# Joint Replacement Surgery: out with the old in with the new

Scott King, D.O. - Orthopaedic Surgeon

Justin Mitchell, DPT, MS - Physical Therapist





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# Scott King, D.O.

- Medical School
  - Philadelphia College of Osteopathic Medicine






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# Scott King, D.O.

- Commissioned in US Navy
  - Internship and General Medical Officer
  - Walter Reed National Military Medical Center
    - Bethesda, Maryland
    - Hospital of the President and Congress
  - Congress Capitol Physician
    - 2006 State of the Union Address





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# Scott King, D.O.

- Orthopedic Surgery Residency
  - Memorial Hospital
  - York Hospital
  - Sinai Hospital Baltimore
  - Holy Spirit
  - Shriner's children's in Philadelphia
- Level 1 Trauma training
- >30 staff ortho – all subspecialties

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# Scott King, D.O.

- Navy Orthopedics
- Robert E. Bush Naval Medical Center


  - Marine Corps Air Ground Combat Center - 29 Palms, CA
  - Director, Department of Orthopedic and General Surgery
  - Staff Orthopedic Surgeon





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# Scott King, D.O.

- Fellowship Training: Sports medicine/arthroscopy
- UMass Memorial Medical Center
  - Shoulder, elbow, knee, ankle arthroscopy
  - Complex open shoulder, elbow, knee, ankle procedures
  - Total knee, shoulder arthroplasty
  - High school, college, and professional team coverage

# Scott King, D.O.

- OSS Staff Orthopedic Surgeon
- General Orthopedics
  - Fracture care
- Total Knee Replacement
- Total Shoulder Replacement
- Sports Medicine
  - Messiah College team physician, area high schools
  - Rotator cuff repair, ACL, shoulder dislocations, ankle/knee ligament reconstruction
  - Shoulder, knee and hip arthroscopy





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# Justin Mitchell, PT, DPT, MS

- Education
  - Masters of Science Clinical Regional Anatomy
    - University of Delaware
  - Doctorate of Physical Therapy
    - University of Delaware





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# Justin Mitchell, PT, DPT, MS

- Certifications
  - Selective Functional Movement Assessments (SFMA)
    - Level I & II
  - Barbell Rehab Method Certification (BRM)







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# Justin Mitchell, PT, DPT, MS

- Experience
  - Elite Sports PT – Clinical Training
    - Tinton Falls, NJ
    - ACL reconstruction, Tommy John, Labral Repairs
  - OSS Health Staff Therapist

# Arthritis

- >50 million adults in the United States have doctor-diagnosed arthritis (just over 1 in 5 adults)

***Arthritis is the most common cause of disability in the United States.***




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# Arthritis - Costs

- Costs of OA pain
  - $5,700 spent annually / person
- Impact of OA
  - Indirect cost of OA was $5 billion in 2002
  - Due to absenteeism and loss of productivity
- Estimated to be over $20 billion currently

# Arthritis – Men vs. Women

Sources
5. Centers for Disease Control and Prevention (2009)
6. WebMD (2012)
7. American Academy of Orthopaedic Surgeons (2011)
8. Wu (2005)
9. American Academy of Orthopaedic Surgeons (2009)

- Delaying treatment can result in more serious problems
- Women are 2 to 8 times more likely than men to have knee problems[6]
  - Over 600,000 knee replacements are performed yearly in the United States[7]
  - Women have a 36% higher incidence risk rate for Hip OA than men[8]
  - More than 230,000 people have their hips replaced each year[9]





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# Osteoarthritis vs. Rheumatoid Arthritis

**Osteoarthritis**

- ✓ Affects millions of Americans
- ✓ Degenerative joint disease affecting cartilage
- ✓ Caused by heredity, obesity, injury, joint wear and tear
- ✓ Pain can be concentrated or all over the body

**Rheumatoid Arthritis**

- ✓ Affects 1% of U.S. population
- ✓ Chronic inflammatory condition
- ✓ Caused by the immune system attacking joints
- ✓ Symmetrical symptoms in joints




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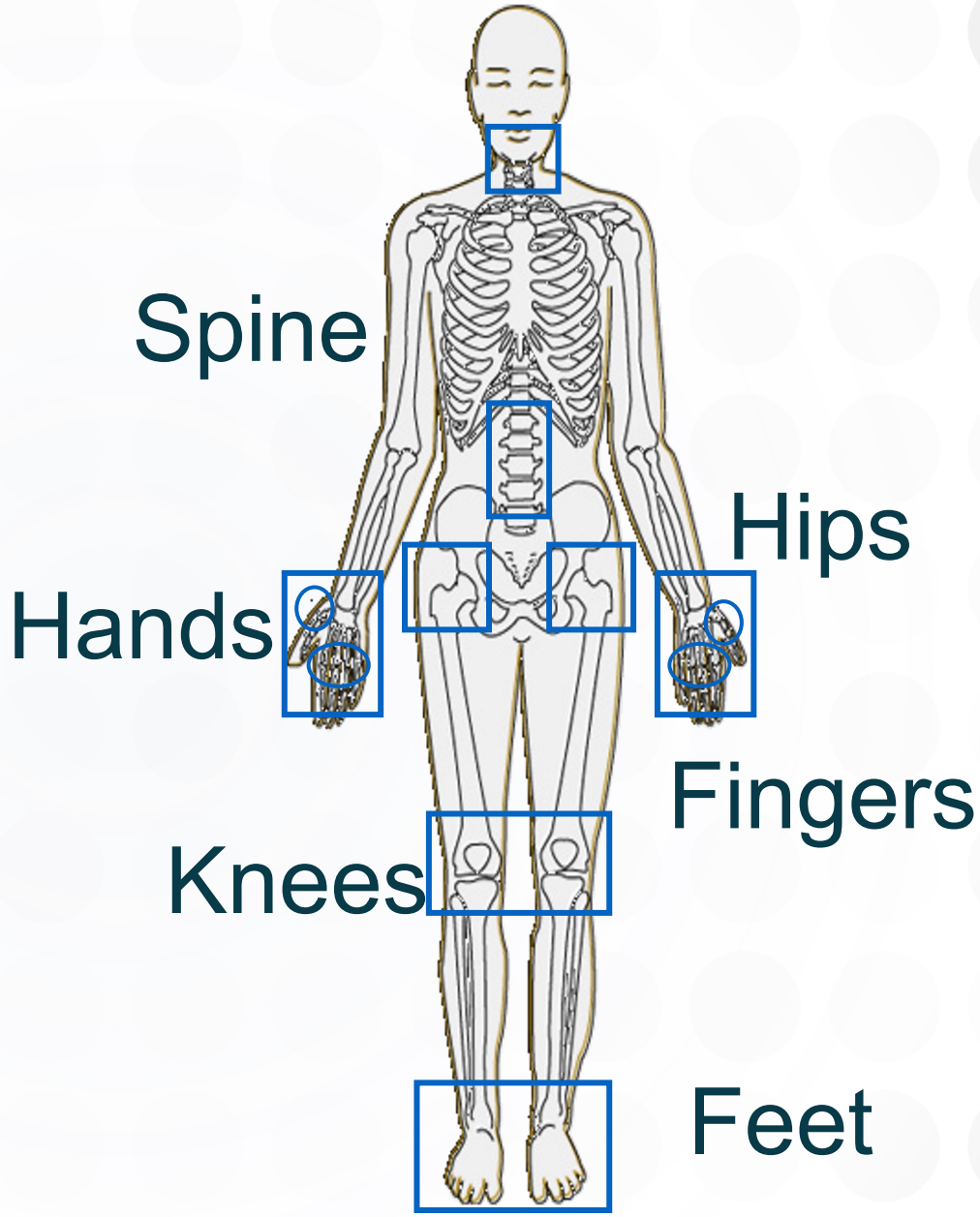
# Arthritis – Causes

- Thought to be result of aging
  - Both genetic and environmental components
- **<u>INABILITY</u>** of cartilage to repair itself
- Ligaments and muscles supporting joints weaken

# Osteoarthritis





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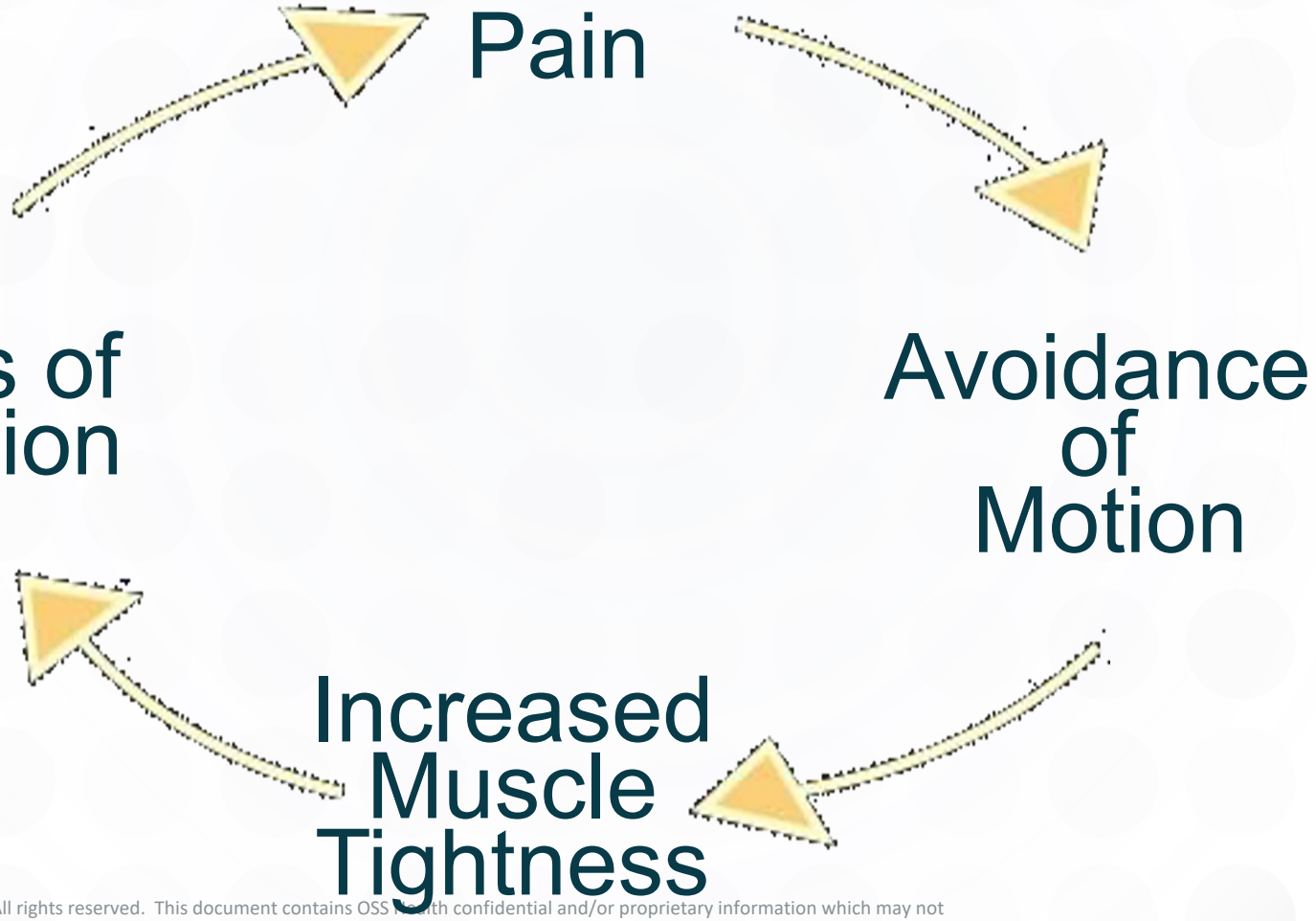
# Osteoarthritis (inflammation of joints)





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# Joint Pain and Your Life

## Symptoms

- ✓Chronic aches/pain
- ✓Feeling of heat/swelling
- ✓Joint stiffness
- ✓Locking joints
- ✓Sleep disruption
- ✓Bone Spurs

## Contributing Factors

- ✓ Age
- ✓ Weight
- ✓ Activities
- ✓ Genetics
- ✓ Abnormal body structure
- ✓ Repeated joint injuries

## Other Psychological Symptoms:

- ✓ Depression
- ✓ Fear of surgery





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# Treatment Eases Pain & Restores Health

## Non-surgical Treatments

- ✓ Medications
- ✓ Dietary supplements
- ✓ Exercise
- ✓ **Physical Therapy**
- ✓ Shoe Inserts
- ✓ Bracing
- ✓ Walkers, cane
- ✓ Joint Injections

## Surgical Treatments

- ✓ Arthroscopy
- ✓ Partial Knee Replacement
- ✓ Total Knee Replacement
- ✓ Hip Replacement
- ✓ Shoulder Replacement




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# Diagnosis

- History
- Physical exam
- Location, duration, & character of symptoms
- X-rays
- Blood test to rule out other diseases




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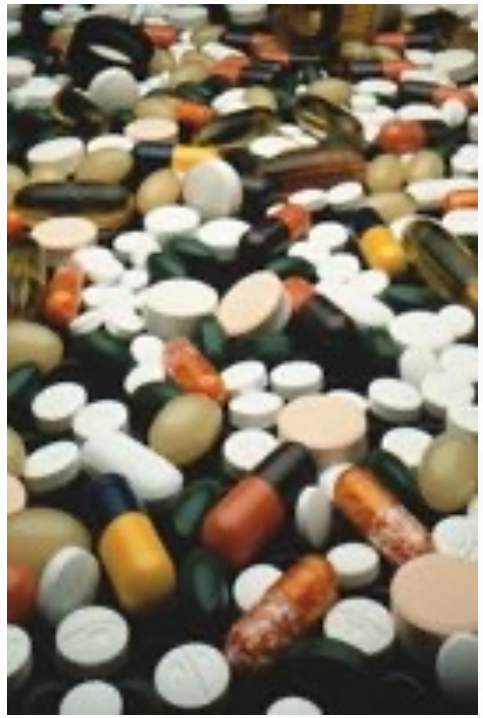
# Medication: NSAIDS



- NSAIDs are nonsteroidal anti-inflammatory drugs
  - Aspirin
    - Not a great choice
  - Ibuprofen
  - Naproxen
  - Acetaminophen
  - Prescription strength

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# Vitamins and Nutritional Supplements

- Glucosamine and Chondroitin Sulfate
  - Some positive results
    - Mild to moderate pain relief
    - If benefits not seen within 8 weeks, not likely
  - Proceed with caution

# Physical Therapy/Exercise

- "Physical activity decreased pain and improved physical function (strong evidence) and improved health-related quality of life (moderate evidence) among people with hip or knee OA relative to less active adults with OA." -Kraus et. al.

# Physical Therapy/Exercise

- Goals of Therapy
  - EDUCATION
  - Maintain/restore full range of motion (ROM) of the joint to allow for normal mechanics
  - Strengthening (quadriceps, hip abductors, rotator cuff)
  - Gait training/functional training

# Effects of Extra Weight

- Force on each knee per step = 2.5 to 3x body weight
- Average person takes 8,000 steps per day (4,000 steps per each knee)
- (33 extra pounds) x 3 ~ 100 extra pounds on each knee per step
- (100 extra pounds per step) x (4000 steps per day) x (1 ton per 2000 pounds) = 200 extra tons on each knee per day
- Every pound lost is important!




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# Bracing

- TYPES
  - **Off-loader braces**
  - **Reaction knee braces**
  - **sleeves**
- Function
  - **Off-load pressure in the knee**

- Lack of evidence for / against use of any bracing




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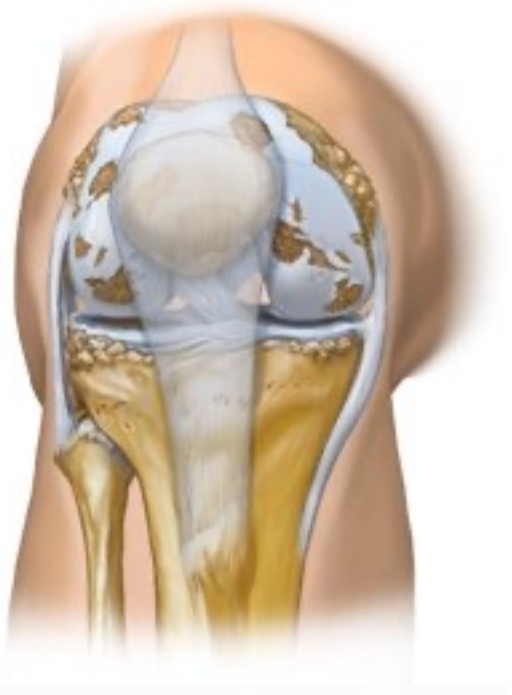
# Knee Osteoarthritis

# Why Does My Knee Hurt?

- In a **healthy knee**, cartilage provides a cushion between the bones.



- In a knee with **osteoarthritis**, the cartilage has thinned and deteriorated, allowing bone to rub against bone, causing pain.





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Normal Knee

Arthritic knee





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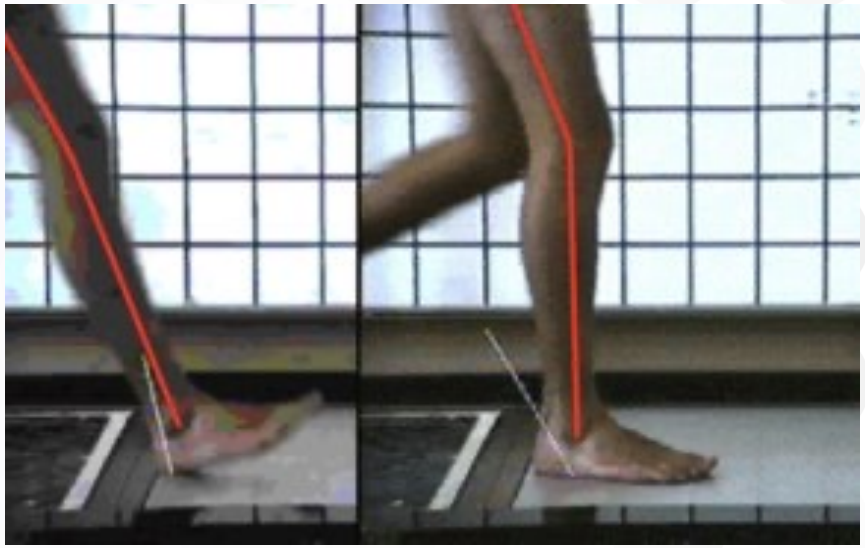
# Non-Operative Management of Knee OA

- Goals:
  - EDUCATION
  - Maintain/restore full range of motion (ROM) of the knee to allow for normal mechanics of the knee
  - Strengthening (quadriceps, hip abductors)
  - Gait training

# Non-Operative Management of Knee OA

- Quadriceps: "The Magic Muscle"
  - Losing strength is a problem:
    - Pain/inhibition
    - Learned disuse
    - Can play into motion loss (extension ROM)
  - Importance of a strong quadriceps:
    - Eccentric contraction controls weight acceptance phase of gait and reduces impact at knee during ambulation
    - Reduces the rate of joint loading



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# Surgery

- Arthroscopy
- Cartilage Procedure
- Osteotomy
- Total Joint Replacement





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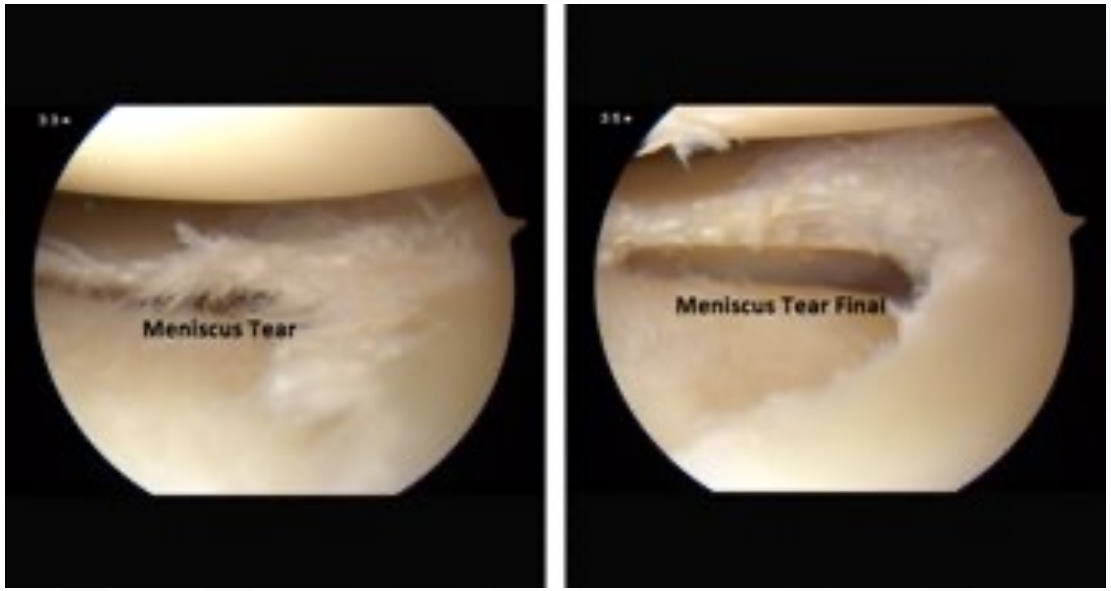
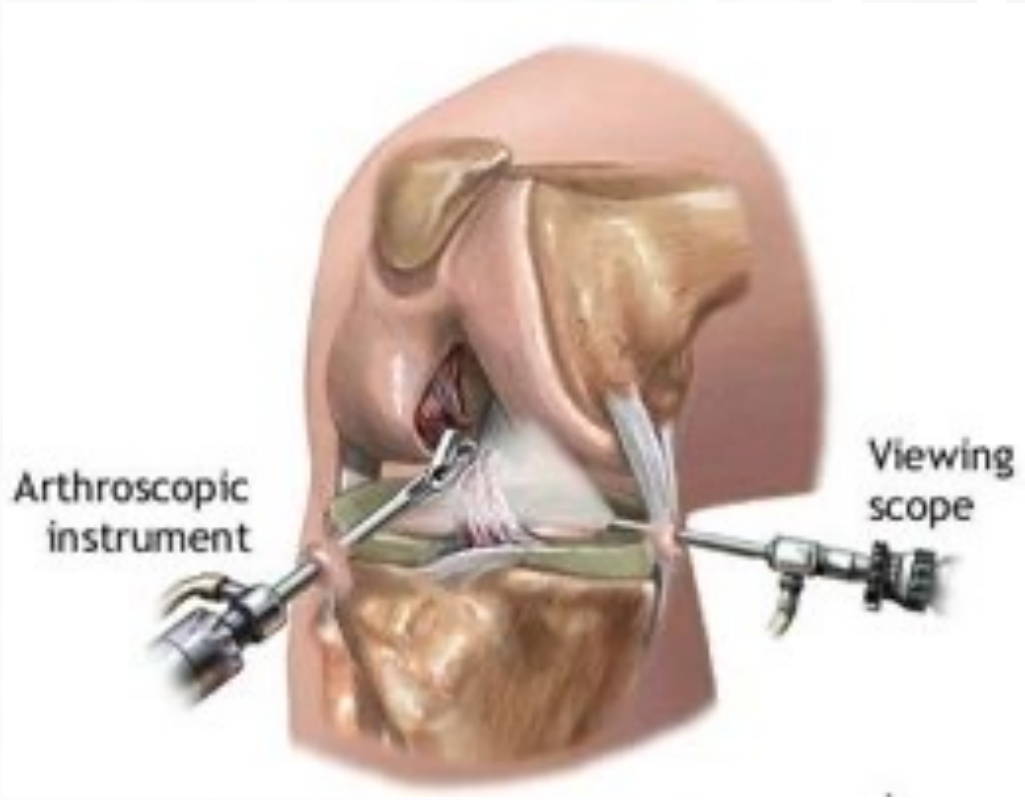
# Surgery

- Arthroscopy





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# Components of Human Knee

Medial Compartment
(inside aspect of the knee)

Patellofemoral Compartment
(in front of the knee)

Lateral Compartment
(outside of the knee)

# Knee Replacement

- Replaces the cartilage on the femur (thigh bone), tibia (shin bone), and sometimes the patella (knee cap)
- Metal components cover the bone separated by a plastic spacer





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# Total vs. Partial Knee Replacement





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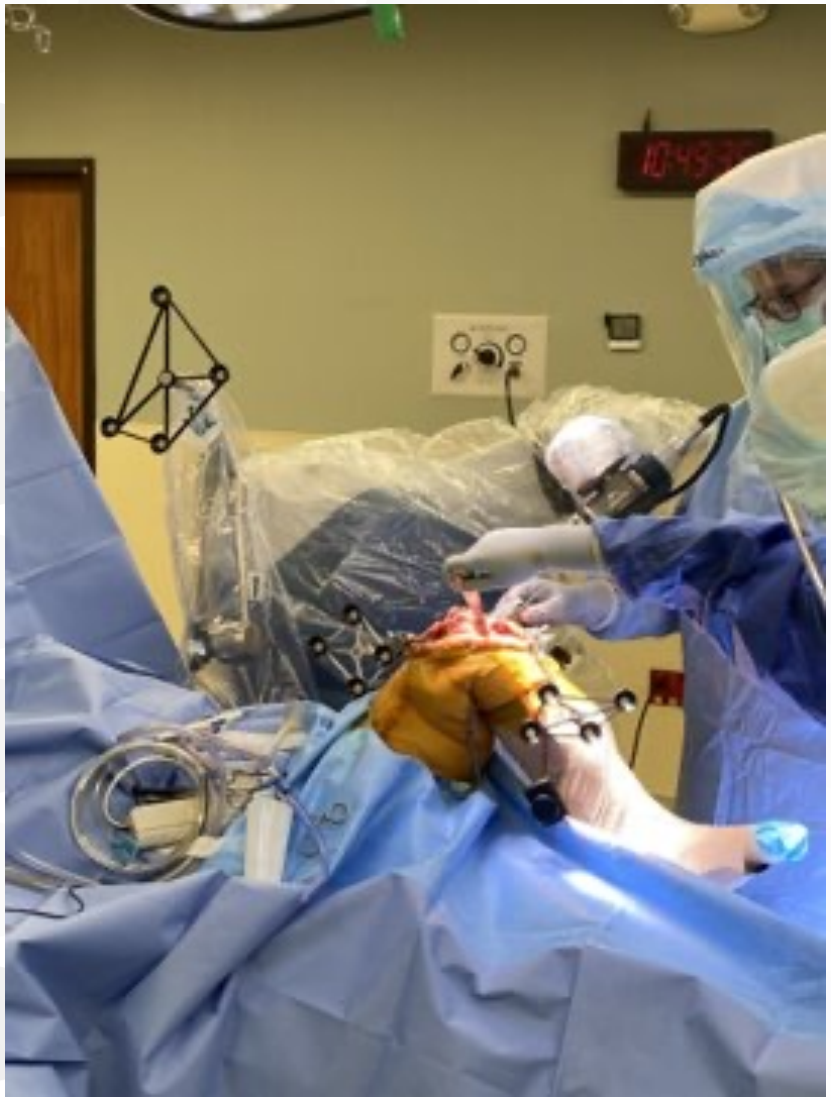
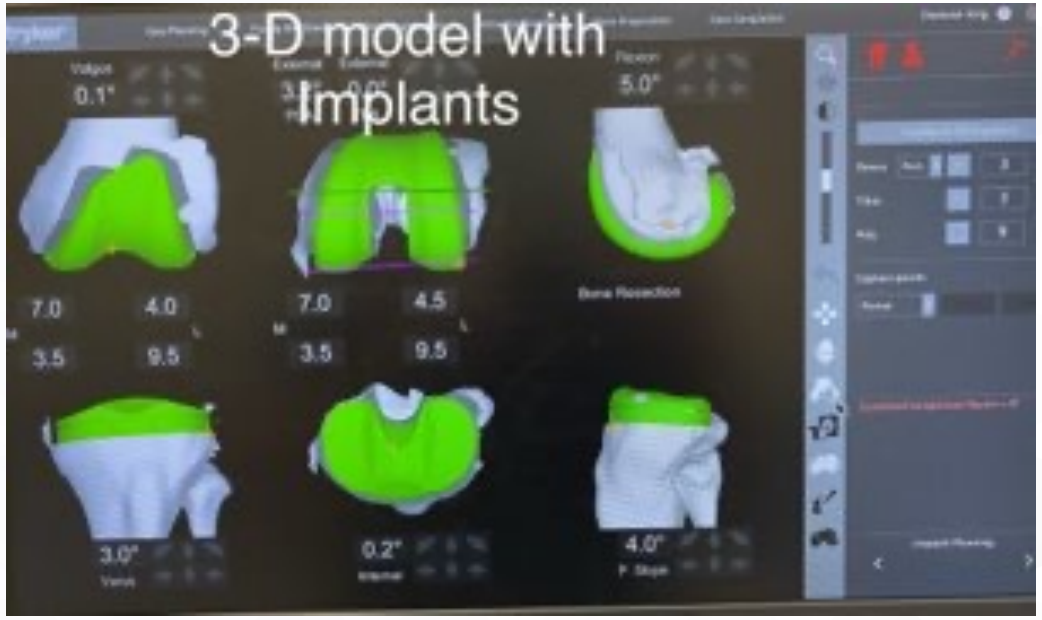
# Robotic Assisted Joint Replacement







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# Rehab After Total Knee Arthroplasty

- Goals:
  - Prevention of post-operative complications
  - **Regain range of motion**
  - **Reduce swelling**
  - **Regain muscle function**
  - Improve function/quality of life
  - Improve independence




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# Rehab After Total Knee Arthroplasty

- Regain full extension ROM
  - Get to full extension in first 2 weeks!!
  - Maintain this motion throughout rehab
- Regain flexion ROM
  - 0-90 in first 2 weeks
  - End goal is at least 120 degrees




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# Rehab After Total Knee Arthroplasty

- Regain quadriceps activation
  - Arthrogenic Muscle Inhibition (AMI) - reflex inhibition of muscles around joint
  - Early application of NMES has been shown to improve recovery of quadriceps strength (Stevens-Lapsley 2012)
  - Quadriceps strength is the strongest predictor of functional performance
    - Greater quad strength = greater functional performance

# Knee Replacement Success

- Knee replacement is the most common orthopaedic surgery performed in the U.S.
- Replacement techniques have vastly improved since their introduction in the 1970's
  - Relieves severe knee pain
  - Restores your ability to perform everyday activities

**Over *600,000* knee replacements are performed annually in the U.S.**





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# Knee Replacement Success

- 85-96% of knee implants last 20 years
- Technology is continually improving to enhance recovery and a patient's quality of life after surgery
- Many changes in surgical technique and post operative pain protocols



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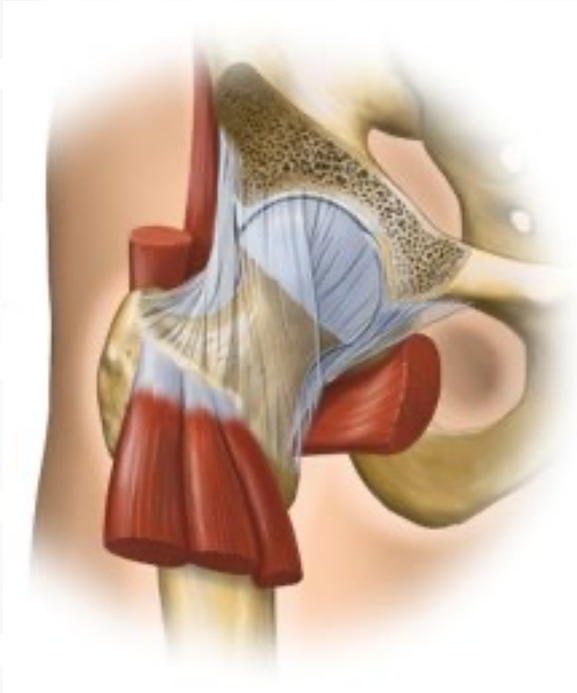
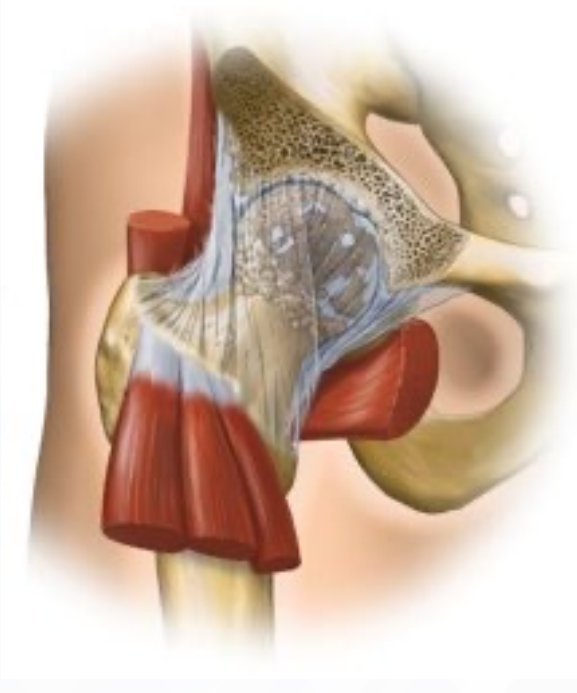
# Hip Osteoarthritis

# Why Does My Hip Hurt?



- In a **healthy hip**, cartilage provides a cushion between the hip ball and socket.



- In a hip with **osteoarthritis**, the cartilage has thinned and deteriorated, allowing bone to rub against bone, causing pain.

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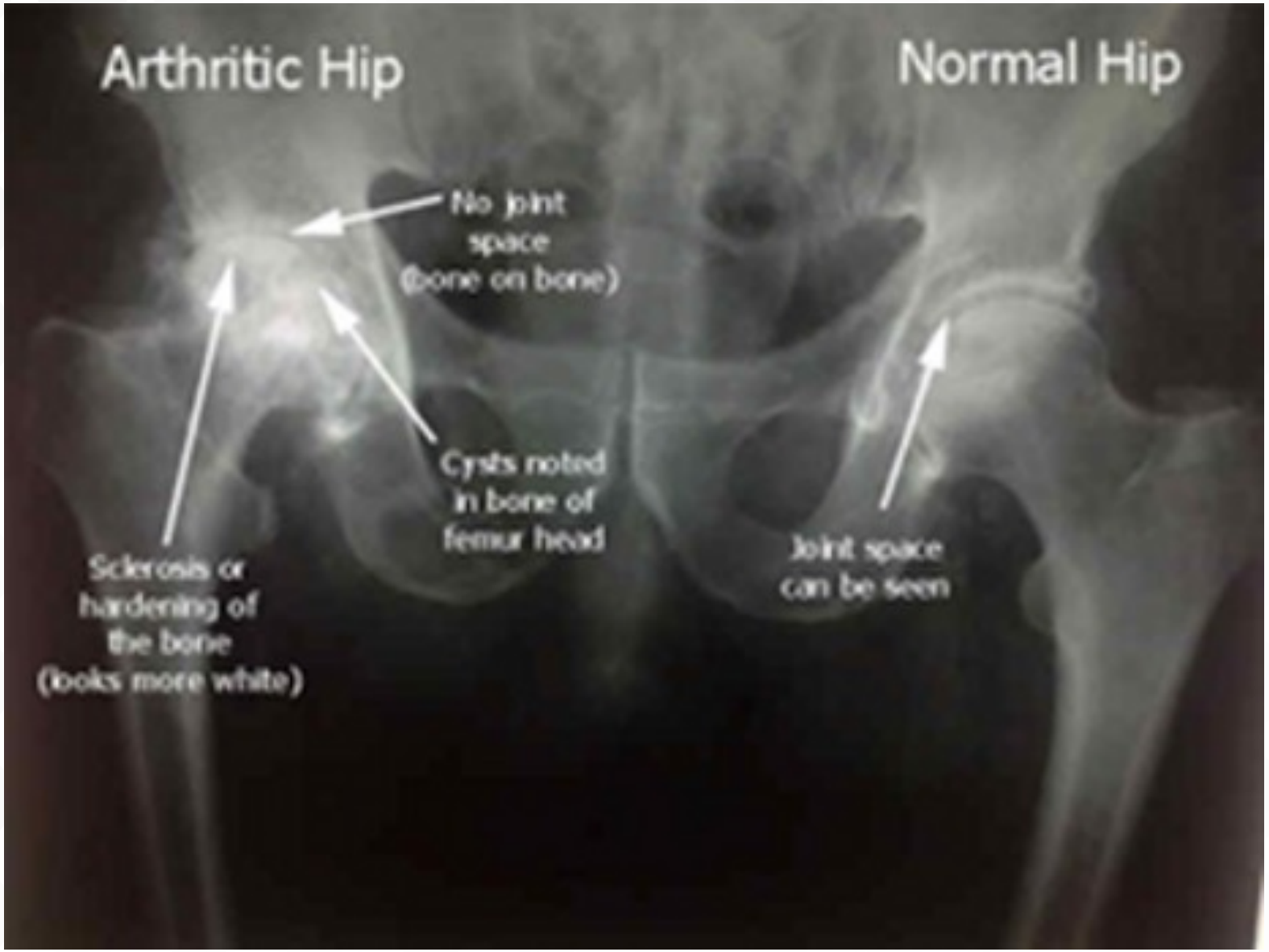






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# Non-Operative Management of Hip OA

- Goals:
  - EDUCATION
  - Maintain/restore full range of motion (ROM) of the hip
  - Strengthening
    - Quadriceps
    - Hip abductors
  - Gait training
    - Hip activation to prevent asymmetry of loading
  - Balance training

# Non-Operative Management of Hip OA

- Maximize function and return to PLOF
  - Education on benefits of physical activity on management of Hip OA
  - Tailor PT to meet the goals of the patient – therapy should look like the activities the patient wishes to return to
  - Constantly modify treatment to meet changes in condition.

# Non-Operative Management of Hip OA

Review > Arch Phys Med Rehabil. 2013 Jan;94(1):164-76.
doi: 10.1016/j.apmr.2012.08.211. Epub 2012 Sep 4.

## Does exercise reduce pain and improve physical function before hip or knee replacement surgery? A systematic review and meta-analysis of randomized controlled trials

Stephen D Gill [1], Helen McBurney

- **Conclusions:** Exercise-based interventions can reduce pain and improve physical function for people awaiting hip replacement surgery




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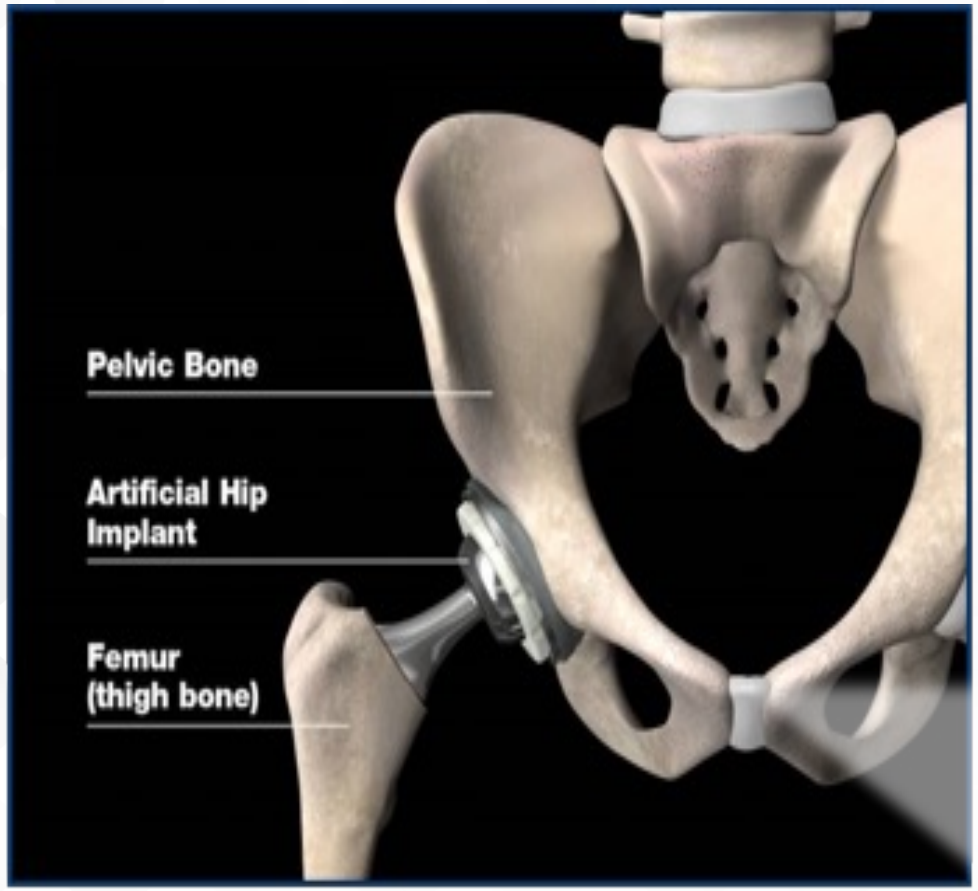
# Total Hip Replacement




# Typical Precautions: Traditional vs. Anterior

## Traditional (posterior approach)

- Do not cross legs
- Do not bend hip more than a right angle
- Do not turn feet excessively inward or outward
- Use a pillow between your legs when sleeping

## Direct Anterior Approach

- Under doctor's supervision, may be immediately allowed to move hips
- May potentially avoid restrictions associated with traditional hip replacement

# Potential Benefits of Direct Anterior Approach

- Decreased hospital stay and quicker rehabilitation.
- Smaller incision and reduced muscle disruption may allow patients a shorter recovery time and less scarring.
- Potential for less blood loss, less time in surgery, and reduced post-operative pain.
- Risk of dislocation may be reduced.
- May allow for a more natural return to normal function and activity.

# Rehab After Total Hip Arthroplasty

- Goals:
  - Prevention of post-operative complications
  - **Regain range of motion**
  - **Reduce swelling**
  - **Regain muscle function**
  - Improve function/quality of life
  - Improve independence

# Rehab After Total Hip Arthroplasty

**Prevent Hip Dislocation**

- Posterior approach:
  - **Flexion > 90**
  - **Adduction beyond neutral**
  - **Internal rotation beyond neutral**
  - Pivoting on surgical limb
  - Leg crossing
  - Side lying position
- Anterior approach:
  - **Flexion > 90**
  - **Avoid extension**
  - **External rotation beyond neutral**
  - Avoid combined flexion, adduction, and external rotation

# Rehab After Total Hip Arthroplasty

- Regain ROM needed for functional activities
  - Preoperative ROM affects postoperative ROM
  - Flexion, abduction, and external rotation correlate with self-reported function
    - Walking – 37 degrees hip flexion
    - Stair ascent – 67 degrees hip flexion
    - Sitting onto a chair - 104 degrees hip flexion
    - Tying shoe with leg crossed – 115 degrees hip flexion, 18 degrees abduction, 13 degrees external rotation
  - Reese NB, Bandy WD; Range of motion and muscle length testing, 2nd ed.

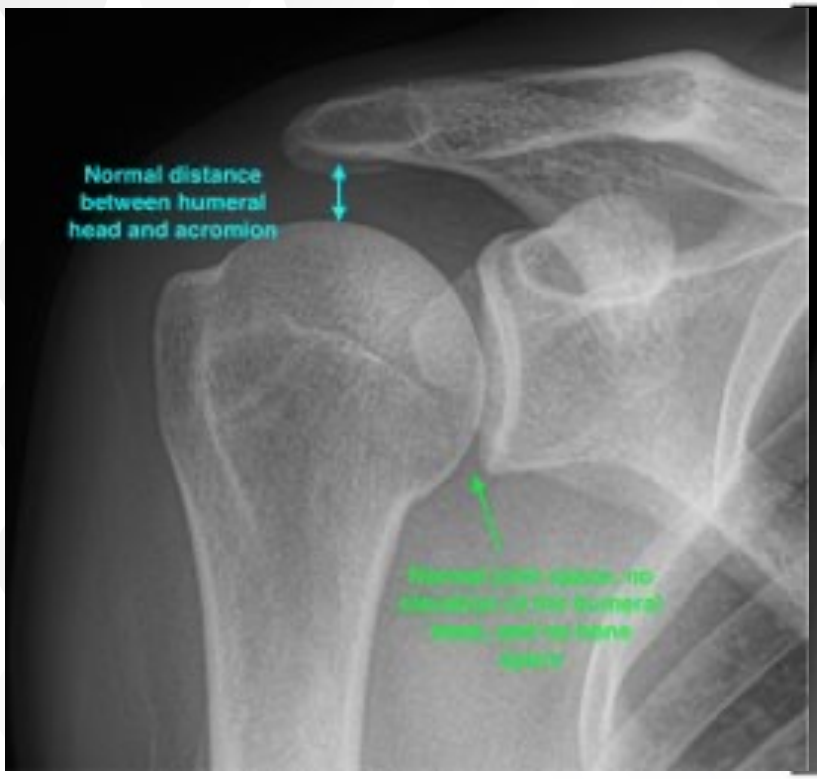
# Rehab After Total Hip Arthroplasty

**Muscle weakness after surgery:**

- More affected:
  - Hip flexors
  - Hip abductors
  - Hip extensors
  - Knee extensors
- Less affected:
  - Hip adductors
  - Knee flexors

# Shoulder Osteoarthritis

# Shoulder Arthritis





# Shoulder Arthritis Causes

- Post traumatic – dislocation
- Chronic rotator cuff tear
- Osteoarthritis
- Rotator cuff arthropathy

# Shoulder Treatment Options

- Therapy
- Injections
  - Steroid + local anaesthetic (reduces inflammation)
- Shoulder Replacement
  - The most definitive way to treat shoulder arthritis
  - Longevity of the replacement will be negatively affected by heavy use of the shoulder or high impact activities

# Non-Operative Management of Shoulder Pain/OA

Arthritis. 2013; 2013: 370231. Published online 2013 Jan 10. doi: 10.1155/2013/370231

PMCID: PMC3556427 | PMID: 23365745

## Shoulder Osteoarthritis

Claudio Chillemi [1,*] and Vincenzo Franceschini [2]

- "Nonoperative modalities should be utilized before operative treatment is considered, particularly for patients with mild-to-moderate OA or when pain and functional limitations are modest despite more advanced radiographic changes."
- "Although nonsurgical management of shoulder OA will not ultimately alter the progression of disease, it can be effective in reducing pain and improve the range of motion."





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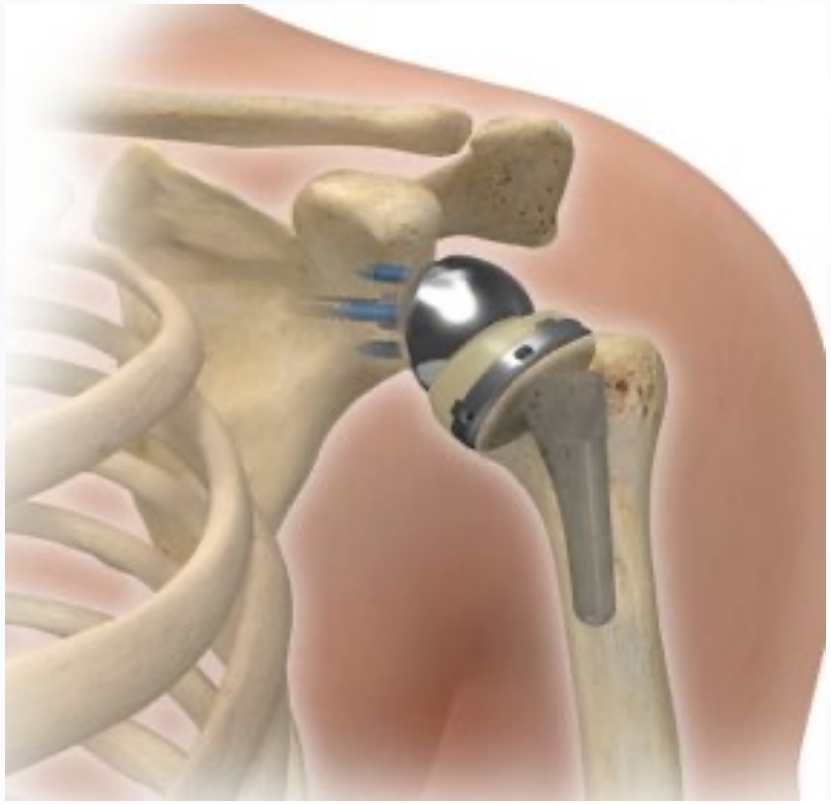
# Non-Operative Management of Shoulder Pain/OA

- **"Nearly all patients with shoulder OA can benefit from physical therapy.** Ideally, therapy should be initiated before the development of atrophy or contracture, and it should be tailored to the specific needs of the patient"
  - Restore range of motion
  - Strengthening of rotator cuff musculature
  - Strengthening of scapular musculature
  - Promote function -> tailor exercise specific to patient's goals

# Anatomic Total Shoulder Replacement vs. Reverse Total Shoulder

- What's the difference?







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# Anatomic Total Shoulder Replacement vs. Reverse Total Shoulder

- **Anatomic Total Shoulder Arthroplasty (TSA)**
  - There must be an intact and functioning rotator cuff
    - Sometimes will obtain pre-op MRI to evaluate rotator cuff
  - Slower progression post-op, protect rotator cuff repair

# Anatomic Total Shoulder Replacement vs. Reverse Total Shoulder

- **Reverse Total Shoulder Arthroplasty (rTSA)**
  - DO NOT need an  intact and functioning rotator cuff
    - Sometimes obtain pre-op MRI to evaluate rotator cuff
    - If the patient has humeral head elevation an MRI not indicated
  - Faster post-op progression with ROM because we are not protecting a rotator cuff repair





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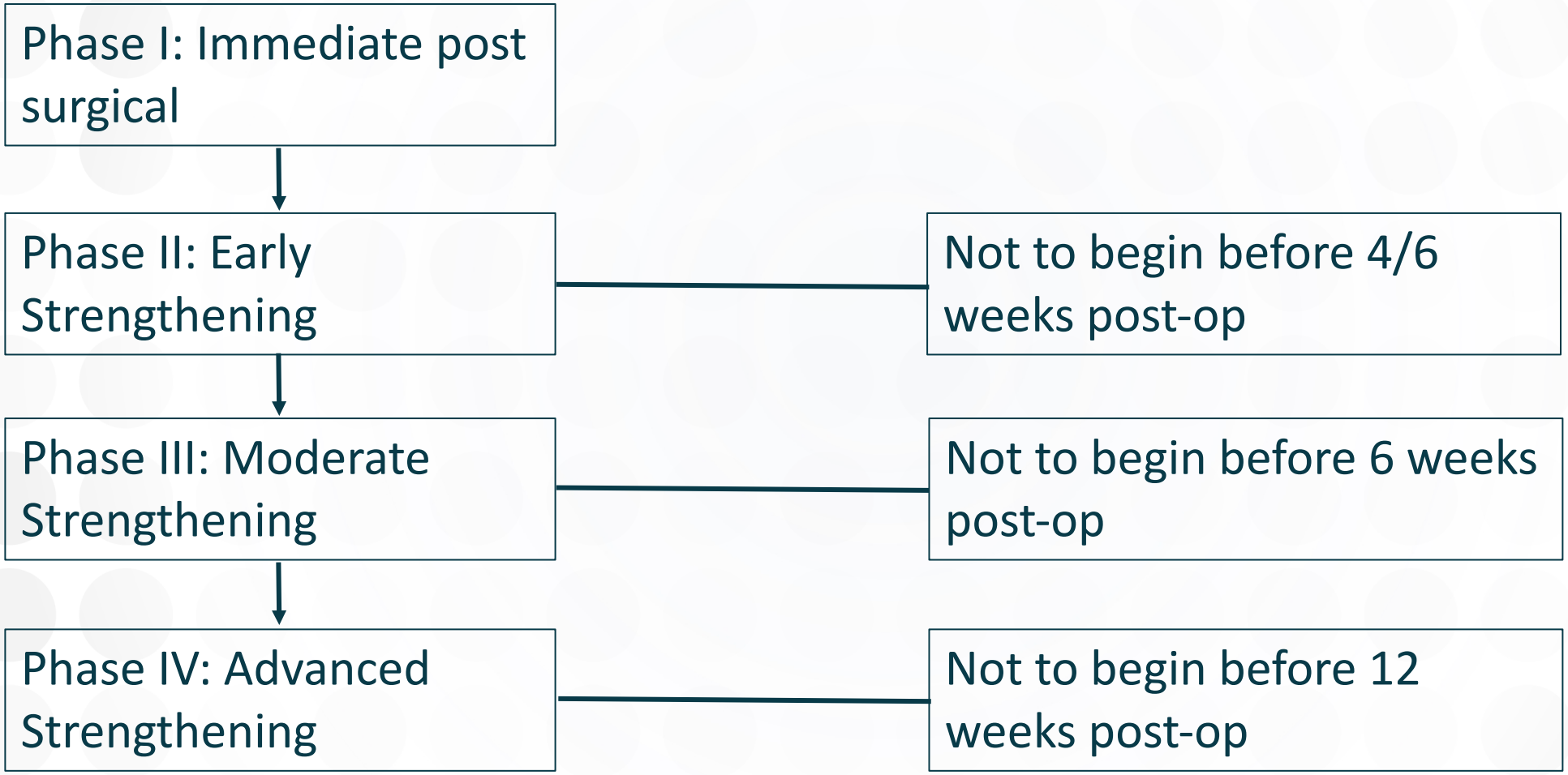
# TSA Rehab Protocol







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# TSA Rehab Protocol

## PHASE I: IMMEDIATE POST-SURGICAL

- Precautions:
  - Wear sling for 4 weeks, only removed to exercise
  - Protect subscapularis and anterior capsule
  - Avoid shoulder AROM
  - No object lifting or sudden jerky motions
  - No driving for 3 weeks

# TSA Rehab Protocol

## PHASE II: EARLY STRENGTHENING

- Precautions
  - In presence of faulty mechanics, avoid repetitive AROM exercises
  - No combined ABD/ER above 80 deg ABD (dislocation risk)
  - No heavy lifting

# TSA Rehab Protocol

## PHASE IV: ADVANCED STRENGTHENING

- Precautions:
  - Avoid exercise and functional activities that put stress on the anterior capsule (NO combined ER and ABD>80)
  - Ensure gradual progression of strengthening

# rTSA Rehab Protocol

Phase I: Immediate post surgical

Phase II: AROM/Early Strengthening

Phase III: Moderate Strengthening

Phase IV: Home Program

Review > J Orthop Sports Phys Ther. 2007 Dec;37(12):734-43.
doi: 10.2519/jospt.2007.2562. Epub 2007 Aug 28.

**Rehabilitation following reverse total shoulder arthroplasty**

Stephanie Boudreau [1], E D Boudreau, Laurence D Higgins, Reg B Wilcox 3rd

Weeks 6-12

Weeks 12+

Typically 4+ months





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# TSA Rehab Protocol

- Higher risk of dislocation following rTSA
  - Avoid IR+ADD+EXT for at least 12 weeks
- Deltoid primary elevator of shoulder
  - Need to enhance deltoid function
- ROM and functional expectation
  - Case by case but… DO NOT expect full shoulder AROM
  - Elevation ~105 degrees
  - If Teres minor tear, ER ~ 15 degrees



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# TSA Rehab Protocol

- Phase I: Immediate post surgical
  - Only PROM
  - Immobilization with sling (at least 3-4 weeks)
  - Cryotherapy for pain control
- Phase II: AROM/Early Strengthening
  - Only AAROM and AROM
  - Submaximal isometric scapular strengthening

# TSA Rehab Protocol

- Phase III: Moderate Strengthening
  - Strengthening exercise
  - Low weight high repetition (max 3lb)
  - Avoid sudden lifting or jerking movements
- Phase IV: Home Program
  - Pt discharged from PT
  - Home exercise program
  - Max weight lifting: 15 lbs indefinitely

# TSA PROTOCOL DISCLAIMER

- "[…] the progression of exercises and timelines outlined in the protocol 4 phases were continually modified based on clinical presentation of the patients and their underlying pathology."
  - Rehab needs to be tailored!
  - Underlying cause of TSA has effect on:
    - Advancement of protocol
    - Outcome of rehabilitation

# When Should You Consider Surgery?

- When simple, everyday activities are painful
- When pain continues day or night, or prevents sleep
- Other treatments, such as physical therapy, do not relieve knee pain
- Chronic knee inflammation/swelling and stiffness does not improve with rest or medication
- If you have harmful or unpleasant side effects from medications

# Considering Joint Replacement

- With any surgery there are risks and your results will depend on your personal circumstances
- Talk to your doctor for more information about risks
  - Infection
  - Blood Clots
  - Bleeding
  - Additional Surgery
- While rare- infection, blood clots and bleeding can lead to significant health complications and could even be life threatening



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# Worker's Compensation Information and Cases

# Pre-existing Conditions

- Confusing and vague laws
- Can argue most work activities can exacerbate or aggravate any pre-existing condition
- I will contradict myself
- Individual case by case decision
- In most situations there is a valid argument to support either opinion



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# PA Worker's Compensation

- The Pennsylvania Worker's Compensation Act provides wage loss and medical benefits to compensate employees suffering from work related injuries or diseases.





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# Injury

- A specific incident at work causing an injury, i.e.: "Fall at work" is the most common.
- A series of repetitive actions resulting in a disability, i.e.: Carpal Tunnel Syndrome.
- A pre-existing condition that has been aggravated by work. i.e.: Asthma.
- An earlier work related disability which recurs causing a later disability, i.e.: Back injury

- PA Dept of L&I website

# Occupational Disease

- The employee is exposed to the disease by reason of his/her employment.
- The disease is causally related to the employee's industry or occupation.
- The occurrence of the disease is substantially greater in that industry or occupation than it is in the general population

# Pre-existing Conditions

- Aggravation or worsening of a pre-existing condition by activities at work or their work environment
- Pre-existing condition is often not work related

# Temporary Exacerbation vs. Permanent Aggravation

- Aggravation
  - Increase in the severity of a pre-existing when the underlying pathology or condition is permanently moved to a higher level

- Exacerbation
  - Temporary increase in the symptoms of a pre-existing condition that returns to it's prior level within a reasonable period of time

# Aging Workforce

- More pre-existing conditions





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# Knee Injuries and Conditions

- Aggravation of pre-existing osteoarthritis

# Knee Injury Case

- 60yo male
- Fall with right hip fracture and left knee injury
- Corticosteroid and Visco supplementation injections
- TKA





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# Knee Injury Case

- 67 yo male with twisting injury to right knee
- Corticosteroid and Visco supplementation injections
- TKA





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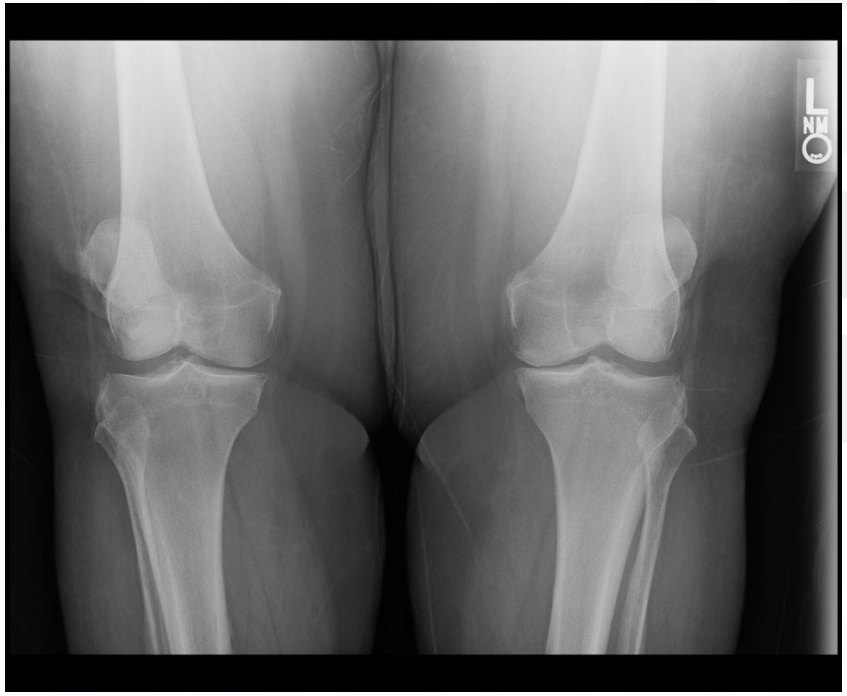
# Knee Injury Case

- 61yo female slipped and twisted left knee
  - MRI revealed medial meniscus tear and mild medial compartment chondromalacia
  - Xrays revealed mild joint space narrowing
  - Knee scope delayed secondary to MI
  - 1 year later cleared for surgery
  - Xrays 1 year later show severe bone on bone DJD
  - Recommended for left medial partial knee replacement







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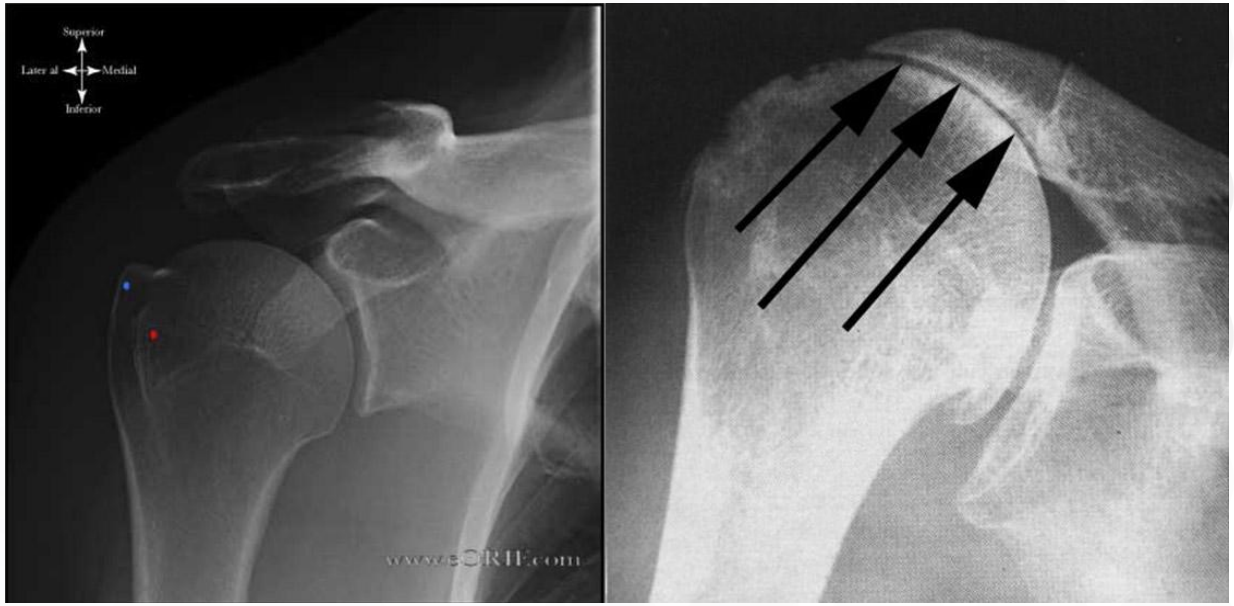
# Knee Injury from Pre-existing Condition

- Advanced OA at time of injury is temporary exacerbation
  - Patient asymptomatic prior to injury
  - Would develop symptoms regardless of work injury
- Meniscus tears leading to OA years later
- Complex or degenerative meniscus tears pre-existing?
- Cartilage injury

# Long-term Effect of Rotator Cuff Tear

- Possible long term effect
- Rotator Cuff Arthropathy
- Failure of repair
- Chronic Full Thickness tears
  - Loss of rotator cuff function
  - Rotator cuff atrophy







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# Shoulder Case

- 63yo female fell at work onto her shoulder
- MRI 6 weeks later shows 3 out of 4 RTC tendons torn, atrophy noted on MRI
- Prior to injury – denies pain or any weakness
- RTC repair with allograft tissue
- Moderate improvement in pain, no improvement in ROM and strength postop
- Pre-existing?

# Rotator Cuff Tears Pre-Existing?

- Rotator cuff atrophy takes about 3 months to show on MRI
  - Minimal to no atrophy on MRI is an acute tear
- Injury vs Overuse
  - Injury with intact function pre-injury is nearly always related to occupational injury
  - Chronic weakness, tear with pre-existing dysfunction should be considered temporary exacerbation
  - No injury but overuse with pre-existing rotator cuff tear should be considered temporary exacerbation

# Don’t live in pain. You *have* options.





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# Thank You!!





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# Questions?





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