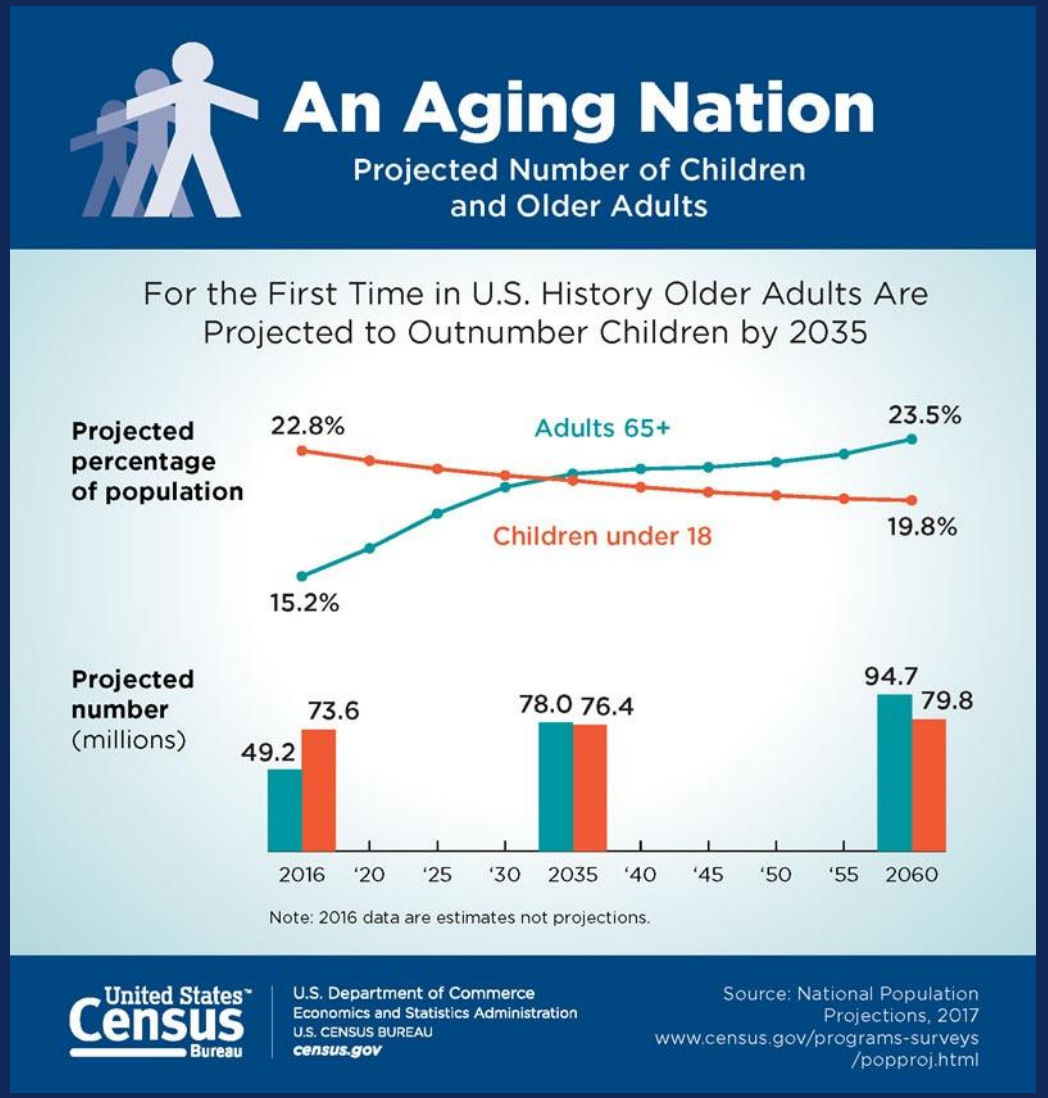
HIP AND KNEE OSTEOARTHRITIS IN THE INJURED WORKER

Matthew W. Squire, MD, MS, CIME

OBJECTIVES

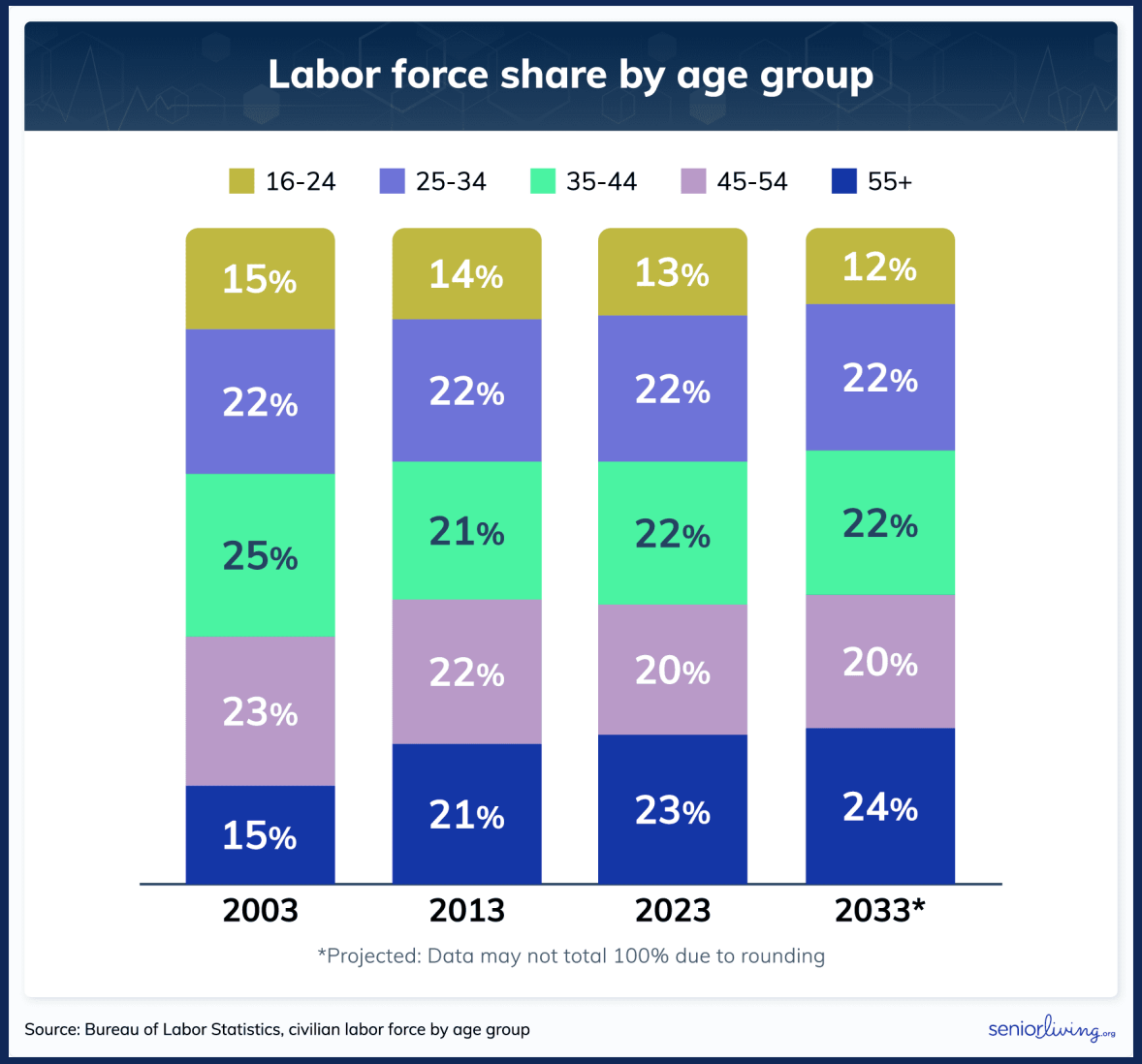
- Appreciate the growing burden of osteoarthritis in the aging worker
- Discuss basic anatomy and the pathogenesis of hip and knee osteoarthritis
- Recognize the risk factors for hip and knee osteoarthritis
- Understand how hip and knee osteoarthritis is diagnosed
- Describe evidence-based treatment guidelines for hip and knee osteoarthritis
- Review case examples

AN AGING NATION; AN AGING WORKFORCE



https://www.census.gov/library/visualizations/2018/comm/historic-first.html

AN AGING NATION; AN AGING WORKFORCE



https://www.seniorliving.org/finance/senior-employment-annual-report/

ARTHRITIS

PRIMARY

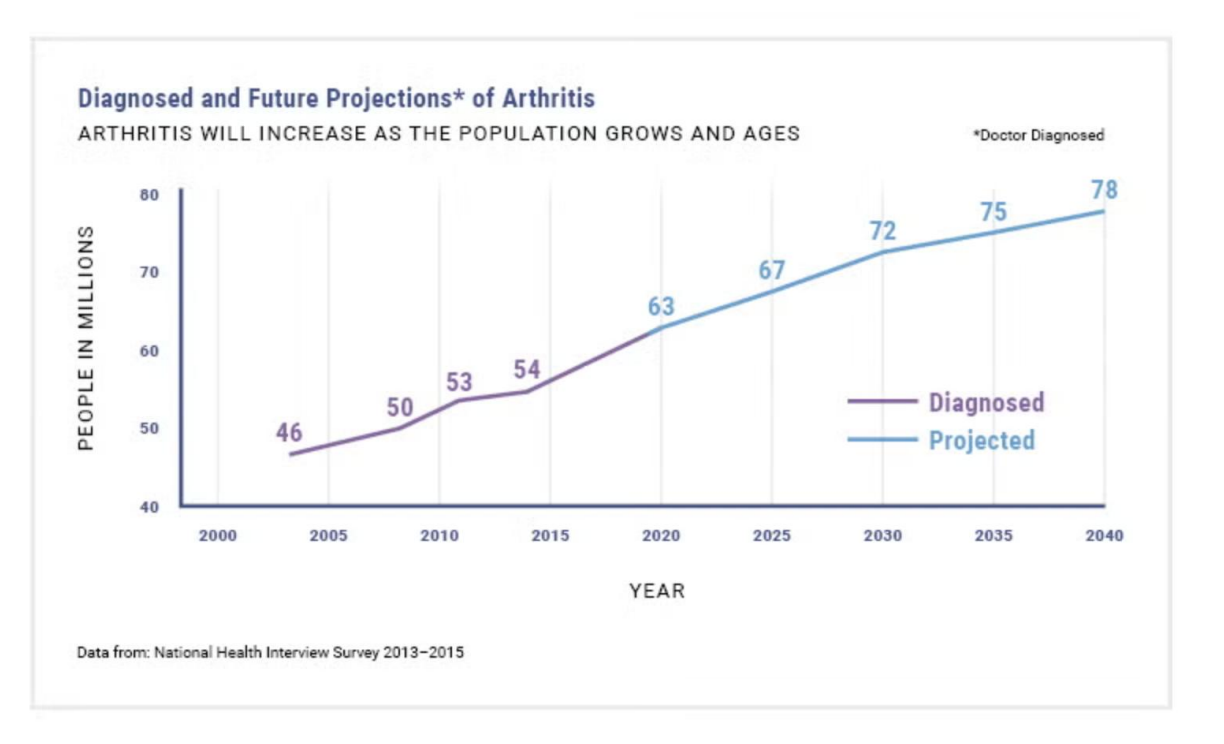
(AGE-RELATED DEGENERATIVE OSTEOARTHRITIS)

SECONDARY

- POST-TRAUMATIC
- INFLAMMATORY
- INFECTIOUS

OSTEOARTHRITIS (OA) PREVELANCE AND BURDEN

- OA is the most common form of arthritis, affecting 1 in 7 US adults.
- Third mostly rapidly rising disabling condition – just behind diabetes and dementia.
- Annual incidence (new cases) of knee OA is highest between 55 and 64 years old.
- The overall economic burden of OA in the US is estimated at almost $140 billion annually.
- Absenteeism and presenteeism are more common in Individuals with OA.



https://oaaction.unc.edu/oa-module/oa-prevalence-and-burden/

RISK FACTORS
FOR OSTEOARTHRITIS OF THE HIP AND KNEE

Advancing Age

Female Gender

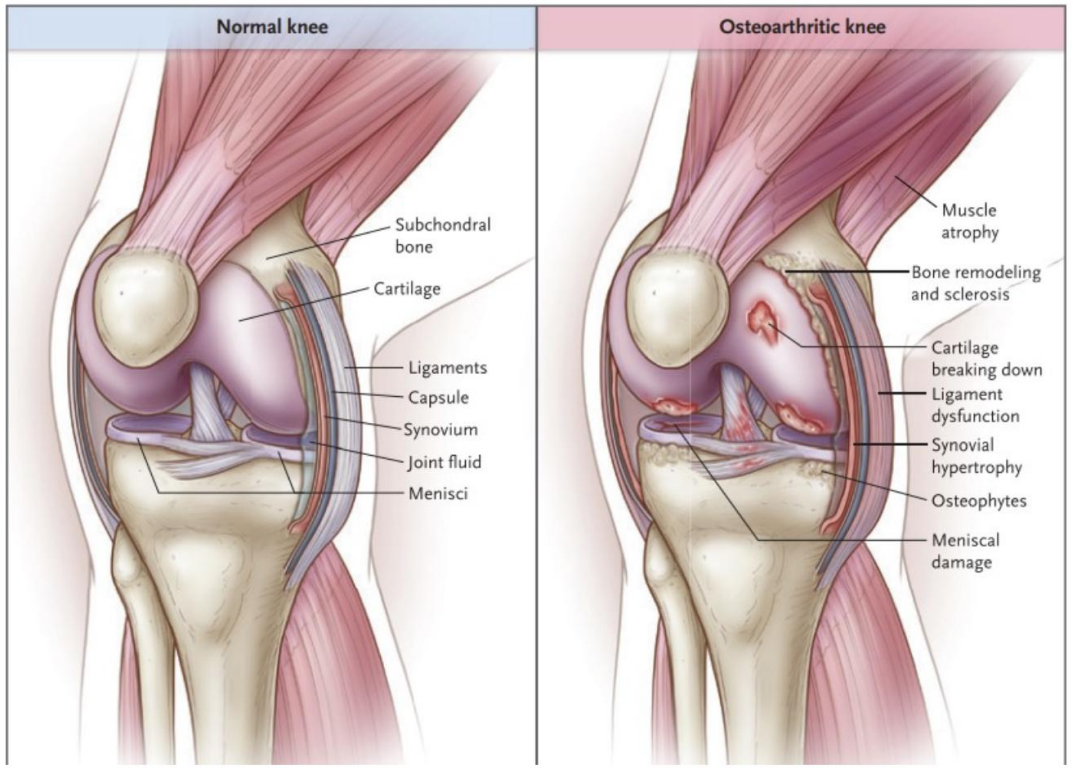
Excess Weight

Prior Joint Injury

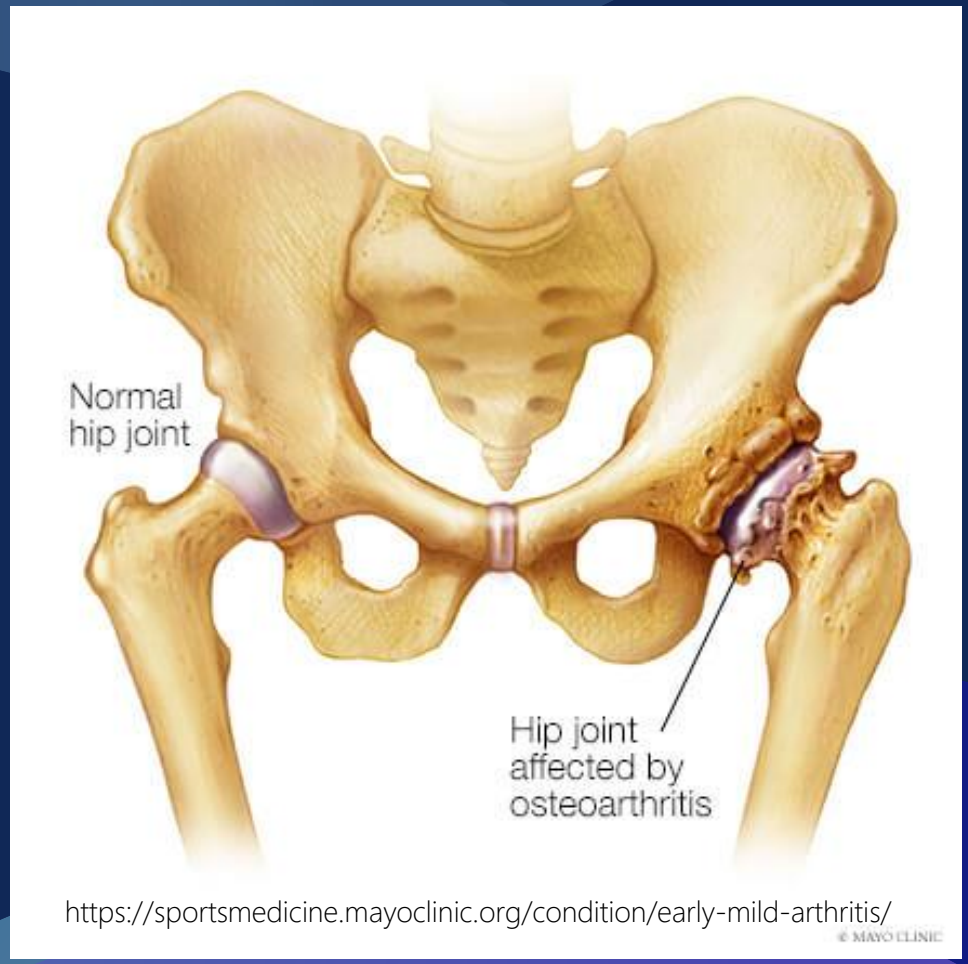
Genetics

Developmental or Acquired Deformity (Hip)

NORMAL VS DEGENERATIVE ANATOMY:
ARTHRITIS IS A DISEASE OF ENTIRE JOINT



Sharma L. Osteoarthritis of the Knee. *The New England journal of medicine*. Jan 7 2021;384(1):51-59.

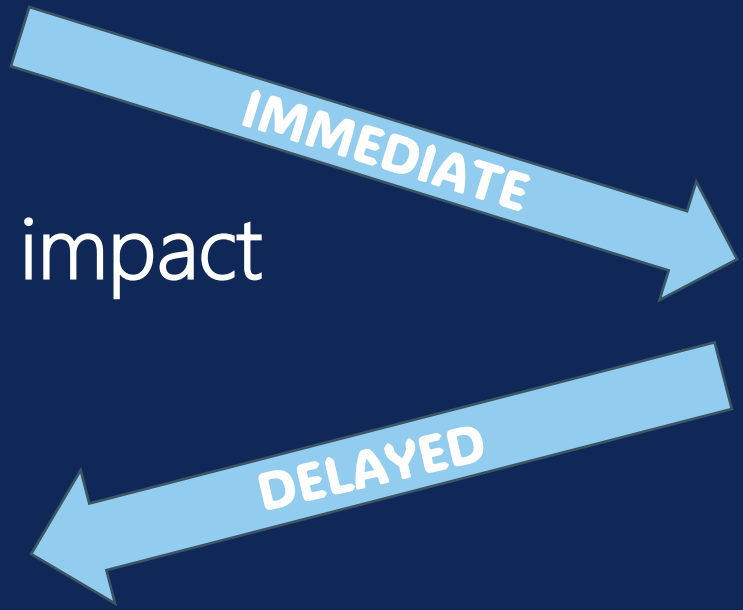


https://sportsmedicine.mayoclinic.org/condition/early-mild-arthritis/

CAN WORK CAUSE OSTEOARTHRITIS?

YES – A discrete, "high energy" traumatic work injury can cause POST-TRAUMATIC osteoarthritis

- Major ligamentous injury
- Fracture
- Joint dislocation
- High energy joint impact



Damage to joint surface and/or major supporting structures

ARTHRITIS

More often than not, a worker's hip or knee arthritis is NOT DIRECTLY CAUSED BY the work. Rather, it is a pre-existing condition.

Knee or hip pain from minor injury

- "Bumped my knee"
- "Stepped wrong"
- "Just started hurting"

Damage to joint surface and major supporting structures (menisci / labrum)

Pre-existing injury or age-related joint degeneration

COMMONLY REPORTED MECHANISMS OF INJURY:

- Slip on ice or a slippery floor – Land on the hip or knee.
- Slip and twist of the hip or knee (no actual fall).
- Trip over an unseen object resulting in a fall or twist.
- Low-energy bump or strike of the hip or knee.
- Step “wrong” on uneven ground or stairs.
- Bend or squat to lift or stock items.

WHAT ABOUT CUMULATIVE EXPOSURE?

THIS IS MUCH LESS CLEAR

- Murky evidence at best for this
- Impossible to disentangle worker characteristics (BMI, smoking, genetics, etc..) from work exposure
- Almost no evidence hip arthritis is caused by cumulative exposure

SOME PROFESSIONS SEEM MORE AT RISK

- Farmers, construction workers, firefighters, flooring installers, plumbers
  - Prolonged squatting and kneeling
  - Combined squatting, kneeling, lifting, exertion

IF THE INJURY IS NOT DIRECTLY RELATED...

Did the work exposure temporarily aggravate a pre-existing condition?

Did the work exposure aggravate, accelerate and precipitate (i.e., permanently aggravate) a pre-existing condition beyond its ordinary progression?

Was an appreciable period of workplace exposure the sole cause of the condition or at least a material contributory causative factor in the condition's onset or progression?

OR

Is the occurrence or incident complained of a mere manifestation or appearance of symptoms of a definitely pre-existing, deteriorating condition?

HELPFUL INFORMATION TO DETERMINE CAUSATION:

- PAST medical history pertaining to the injured limb
  - Medical records preceding the incident in question are invaluable!
- Imaging obtained PRIOR to the incident in question
  - If a radiology report indicates that comparison images exist, why were they ordered?
- My PERSONAL REVIEW of images when possible
  - Emergency Department and Primary Care radiographs are often ordered to rule out an acute bony injury or malalignment – The radiologist interpretation may or may not comment on any degenerative changes.
- Consistency of reporting – Incident/symptom description
  - Initial injury report
  - History reported at initial medical evaluation
  - Recorded statement
  - History reported at initial physical therapy evaluation
  - History reported at the IME

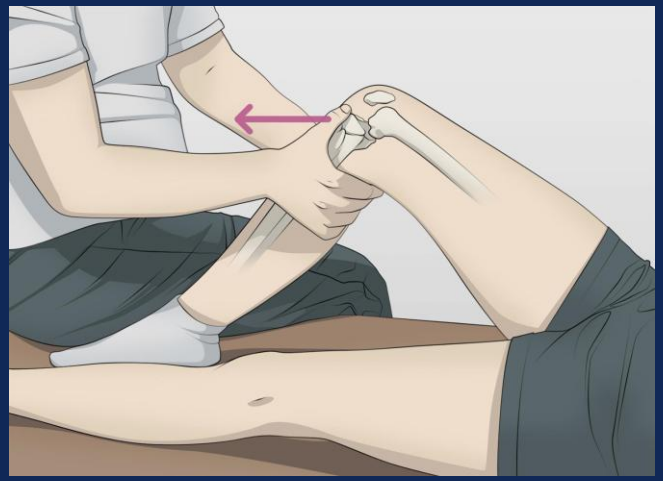
SYMPTOMS

Pain with activity or at end of the day	Stiffness/Limited range of motion
Pain at night	Swelling
Instability	Locking/Catching

https://oaaction.unc.edu/oa-module/oa-prevalence-and-burden/

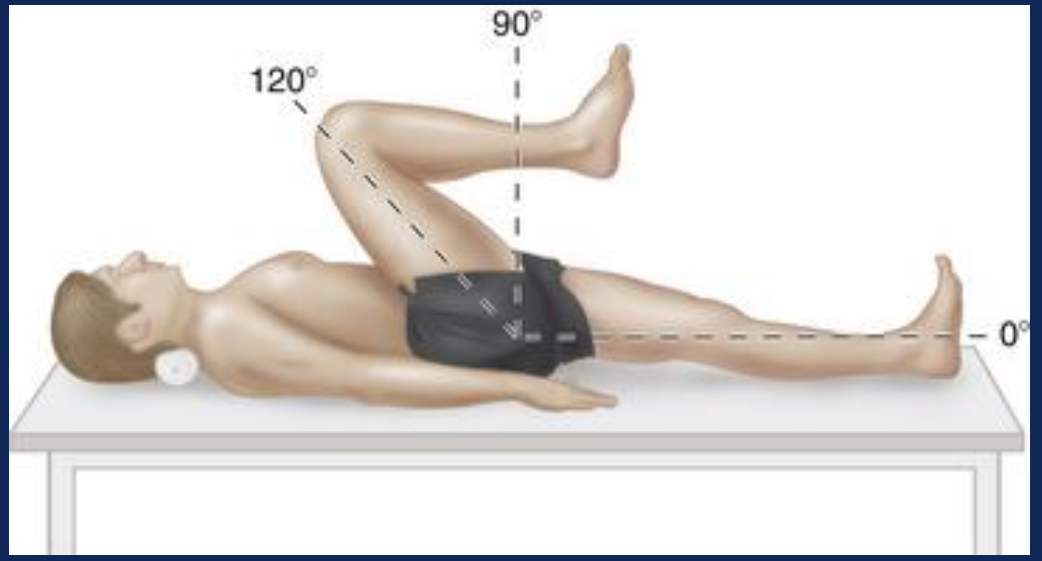
PHYSICAL EXAMINATION FINDINGS

- Abnormal gait
- Reduced/painful range of motion
- Crepitus
- Muscle weakness (severe OA)



KNEE Specific:

- Malalignment
- Bony enlargement
- Joint line tenderness

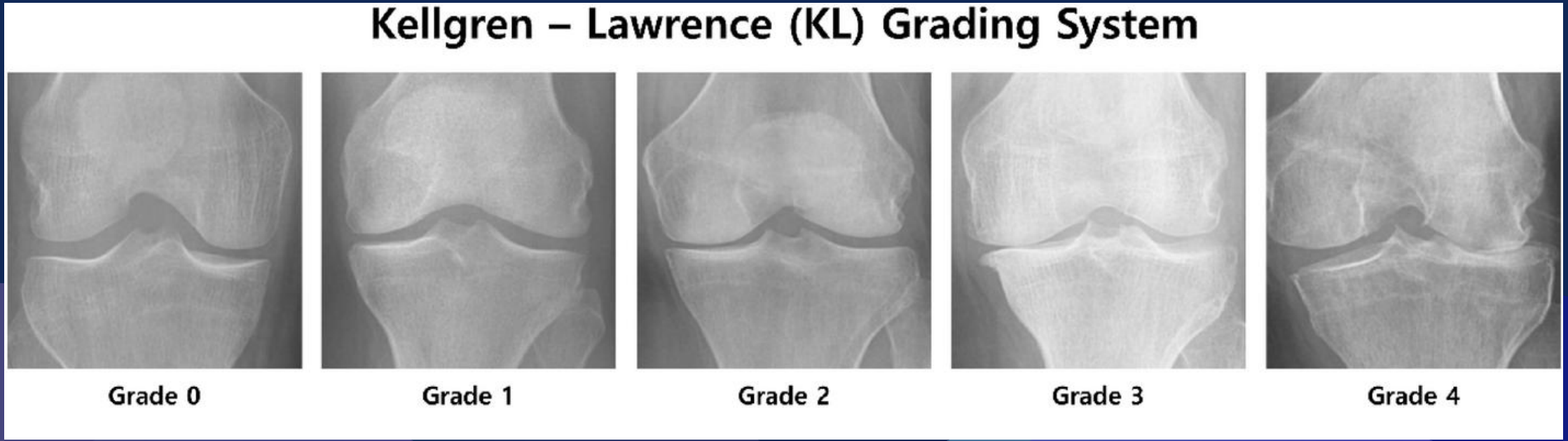


https://clinicalgate.com/the-hip-3/

https://www.orthobullets.com/recon/12755/knee-physical-exam--adult

IMAGING

HIGH-QUALITY, WEIGHTBEARING X-RAYS are often sufficient to diagnose OA, dislocations, and fractures. They are more accessible and substantially more cost-effective than MRI.

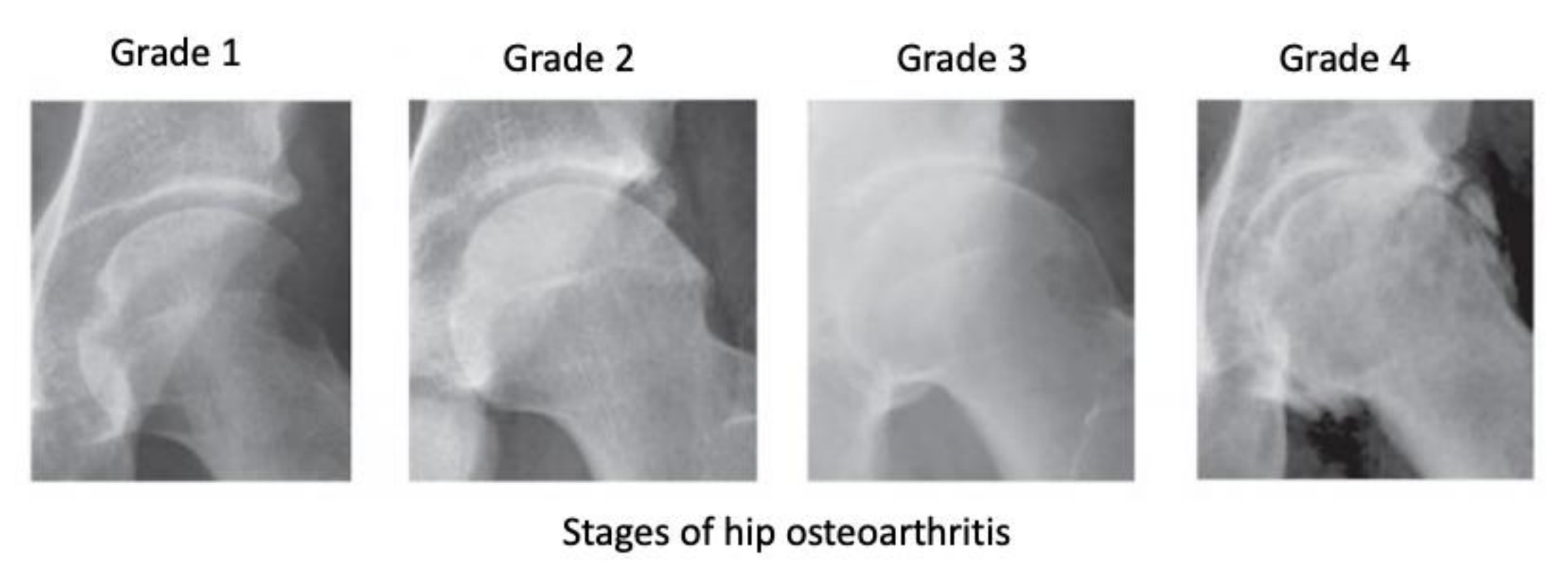


https://www.nature.com/articles/s41598-023-50210-4/figures/1

CHARACTERISTIC OA FINDINGS ON PLAIN RADIOGRAPHS:

Joint space narrowing, osteophytes (bone spurs), subchondral cysts and subchondral sclerosis (damaged bone adjacent to damaged cartilage).

CAVEAT: Radiographic features do not strictly correlate with clinical signs and symptoms.



https://www.orionortho.sg/hip-arthritis

WHEN IS AN MRI INDICATED?

- Suspected soft tissue injury
  - Knee: Ligaments, tendons, menisci
  - Hip: Labrum
- X-rays inconclusive or symptoms inconsistent with x-ray findings
- Lack of symptomatic/functional improvement as anticipated

The clinical context often does not require MRI – Especially in older individuals.

- Study published in the Journal of the American Academy of Orthopedic Surgeons in 2016
  - 600 patients aged 40 years or older
  - Referred to a sports medicine practice
  - Nearly one in four patients had a pre-referral MRI
  - Only 58% had pre-referral standard x-rays, and only 13% had weightbearing x-rays!
- 40% of these patients were diagnosed with osteoarthritis – and did not benefit from an MRI!

https://radiopaedia.org/cases/normal-mri-hip

AAOS Evidence-Based Clinical Practice Guidelines – Knee OA

NON-OPERATIVE INTERVENTION	STRENGTH OF RECOMMENDATION
Exercise (supervised, unsupervised, aquatic)	★★★★
Self-Management and Patient Education Programs	★★★★
Oral NSAIDS* and/or Acetaminophen (Tylenol)	★★★★
Topical NSAIDs (i.e., Voltaren/Diclofenac Gel)	★★★★
Sustained Weight Loss	★★★
Intra-articular Steroid Injection (short-term relief)	★★★
Canes or Braces	★★★
Balance/Coordination/Agility Programs	★★★

* When not contraindicated.

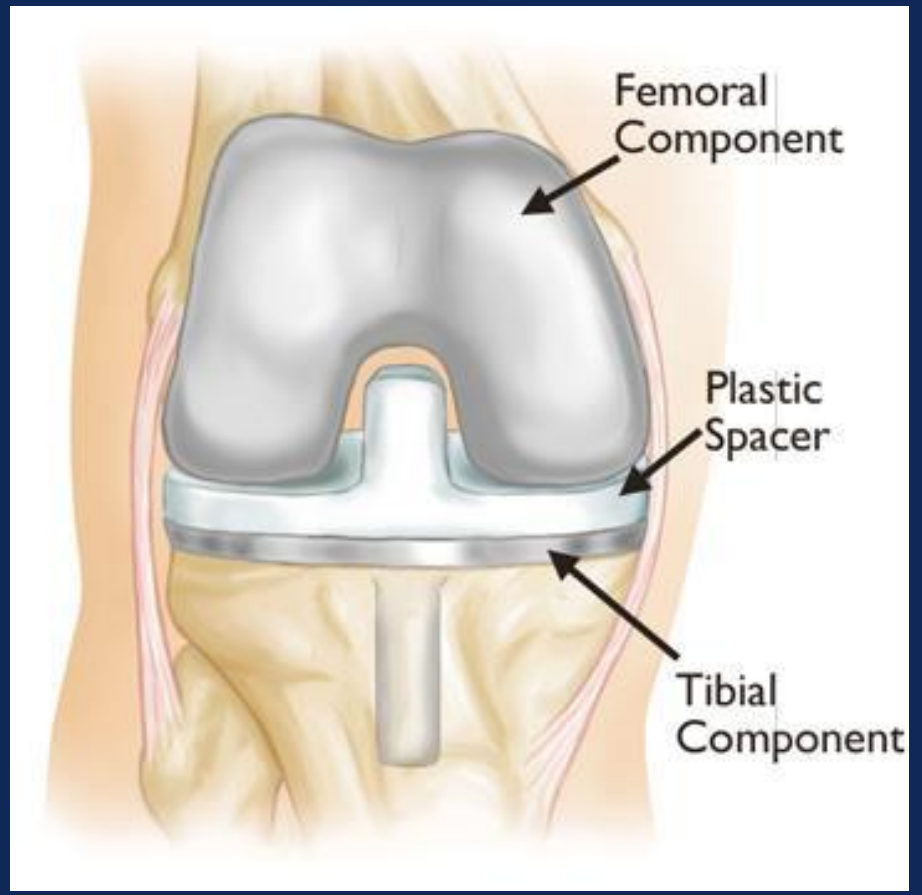
★★★★ = Strong
★★★ = Moderate
★★ = Limited

What about Hyaluronic Acid injections and Platelet-Rich Plasma (PRP)?

- Hyaluronic Acid injections are NOT recommended for routine use in treatment of symptomatic knee OA. ★★★
- PRP *may* reduce pain and improve function in patients with symptomatic osteoarthritis of the knee. ★★

WHEN TO PROCEED WITH TOTAL KNEE ARTHOPLASTY (REPLACEMENT)?

- Severe knee pain or stiffness that limits activities of daily living (i.e., walking, climbing stairs, and getting in and out of chairs)
- Moderate or severe knee pain while resting, either day or night.
- Chronic knee inflammation and swelling that does not improve with rest or medications.
- Knee deformity — bowing in or out of the knee.
- Failure to substantially improve with non-operative treatment.



https://orthoinfo.aaos.org/en/treatment/total-knee-replacement/

TOTAL KNEE REPLACEMENT

https://orthoinfo.aaos.org/en/treatment/total-knee-replacement-animation/

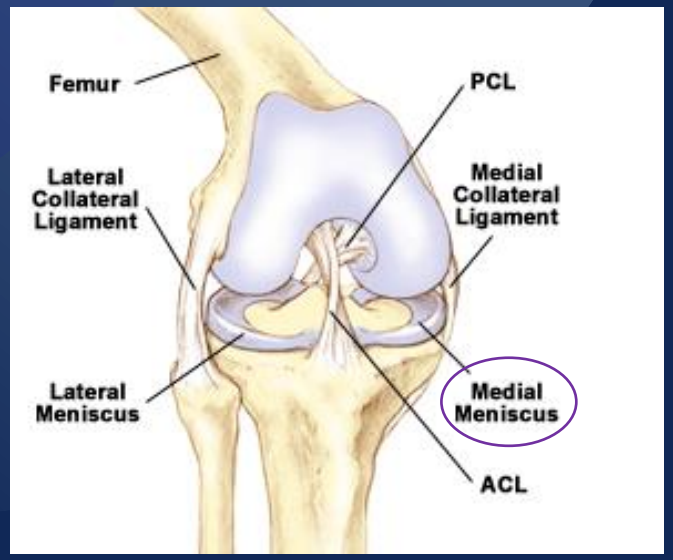
CAN YOU JUST "CLEAN IT UP?": KNEE ARTHROSCOPY

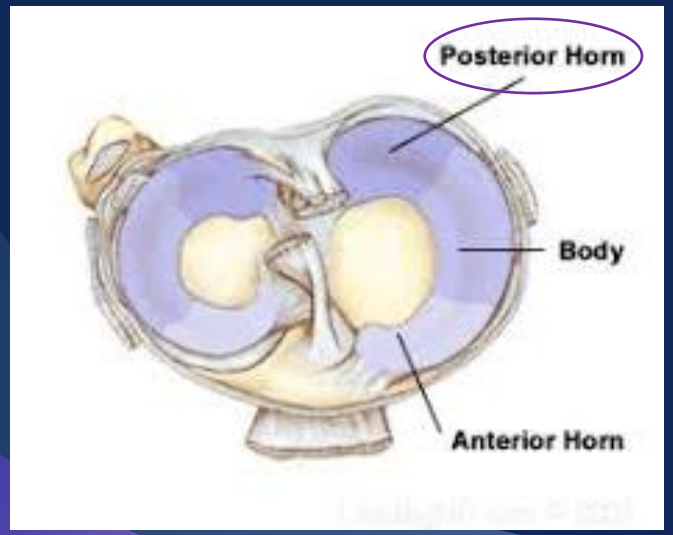
Study published in New England Journal of Medicine (2002).

- Outcomes after arthroscopic lavage (washout) or arthroscopic debridement (removal of damaged or loose tissue) were no better than those after a placebo procedure.

What about a meniscus tear on MRI?

THE DEGENERATIVE MENISCUS TEAR





Menisci:
Two rubbery disks that help cushion the knee joint.

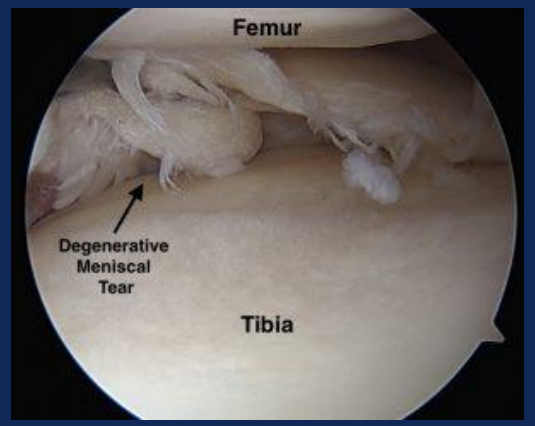
- Prevalence increases with age and with severity of concomitant osteoarthritis.
- ATRAUMATIC.
- Often located in the mid-body and posterior horn of the MEDIAL meniscus.
- Observed frequently on MRI of symptomatic patients.
- *Similar rates of degenerative meniscus changes are also observed when compared to ASYMPTOMATIC cohorts!*

https://www.thesteadmanclinic.com/patient-education/knee/meniscus-injuries

ARTHROSCOPIC PARTIAL MENISCECTOMY IN PATIENTS WITH CONCOMITANT MILD-TO-MODERATE OSTEOARTHRITIS IS CONTROVERSIAL.

Study published in Arthritis and Rheumatology (2020).

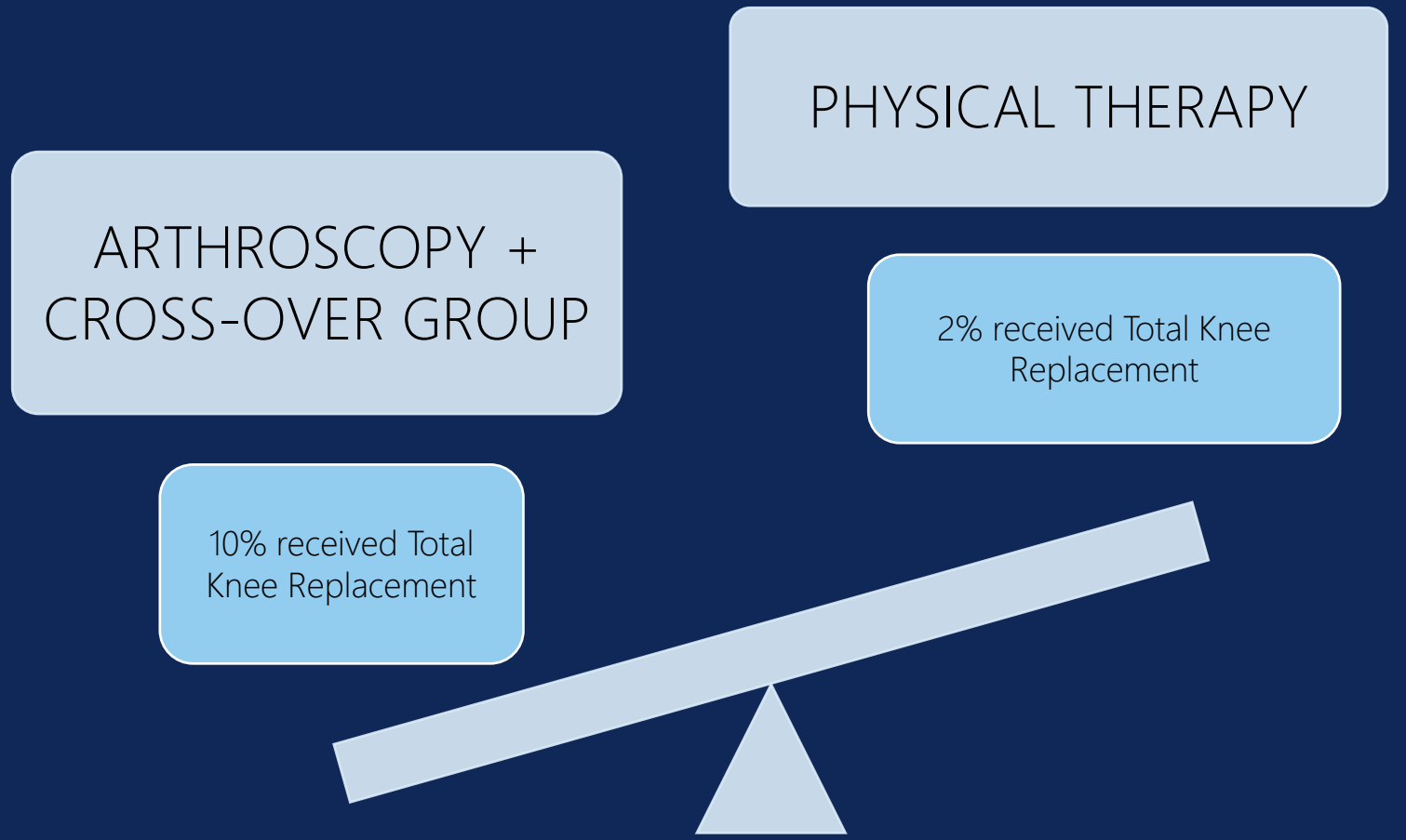
- 351 patients age 45 and older with:
  - Symptoms that seemed related to a meniscus tear (i.e., intermittent, sudden pain, catching)
  - No improvement with conservative management
  - Image-proven knee OA and meniscus tear
- Randomized into two groups: ½ physical therapy; ½ knee arthroscopy.
- Followed patients for 5 years.



https://radsource.us/meniscal-tear-patterns/
https://davidslattery.com/knee-conditions/meniscal-tears/description/

Initial weeks/months, pain and function improved about the same in both groups - and at a similar rate.

But nearly 40% of the PT group crossed over into the arthroscopy group due to lack of improvement (frustration).



BOTTOM LINE: DEGENERATIVE MENISCUS TEAR

- Individuals with true knee locking and/or inability to walk at all without pain or catching may be candidates for knee arthroscopy.
- In older individuals without these symptoms, the severity of joint surface cartilage loss (arthritis) should determine the treatment pathway.
  - Minimal arthritic change → Non-operative management or arthroscopy
  - Significant arthritic change → Total Knee Replacement

https://www.proortho.com/knee/meniscus-surgery/

American Academy of Orthopaedic Surgeons (AAOS) Evidence-Based Clinical Practice Guidelines – Hip OA

NON-OPERATIVE INTERVENTION	STRENGTH OF RECOMMENDATION
Oral NSAIDS* (i.e., Naproxen, Ibuprofen, Meloxicam)	★★★★
Physical Therapy (Mild-to-Moderate Disease)	★★★
Intra-articular Steroid Injection (Short-Term)	★★★

* When not contraindicated.

★★★★ = Strong
★★★ = Moderate

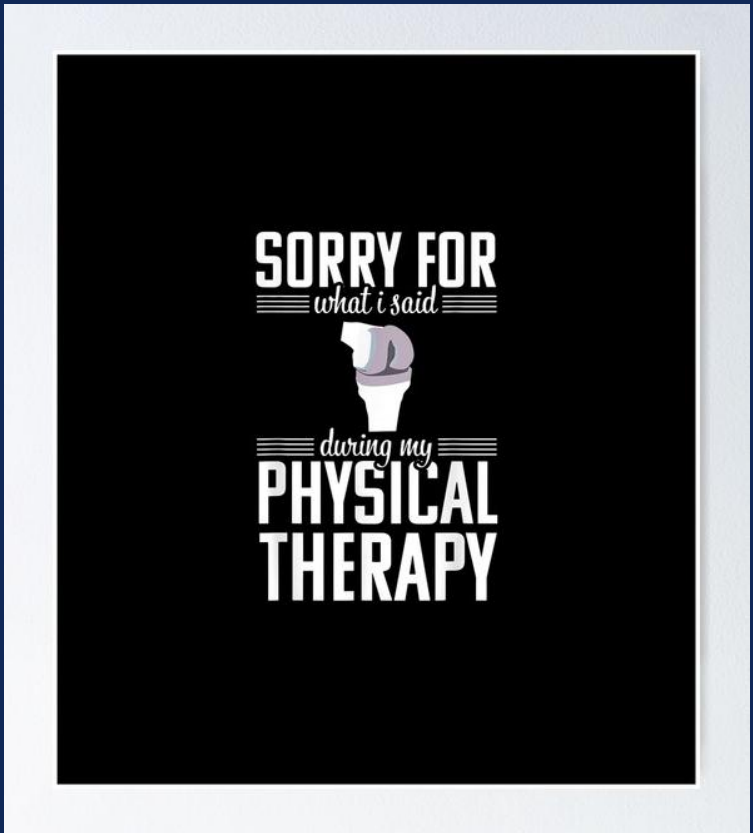
WHEN TO PROCEED WITH TOTAL HIP ARTHROPLASTY (REPLACEMENT)?

- Hip pain that limits activities of daily living (i.e., walking, bending)
- Hip pain that continues at rest (day or night)
- Stiffness in hip that limits the ability to move or lift the leg
- Inadequate pain relief from non-operative interventions

TOTAL HIP REPLACEMENT

https://orthoinfo.aaos.org/en/treatment/total-hip-replacement-animation/

ARTHROPLASTY RECOVERY

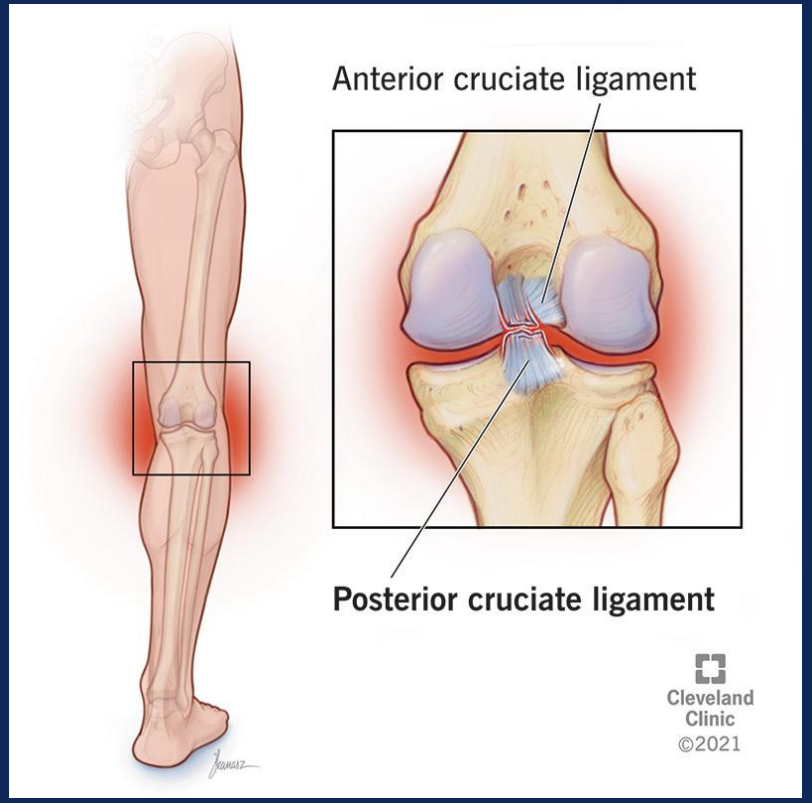


- Inpatient vs outpatient surgery
- Physical Therapy (KNEE)
- Surgeon follow-up/X-rays/suture removal
- Return to usual Activities of Daily Living within 4 to 8 weeks
- Resume driving:
  - 1 week (LEFT side replaced)
  - 3 weeks (RIGHT side replaced)
- Return to Work:
  - From home in 1 to 2 weeks
  - Sedentary duty in 4 to 8 weeks
- General Post-Operative Rule of Thumb:
  - On feet for 4 hours per day at 4 weeks, 5 hours per day at 5 weeks, 6 hours per day at 6 weeks…
- Anticipate 1 year to recover full strength and endurance
- > 90% of modern implants last 20 years without signs of mechanical failure

https://www.redbubble.com/i/poster/Knee-Replacement-Funny-Therapy-Surgery-Recovery-by-JacekshiAmra/91179514.LVTDI

CASE EXAMPLE #1

- 50-year-old male custodian
  - History of RIGHT knee PCL tear
    - Surgical reconstruction 20 years earlier
  - History of LEFT total hip replacement
  - History of BILATERAL knee arthritis, RIGHT > LEFT
  - Chronic neck, back, hip, and knee pain treated with opioids



- Slipped on a wet floor at work.
  - RIGHT knee bent awkwardly
  - Felt a "clunk" in the knee, followed by swelling
  - Did not fall or strike the knee

https://my.clevelandclinic.org/health/diseases/21793-pcl-posterior-cruciate-ligament-tears
https://www.istockphoto.com/search/2/image?mediatype=illustration&page=3&phrase=custodian+with+mop+and+pail

NOTABLE PAST MEDICAL HISTORY

- Advanced degenerative changes present on RIGHT knee x-ray 6 years prior to the incident.
- Potential right total knee replacement discussed – Did not pursue (was told he needed to stop smoking).
- 2 years prior to the incident, he "stepped wrong" and felt a "shift and clunk" of the RIGHT knee, followed by swelling and feelings of instability.
- 3 days before the incident, he saw his treating physician with a RIGHT knee "flare up."

RIGHT knee examination consistent with osteoarthritis.

No pathologic ligamentous laxity.

RIGHT Knee MRI:

- Tricompartmental cartilage loss, most severe in the medial and patellofemoral compartments.
- Bone edema, geode, and osteophyte formation.
- Medial meniscus tear.
- Intact PCL graft. Intact ACL.

INDEPENDENT EXPERT OPINION

DIAGNOSIS: Post-Traumatic Arthritis of the RIGHT Knee with Consequential Medial Meniscus Tear

CAUSATION: Mere manifestation of a definitely pre-existing, deteriorating condition.

PAST TREATMENT: All treatment was related to personal and intrinsic post-traumatic arthritis of the RIGHT knee.

FUTURE TREATMENT: RIGHT total knee replacement; not related to work.

RESTRICTIONS: Sedentary duty; not related to work.

PCL tears are associated with increased risk of meniscus tear, osteoarthritis, and subsequent total knee replacement.

https://orthoinfo.aaos.org/en/diseases--conditions/posterior-cruciate-ligament-injuries/

CASE EXAMPLE #2

- 63-year-old female researcher
- History of RIGHT knee arthroscopy and meniscus repair 14 years earlier
- History of periodic flares of right knee pain, independent of activity
- Slipped at work, RIGHT knee twisted, fell
- No improvement with conservative measures on her own
- Saw her physician approximately 2 months after the incident
- Non-weightbearing RIGHT knee x-rays ordered – “Normal examination” per radiologist
- RIGHT knee MRI recommended

IMAGING REVIEW

- WEIGHTBEARING RIGHT knee x-rays 5 years earlier: Mild medial and lateral compartment degenerative joint disease.
  - My personal review - subchondral sclerosis of the medial compartment and scattered tricompartmental osteophytes.
- My personal review of the "normal" non-weightbearing x-rays following work incident
  - Progression of osteophyte formation.
- Was the MRI necessary?
  - NO catching or locking reported
  - Should have started with WEIGHTBEARING X-RAYS of the RIGHT knee
- MRI RIGHT knee results
  - Complex degenerative tearing of the medial and lateral menisci with displaced flap fragments.
  - Tricompartmental osteoarthritis with extensive cartilage loss.
  - Knee effusion with intra-articular debris.

INDEPENDENT EXPERT OPINION

DIAGNOSIS: RIGHT knee osteoarthritis with degenerative meniscus tears.

CAUSATION: Temporary aggravation of pre-existing RIGHT knee osteoarthritis.

PAST TREATMENT: 6 months of conservative treatment (oral NSAIDs, activity modification, and physical therapy) was required to return to pre-injury status.

FUTURE TREATMENT: Intra-articular steroid injections, RIGHT total knee replacement; not related to work.

RESTRICTIONS: Avoid crawling, squatting, climbing, or kneeling; not related to work.

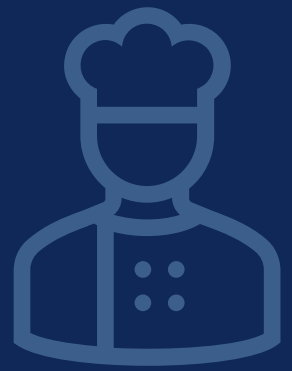
https://www.health.harvard.edu/blog/can-virtually-improve-knee-pain-2017032011309

CASE EXAMPLE #3

- 61-year-old prep cook
- Chronic LEFT quad and gastroc atrophy due to two significant farming injuries in childhood
  - NO FUNCTIONAL LIMITATIONS
- Carrying items through kitchen, shoe caught on step, fell forward, landed on LEFT knee
- Within one week, developed a "bone-on-bone" feeling when weightbearing on the LEFT leg
- Non-weightbearing LEFT knee x-rays - "no acute abnormality"
  - My interpretation - Moderate medial joint space narrowing and subchondral sclerosis
  - Severity of joint space loss likely UNDERESTIMATED
- LEFT knee MRI obtained 3 months after incident. My interpretation:
  - Extensive marrow edema involving the medial femoral condyle. Edema in the medial patella also noted.
  - Small horizontal tear of the posterior horn of the medial meniscus without extrusion.
  - Myxoid degeneration of the ACL.
  - No effusion.

CLINICAL COURSE

- Referral to orthopedic surgeon
- Trial of physical therapy and Celebrex – plateaued
- Intra-articular steroid injection – Some benefit
- LEFT knee arthroscopy recommended
- At IME, required knee sleeve and single-point cane
- Had returned to working part-time as a cook
- Persistent LEFT knee pain, worsened by prolonged standing and negotiation of stairs
- Intermittent LEFT knee locking
- LEFT knee examination at IME
  - Noticeable limp
  - Audible patellofemoral crepitus
  - No pathologic laxity of the ligaments
  - Joint line tenderness
  - Range of motion 0 to 114 degrees (compared to uninjured right knee – 0 to 126 degrees)
  - Left leg muscles strength 5/5 (quad 4/5 with good effort)



INDEPENDENT EXPERT OPINION

DIAGNOSIS: Severe bone contusion of the LEFT medial femoral condyle, early LEFT knee degenerative changes, including a degenerative meniscus tear.

CAUSATION: Permanent aggravation of pre-existing LEFT knee degenerative disease.

PAST TREATMENT: All reasonable, necessary, and related to the work incident.

FUTURE TREATMENT: LEFT knee arthroscopy recommended by treating physician.

- In my opinion, this would not provide sustained symptomatic or functional improvement due to the extent of bone edema and cartilage irregularities present.
- A LEFT total knee replacement is the only surgical intervention that will predictably improve quality of life and function.
- Proceeding directly to a LEFT total knee replacement would likely return the claimant to work full-time, full-duty in 4 months.

RESTRICTIONS: ½ days, no squatting, kneeling, climbing, no lifting over 30 pounds; work-related.

TAKE HOME POINTS

- OA of the hip and knee is UNAVOIDABLE in the workforce.
- A work incident is more likely to cause aggravation of PRE-EXISTING primary OA than secondary post-traumatic OA.
- Minor injuries rarely lead to permanent aggravation.
- An MRI is often UNNECESSARY when osteoarthritis is present on x-ray.
- A meniscus tear is not always an indication for arthroscopy!
- *The pre-injury functional and symptomatic status of the worker is the most significant factor when determining causation.*
  - *PRE-INJURY MEDICAL RECORDS/IMAGING (when they exist) ARE ESSENTIAL!*

THANK YOU

QUESTIONS?