverse reactions were mild/occurred among all treatment groups/serious adverse events were rare

Acupuncture

- Acupuncture has been used as a therapeutic modality for more than 2000 years
- Over 2 million people use acupuncture annually in the US
- Chronic pain is the most common condition treated by acupuncturists
- Needles may be stimulated by hand, moxibustion, or by electrical current
- Increase in research evaluating efficacy in patients with knee OA

Acupuncture: Clinical Efficacy

- "Acupuncture in Patients with Osteoarthritis of the Knee: A Randomized Trial" (Witt, et al, Lancet, 2005)
  - Investigate efficacy of acupuncture in patients with knee OA
294 patients with chronic knee OA randomized to 3 groups
- Acupuncture → 12 sessions over 8 weeks
- Superficial needling @ non-acupuncture points → 12 sessions over 8 weeks
- Waiting list/no-treatment control

Results
- Patients in acupuncture group had significantly improved WOMAC pain/function scores after 8 weeks
- Differences were no longer significant at 26 and 52 weeks
  - Suggests that single course of acupuncture treatment has limited long-term point-specific effects

**Acupuncture: Clinical Efficacy**
- “Immediate Effects of Acupuncture on Gait Patterns in Patients with Knee Osteoarthritis” (Tung-wu Lu, et al., Chinese Medical Journal, 2010)
  - Investigate effects of acupuncture on gait patterns in patients with knee OA
  - 20 patients with bilateral, medial knee OA randomized to 2 groups
    - Control group → 30 minute sham acupuncture therapy
    - Experimental group → 30 minute electro-acupuncture stimulation
  - Outcomes
    - Pre/post VAS scores
    - Pre/post gait analysis (level surface @ self-selected pace/ 7-camera system w/28 markers)
  - Results
    - Significant decrease in VAS scores after acupuncture in both groups
    - Mean change of VAS in experiment group 2 times greater than sham group
    - Experimental group had significant improvements in gait pattern
      - gait speed & step length
      - hip & knee flexion and ankle plantarflexion angles at toe-off

**Tai Chi**
- Originated in China as martial art
- Mind-body practice
  - “Moving meditation”
- For patients with knee OA
  - Improves fluidity of movement
  - Improves balance & strength
  - Focuses on self-awareness and quality of life
  - Many classes modified for patients with OA

**Tai Chi: Clinical Efficacy**
- “Tai Chi Is Effective in Treating Knee Osteoarthritis: A Randomized Controlled Trial” (Wang, et al., Arthritis and Rheumatism, 2009)
  - Investigate efficacy of Tai Chi in treating symptoms of knee OA
  - 40 patients with knee OA randomized into 2 groups
    - Tai Chi → 60 minutes, 2 times/week, 12 weeks
    - Wellness education/stretching 2 times/week, 12 weeks
  - Outcomes measured at baseline & 12, 24, 48 weeks
  - Results
    - Tai Chi group had statistically significant decrease in WOMAC pain scores and improvements in WOMAC function scores, self-efficacy scores & depression
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Future Directions

- Focus on Wellness
- Expansion of wellness classes
  - Group Exercise Classes
  - Education Lectures
- Know your community resources
  - Arthritis Foundation
- Collaborative research

References

- National Center for Complementary and Alternative Medicine (NCCAM) website
Sawitzke A, Shi H. Clinical Efficacy and Safety of Glucosamine, Chondroitin Sulphate, Their Combination, Celecoxib or Placebo taken to Treat Osteoarthritis of the Knee: 2-year Results from GAIT. *Ann Rheum Dis*. 2010; 69: 1459-1464.


