

Osteoarthritis: Moving Beyond Those Aching Joints

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Since 2014, Dr. Wu has been with Lynchburg Family Medicine Residency Program, where she directs musculoskeletal, radiology/point-of-care ultrasound (POCUS), and continuity clinic resident rotations. She earned her medical degree from the University of South Florida and completed a family medicine residency and primary care sports medicine fellowship at Halifax Health in Daytona Beach, Florida. She is currently working on her master's degree in academic medicine from Keck School of Medicine of the University of Southern California (USC). Dr. Wu holds teaching positions with Virginia Commonwealth University School of Medicine, University of Virginia School of Medicine, and Liberty University College of Osteopathic Medicine. She enjoys participating in many athletic pursuits, including Olympic-style fencing, and is the head team physician for Sweet Briar College; team physician for the Lynchburg Hillcats (the Cleveland Indians High-A affiliate); medical director for the Virginia 10 Miler; and co-medical director for the Lynchburg Ultra Series of four ultramarathons.

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Learning Objectives

1. Conduct a thorough physical exam of patients who present with the signs and symptoms of osteoarthritis and refer for appropriate diagnostic imaging tests to confirm the condition.
2. Develop evidence-based treatment plans that focus on a stepwise approach.
3. Counsel patients on lifestyle modifications they can make to prevent osteoarthritis and safe treatments they can utilize to minimize pain.
4. Counsel older adult patients to engage in preventive physical and occupational therapy with a goal to maintain function and mobility.

FMX

Audience Engagement System



FMX

My Osteoarthritis Family

- Meet Grandma, Mom and Dad, and the random pastor.
- Grandma has two hip replacements
- Mom has a meniscal tear
- Dad has lumbar radiculopathy
- Pastor won't tell me his pains



A Review of Osteoarthritis

- Most common form of arthritis
 - Approximately 30 million in United States
- Prevalence increasing with aging population
 - Increased healthcare costs and economic burden
- Associated with cardiovascular comorbidities
 - Increased risk for developing CV disease
 - Common innate immune system factors

A Review of Osteoarthritis

- Chronic, progressive disease
 - Causes pain and disability
 - Affects articular cartilage
 - Structural and functional changes in entire joint
 - Abnormal remodeling
- Common sites are the knee, hands and hips

Poll Question #1

- Which of these is not a risk factor for my family in developing osteoarthritis?
 - A. Age
 - B. Existing knee injury
 - C. Female gender
 - D. Nsaid use
 - E. Obesity

Risk Factors for Osteoarthritis

- Female gender
 - Thinner baseline cartilage, more ACL injuries, post-menopause
- Older age
 - Muscle atrophy, cartilage alteration, shift of cellular homeostasis
- Genetics
 - Bone shape

Risk Factors for OA

- Obesity
 - Associated with knee and hand OA, unclear with hip OA
 - Increased inflammatory molecules
- Trauma
 - ACL and meniscal injury
- Occupation involving repetitive knee bending or heavy lifting

Phenotypes

- Diverse routes to common end
 - Early in disease can be reversible
- Pathways to disease
 - Post-traumatic
 - Metabolic
 - Age
 - Genetic

OA is reversible?

- Since articular cartilage is biomechanically active, healing is possible if stimuli is removed prior to articular surface breakdown
 - Control inflammation
 - Alleviate mechanical overload

Poll Question #2

- Counseling of my arthritis family includes educating them that osteoarthritis is an inevitable part of the aging process due to “wear and tear” of the joints
 - A. True
 - B. False

Defining Osteoarthritis

- Inflammatory, biomechanical and degenerative whole organ disease
- Progressive articular cartilage deterioration and loss with structural changes in synovial joints

Pathophysiology of OA

- Two mechanistic categories
 - Abnormal load on normal cartilage
 - Normal load on abnormal cartilage
- Primary OA is joint damage without cause
- Secondary OA is joint damage due to a preceding insult
 - Trauma, infection, metabolic, inflammatory

Normal Cartilage

- Located at ends of long bones in articular joints
 - Flexible and mechanically compliant
 - Low frictional coefficient aids in load transmission
 - Smooth lubricated surface
- Mainly type 2 collagen
 - Has other collagens and proteoglycans
- Architecture maintained by chondrocytes
- No innervation

Normal Subchondral bone

- Interface between cartilage and bone
 - 2 layers
- Highly innervated
- Supplies nutrients to cartilage
- Shock absorbing
- Metabolically active

Normal Synovium

- Surrounds joints, tendons, bursa and fat pads
- Synoviocytes produce lubrication (joint fluid)
- Synovial fluid provides nutrition to chondrocytes

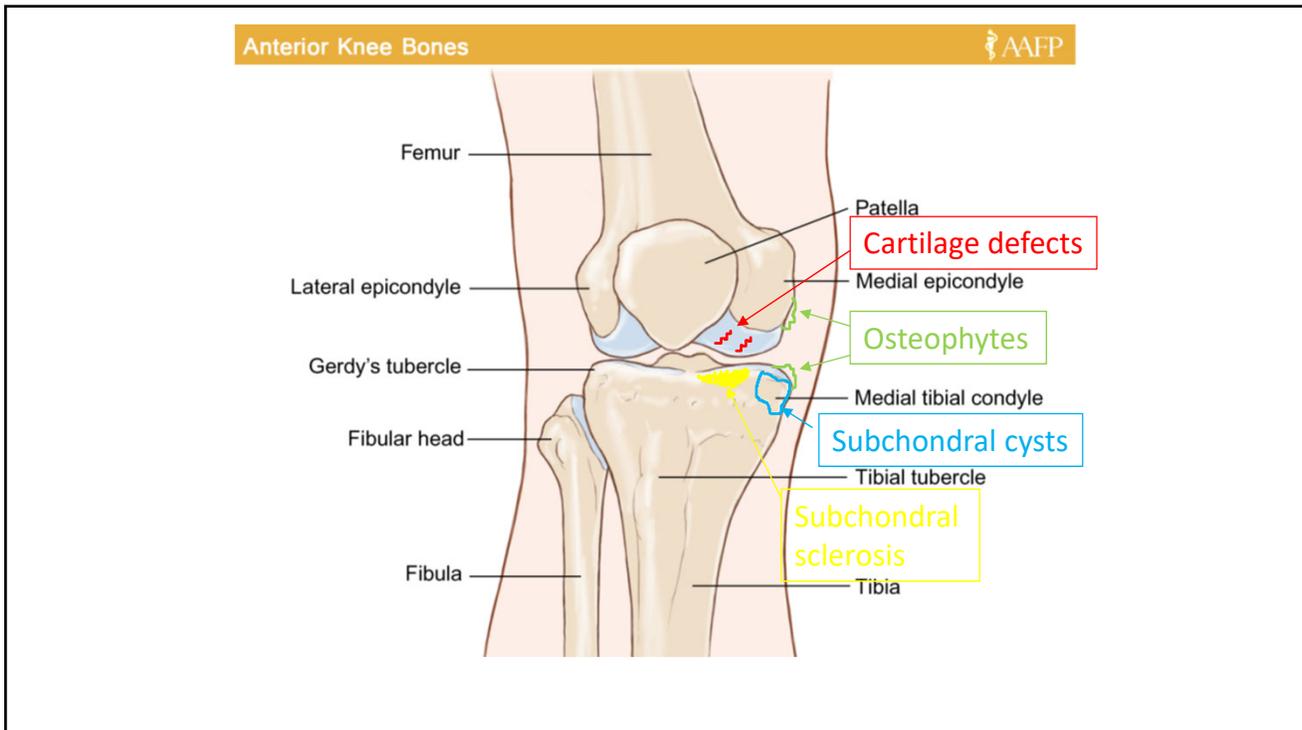
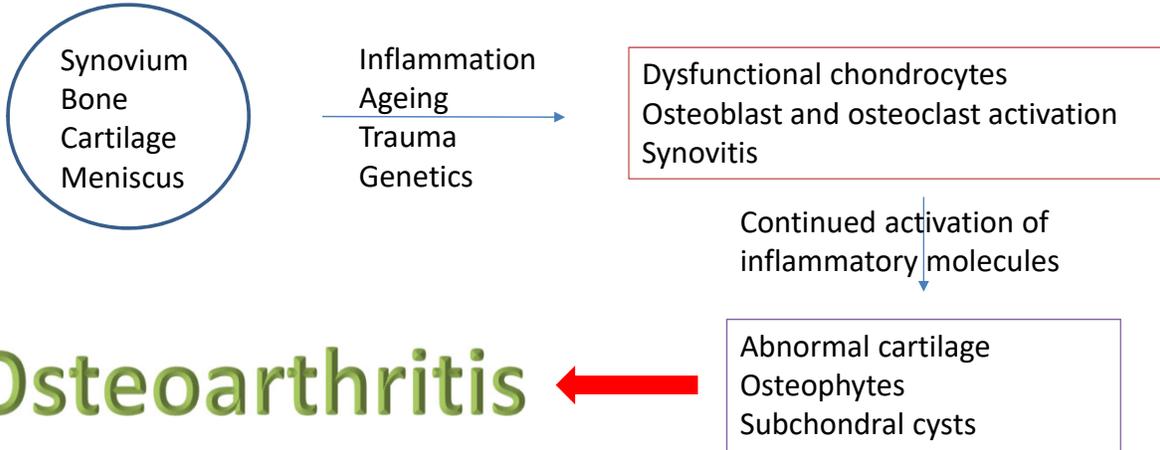
What happens in OA

- Inflammatory and traumatic factors disrupt normal chondrocyte homeostasis – imbalance between repair and destruction of joint tissues
 - Changes in the composition of cartilage and loss of integrity
 - Surface erosions, fissures and calcification
 - Hypertrophy of chondrocytes for synthesis and repair also activates inflammatory pathways
 - Increased subchondral bone turnover and vascular invasion, development of subchondral bone marrow lesions
 - Osteophyte formation due to reactivation of endochondral ossification

The Whole Organ

- Inflammatory and biomechanical changes in interaction of joint components
 - Bone
 - Cartilage
 - Tendon
 - Ligaments
 - Mild, chronic, nonspecific synovial inflammation
- Structural changes
 - Subchondral bone sclerosis
 - Osteophytes at joint margins

The (Knee) Whole Organ *simplified*



Poll Question #3

- Initial diagnosis of my family's osteoarthritis includes
 - A. CT scan of the joint confirming osteophytes
 - B. Joint pain that improves with activity
 - C. Joint stiffness that persists throughout the day
 - D. Joint space narrowing on plain Xray
 - E. Palpable bony tenderness

Signs and Symptoms

- Present mainly in advanced disease
 - Pain with activity
 - Predominant symptom is pain
 - Stiffness that improves with activity
 - Decreased range of motion

Examination

- Crepitus
- Palpable tenderness
- Palpable osteophytes
- +/- effusion

Radiology

- Not necessary for diagnosis
- Structural findings do not always correlate with symptoms
 - More correlation with more severe symptoms
- Useful for atypical presentations and for investigating for other causes to presenting problem

Xray

- Cannot detect early OA
- Joint space narrowing
 - More sensitive and reliable than scoring systems
 - Also dependent on meniscal integrity
- Subchondral bone cysts
- Osteophytes in non-contact zones
- Bone sclerosis



MRI

- Good for evaluating soft tissue structures
- Can detect early OA
 - Evaluates cartilage thickness
 - Identifies bone marrow lesions
- Locates effusions



Other imaging modalities

- Ultrasound
 - Identifies effusions and synovial hypertrophy
- CT
 - Identifies focal cartilage defects

Labs

- Not used for diagnosis of OA
- Inflammatory markers in research phase
 - Cytokines
 - Collagen and proteoglycan precursors
- Joint fluid is non-inflammatory, without crystals

Diagnostic Criteria for knee OA

- ACR
 - Pain and 3 of:
 - Age > 50
 - < 30 minutes morning stiffness
 - Crepitus
 - Bony tenderness
 - Bony enlargement
 - No palpable warmth
- EULAR
 - Knee Pain
 - < 30 minutes morning stiffness
 - Decreased function
 - Crepitus
 - Decreased ROM
 - Bony enlargement

Hand Osteoarthritis

- Physical exam finding of Heberdens(DIP) and Bouchards(PIP) nodes
- Base of thumb (1st CMC) most commonly affected
 - Decreased ROM, pinch and grip strength
 - Positive grind test and traction-shift test

Diagnostic criteria of Hand OA (ACR)

- Hand pain, aching or stiffness and 3 of the following:
 - Bony enlargement of ≥ 2 DIP joints
 - < 3 swollen MCP joints
 - Bony enlargement of ≥ 2 of 10 selected joints
 - Deformity of at least 1 of 10 selected joints
 - Selected joints: CMC, 2nd and 3rd DIP and PIP

Hip Osteoarthritis

- Primarily due to abnormal mechanics leading to progressive articular damage
- Congenital risk factors
 - Hip dysplasia
 - Legg-Calve-Perthes/SCFE
 - Femoral acetabular impingement
 - Hip retroversion
- Most commonly affects superior pole, acetabular rim damaged first

Diagnostic criteria for Hip OA (ACR)

- Hip pain and either
 - Internal hip rotation $\geq 15^\circ$, pain on internal hip rotation, morning stiffness ≤ 60 minutes, > 50 yo
 - Internal hip rotation $< 15^\circ$ and ESR ≤ 45 mm/hr or hip flexion $\leq 115^\circ$ (if ESR not available)

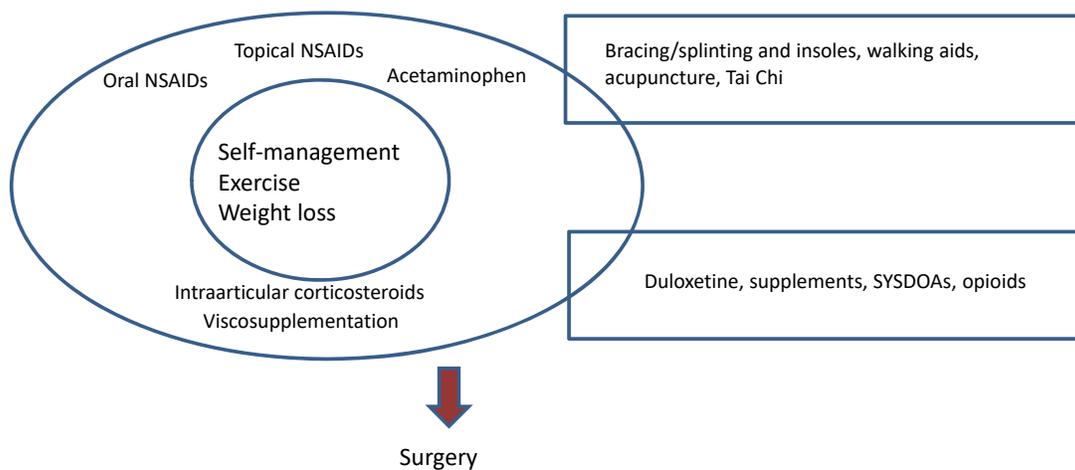
Poll Question #4

- Core management of my family's osteoarthritis includes
 - A. Education on weight loss and exercise
 - B. Opioids
 - C. Intra-articular injection
 - D. Joint immobilization
 - E. Joint replacement

Treatment of OA

- Individualized to patient needs and goals for pain and function.
 - Non-pharmacological
 - Pharmacological
 - Injections
 - Surgery

Treatment of OA



Conservative treatment

- 2010 national public health agenda for OA four intervention strategies
 - Reduce symptoms and progression
 - Self-management education
 - Physical activity
 - Prevention of OA
 - Injury prevention
 - Weight management and healthy nutrition

Self-Management program

- Behavioral intervention
 - Encourages patients to take active role in management
- Goal of program
 - Improve compliance to treatment plan
 - Relieve concerns
 - Optimize quality of life
 - Prevent short and long term health consequences

Self-Management in OA

- Education
 - Disease state and prognosis
 - Pain mechanisms
- Management strategies
 - Awareness of patterns to pain and response strategies
 - Weight loss and exercise plan

Self-management in OA

- Slight improvements in pain, function and symptoms
 - Not clinically meaningful individually
 - Programs unlikely to cause harm despite small benefits
 - Available studies vary in content and delivery
- Group support more effective than individual support
- No difference between patient or provider based education
- Recommended by AAOS guidelines for knee OA

Exercise

- Cochrane review (2018) on effect of exercise on physical, emotional and mental health
 - Low to moderate quality evidence that older people with chronic knee or hip pain should be encouraged to participate in regular exercise
 - Slightly improves physical function, depression, pain and health-related quality of life.
 - May improve self-efficacy, social function and mental health
 - Educate patients that pain with activity does not equate to more joint damage

Exercise

- Strengthens muscles
 - Decrease joint forces
 - Improves alignment
- Improves aerobic capacity
- Decreases pain and improves physical function
- No right way to exercise
 - Can be land or water based
 - Tailored to what the patient will participate in and severity of disease

Exercise

- Low impact, moderate intensity 2.5 hrs/wk
 - Walking, water exercise, cycling
 - Ok for runners to keep running
- Muscle strengthening with different forms of resistance 2 days/wk
 - Joint specific
- Focus on aerobic, strengthening, range of motion and proprioceptive exercise
 - Strength and ROM for hand OA

Weight loss and Nutrition

- General rule is 1 pound of weight loss decreases force felt by joint 4x.
- Weight loss also decreases inflammatory molecules released by adipose
- Follow published weight loss and nutrition guidelines

Bracing

- Evidence for use is inconclusive
- Uni-compartmental unloading knee brace
 - Alter structural biomechanics to decrease mechanical stress on joint
- Patellar taping
 - Improves knee pain and function in symptomatic OA
- Improved function and pinch strength with splinting in 1st CMC OA

Prevention of OA

- Address modifiable risk factors
 - Weight and injury prevention
 - Avoid sedentary lifestyle
 - Maintain high levels of mobility
- Address biomechanics
 - Neuromuscular training programs
 - High intensity plyometrics
- Surgical repair of ACL and meniscal injury does not significantly decrease risk

Medications

- Acetaminophen
- Nsaids
- Antidepressants
- Supplements

Acetaminophen

- Traditionally first-line for osteoarthritis due to safer profile compared with NSAIDs especially for patients at risk for gastrointestinal ulcer
 - Central and peripheral analgesia with minimal anti-inflammatory effect
 - Risk of liver toxicity
- Cochrane review (2019) acetaminophen vs. placebo
 - Concludes acetaminophen provides minimal improvements in pain and function for people with hip or knee osteoarthritis with no increased risk of adverse events overall
 - No clinically important improvement in pain or function
- Cochrane review (2010) acetaminophen vs. placebo and NSAIDs
 - Data suggests that NSAIDs are superior to acetaminophen for improving knee and hip pain in people with osteoarthritis
 - No significant difference in safety (total number of patients experiencing any adverse event)

Systemic NSAIDs

- Modulate pain and inflammation
 - GI and CV risk must be considered when prescribing NSAIDs
 - Use PPI with Cox-2 selective NSAIDs in high GI risk
 - Start with naproxen in high CV risk
 - Not recommended in setting of advanced renal disease
 - Use at lowest dose for shortest possible duration
 - Expected up to 5% of regular NSAID users develop hypertension

Topical NSAIDs

- Decreased GI, Renal and CV risk
- Recommended over systemic for knee and hand OA
- Dosage forms
 - Diclofenac sodium gel or solution
 - Diclofenac epolamine patch

NSAIDs

- AAOS Knee recommendation 7a
 - Recommend NSAIDs (oral or topical) or Tramadol for patients with symptomatic osteoarthritis of the knee
 - Strength of recommendation: Strong
- AAOS Hip
 - Strong evidence supports that NSAIDs improve short-term pain, function or both in patient with symptomatic osteoarthritis of the hip
 - Strength of recommendation: strong evidence

NSAIDs

- ACR 2012
 - Conditional recommendation for topical and oral NSAIDs with topical preferred in persons aged ≥ 75 yo.

Antidepressants

- For neuropathic pain and associated depression
 - Alters central nervous system response
- Duloxetine
 - Small studies show benefit in pain and function, evidence is still being gathered

Chondroitin and Glucosamine

- In class of symptomatic slow acting drugs for osteoarthritis (SYSDOAs)
- Anti-inflammatory and anti-catabolic
- Small effects seen in prescription strength formulations not available in the United States
 - Pharmaceutical grade Chondroitin Sulfate
 - 800 mg PO daily
 - Patented Crystalline Glucosamine Sulfate
 - 1500 mg PO daily

Chondroitin and Glucosamine

- AAOS Knee recommendation 5
 - Cannot recommend using glucosamine and chondroitin for patients with symptomatic osteoarthritis of the knee
 - Strength of recommendation: strong
- AAOS Hip
 - Moderate strength evidence does not support the use of glucosamine sulfate because it did not perform better than placebo for improving function, reducing stiffness and decreasing pain for patients with symptomatic osteoarthritis of the hip
- ACR 2012 conditional recommendation against use in knee and hip AO

Corticosteroid Injections

- Anti-inflammatory action
 - Does not reverse progression
 - Provides short-term pain relief
- Quick onset, duration is variable
- Potential cytotoxic effects
 - Conflicting results on steroid effect on cartilage loss with prolonged use

Corticosteroid injections

- Mixed guideline consensus on use
- AAOS Knee Recommendation 8
 - Unable to recommend for or against use of intraarticular corticosteroids for patients with symptomatic osteoarthritis of the knee
 - Strength of recommendation: inconclusive
- AAOS hip
 - Strong evidence supports use of intraarticular corticosteroids to improve function and reduce pain in the short-term for patients with symptomatic osteoarthritis of the hip.
- ACR 2012
 - Conditional recommendation for use in knee and hip OA
 - Conditional recommendation against use in hand OA

Viscosupplementation/Hyaluronic acid

- Analgesic and anti-inflammatory
 - Increases joint lubrication
 - Improves pain and function
 - May slow progression of disease
- Slow onset, duration is variable (longer than corticosteroids)
- May cause local injection reactions, pseudoseptic joint and pseudogout

Viscosupplementation

- Mixed guideline consensus on use
 - Evidence for knee, shoulder, hip and ankle
 - Use in hand still being studied
- AAOS Knee recommendation 9
 - Cannot recommend using hyaluronic acid for patients with symptomatic osteoarthritis of the knee
 - Strength of recommendation: strong
- AAOS Hip
 - Strong evidence does not support use of intraarticular hyaluronic acid because it does not perform better than placebo for function, stiffness and pain in patients with symptomatic osteoarthritis of the hip
- ACR 2012 gives no recommendation for use in knee and hip OA

Viscosupplementation

- 2015 European Consensus statement
 - Effective for treating mild to moderate knee OA
 - May be helpful in advanced knee OA
 - Is a cost-effective treatment for knee OA
 - Insufficient evidence to recommend for hip OA
 - Is a safe and well tolerated treatment
 - Effective when there is a good clinical indication, adequate dosing regimen, and strict intra-articular injection of gel

Surgery

- When all else fails!
- Knee Arthroscopy
 - Mechanical symptoms
 - No demonstrable effect on pain
- Knee Osteotomy (mixed evidence)
 - Younger and more active patients
 - Improves function and pain
 - Delay total replacement 5-10 years

Total joint replacement

- Consider when
 - Persistent moderate to severe pain
 - Functional limitations
 - Decreased quality of life
 - Already optimized other conservative measures
- Depending on your local orthopedist, BMI matters.
 - May not be candidate for surgery if BMI ≥ 40

But wait, there's more!

- Other possible treatment options to be offered
 - Narcotics
 - Not first-line
 - Disease-modifying medications
 - Still under research
 - Walking aids for balance and fall prevention
 - Wedge insoles
 - Topical capsaicin
 - Platelet-rich plasma injections
 - Acupuncture
 - Tai Chi

Choosing Wisely

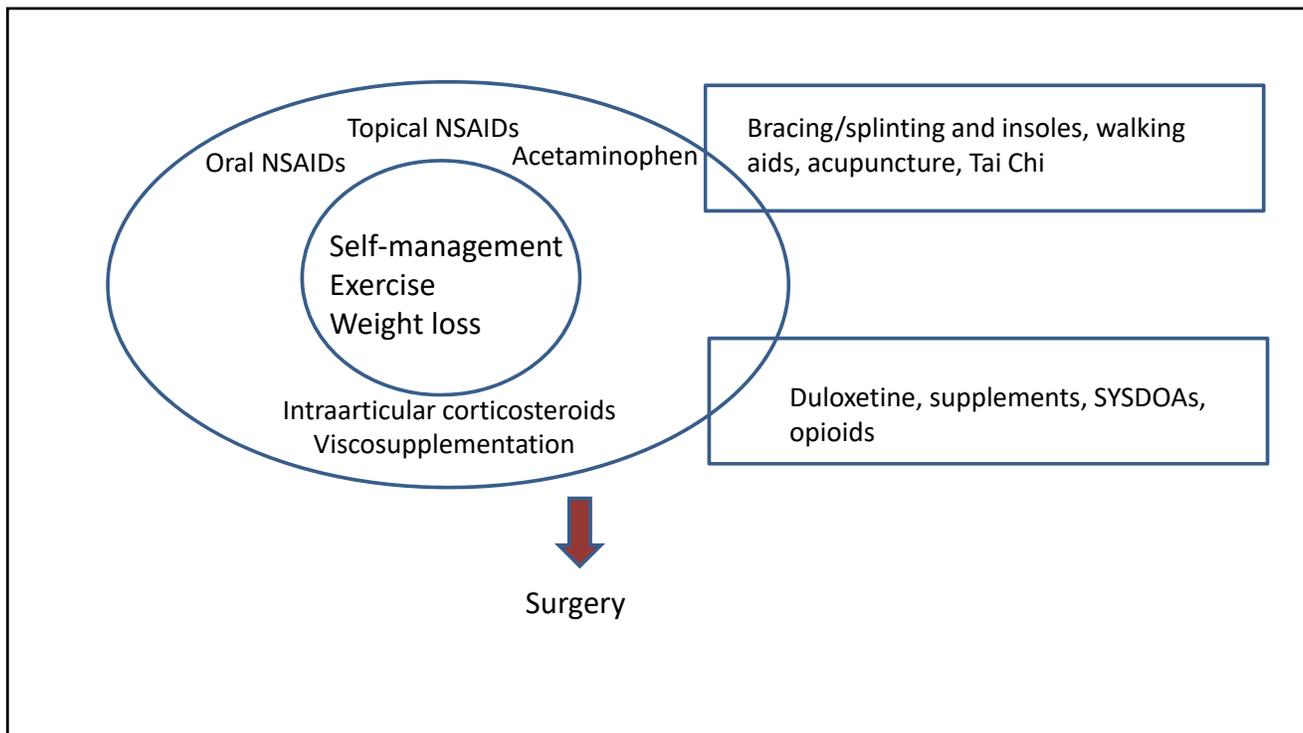
- American Academy of Orthopedic Surgeons (2013)
 - Don't use glucosamine and chondroitin to treat patients with symptomatic osteoarthritis of the knee
 - Don't use lateral wedge insoles to treat patients with symptomatic medial compartment osteoarthritis of the knee

Poll Question #5

- For my family and yours, osteoarthritis is
 - A. A complex progressive biochemical and mechanical whole joint disease
 - B. Adversely affected by exercise and physical activity
 - C. An irreversible consequence of aging
 - D. Best treated with pharmacological management

In Conclusion

- Osteoarthritis is a complex disease of the whole joint organ
 - Combination of genetic, biochemical and mechanical factors
 - Disorder of balance between repair and breakdown of cartilage
- Treatment involves patient education, exercise, weight loss and choosing from a pool of management options tailored to the individual's health profile and preferences



Practice recommendations

1. Consider use of topical NSAIDs instead of oral for knee and hand osteoarthritis
2. Educate patients on weight loss as both prevention and treatment for osteoarthritis
3. Encourage and educate patients on self-management plans for osteoarthritis
4. Discuss with patients an individualized plan including non-pharmacologic and pharmacologic options to manage their pain and function

Consensus Guidelines

- ACR (2012) recommendations for the use of non-pharmacologic and pharmacologic therapies in osteoarthritis of the Hand, Hip and knee
 - ACR 2019 (not yet published) update is in progress
- AAOS Knee (2013) treatment of osteoarthritis of the knee
- AAOS Hip (2017) management of osteoarthritis of the hip
- OARSI (2013) guidelines for non-surgical management of knee arthritis
- NICE (2014) osteoarthritis: care and management
- ESCEO (2019) algorithm recommendation for the management of knee osteoarthritis
- EULAR (2018) recommendations for the management of hand osteoarthritis
- EULAR (2013) recommendations for the non-pharmacological core management of hip and knee osteoarthritis

Useful websites

- CDC Arthritis
 - <https://www.cdc.gov/arthritis/index.htm>
- Osteoarthritis Action Alliance
 - <https://oaaction.unc.edu/>
- Arthritis Foundation
 - <https://www.arthritis.org/>
- US Bone and Joint Initiative
 - <https://www.usbji.org/>

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Questions



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