PLESAE CLICK ON THE FOLLOWING LIVK TO WATCH THE LECTURE ONLINE:-

https://www.youtube.com/watch?v=wq0v1dq5ql0&list=PLuBRb5B7fa_dtajIUw2Eo1E-8Uv8vVNmR&index=1

Total Knee Arthroplasty

Moayad Abu Qa'oud, MD

Canadian Fellowhip, Complex Joints reconstruction

Osteoarthritis

- General:
  - **Degenerative** disease of synovial joints leading to **progressive loss of articular cartilage.**
    - Deterioration in the ability of chondrocytes to restore articular cartilage
  - Epidemiology:
    - Incidence of symptomatic OA:
      - Hand→100/100,000/yr
      - Hip→88/100,000/yr
      - **Knee→240/100,000/yr**
    - F>M.
    - Age→increased risk with increasing age.

RF:

- Modifiable:
  - **Obesity.**
  - **Trauma.**
  - **Occupation/Labor.**
  - **Muscle weakness.**

- Non-Modifiable:
  - Gender (F>M).
  - Age.
  - Genetics.
  - Race (Asians at lower risk).

Pathophysiology:

- Pathoanatomy:
  - Articular cartilage:
    - Damage to **tangential zone** below articular surface.
      - Hypertrophic repair causes increased synthesis of proteoglycans.
      - Surface integrity is lost leading to failure of repair.
      - Cells above tidemark express hypertrophic phenotype→ALP, type X collagen, matrix vesicles.
      - Results in **cartilage fragmentation/collapse.**

- Synovium/Capsule:
  - Early→mild synovial inflammation.
  - Middle→moderate synovial inflammation + hypervascular.
  - Late→severe synovial inflammation + thickened + hypervascular.

- Bone:
  - Once cartilage breakdown begins, subchondral bone attempts to remodel.
    - Produces **fibrocartilage in areas of denuded bone.**
    - **Bone cysts form** (late stages).

- Cell Biology:
  - **Proteolytic Enzymes-** OA leads to an imbalance of MMPs>TIMPs:
    - **Matrix Metalloproteases (MMPs)-** cartilage matrix digestion.
      - Ex. Stromelysin, plasmin, aggrecanase-1 (ADAMTS-4).
      - **Cytokines increase MMP synthesis** (ex. IL-1, IL-6, TNF-α).
        - Secreted by synoviocytes.
    - **Tissue Inhibitors of MMPs (TIMPs)-** control MMPs and limit excessive degradation.

- Genetics:
  - Non-mendellian inheritence.
  - Possible genetic links:
    - Vit D receptor.
    - Estrogen receptor 1.
    - Inflammatory cytokines (IL-1, IL-4, matrilin-3, BMP-2, BMP-5).

- Overall changes:
  - INCREASE in:
    - **Water content**
    - **IL-1**
    - **Chondrocyte activity/proliferation**
    - **MMP Levels**
    - **Cathepsins B + D**

- DECREASE in:
  - **Proteoglycan quality/size**
    - Note: synthesis increases, however, degradation increases more substantially (net decrease)
  - **Quality of collagen**
    - Proportion of collagen increases (d/t decrease in proteoglycans)
  - **Cross-linking**
  - **Modulus of elasticity**

- Aging vs OA:
  - OA:
    - Everything INCREASES except (KEP):
      - **Keratan sulfate**
      - **Elasticity**
      - **Proteoglycans**
  - Aging:
    - Everything DECREASES except (KEC):
      - **Keratin sulfate**
      - **Elastcitiy**
      - **Chondrocyte size**

- Imaging:
  - XR → Hallmark findings:
    - **Joint space narrowing.**
    - **Osteophytes.**
    - **Subchondral sclerosis** (eburnation of bone).
    - **Subchondral cysts.**
    - Others → loose bodies, joint subluxation, deformity, malalignment

- Management of KNEE OA (AAOS Guidelines 2nd Editiion)
  - **Non-Operative:**
    - **Self Management, Physical Activity, Strengthening, Low Impact Aeorbic Exercise, Neuromuscular Education:**

      -AAOS Guidelines→strong recommendation

    - **NSAIDs/Tramadol:**

      -AAOS Guidelines→strong recommendation

    - **Weight Loss:**
      - Indication→patients with symptomatic arthritis + BMI >25.

        -AAOS guidelines→moderate recommendation.

- Inconclusive:
  - **Bracing (Valgus unloading brace)**
  - **Physical Modalities** (i.e. electrotherapeutic modalities)
  - **Manual Therapies** (i.e. manipulation, chiropractic, myofascial)
  - **TYLENOL, OPIOIDS, PAIN PATCHES**
  - **CORTICOSTEROID Injections**
  - **Growth Factor/PRP Injections**

- Recommend AGAINST:
  - **Acupunture** (strong)
  - **Lateral Wedge Insoles** (for **medial compartment OA)** (moderate)
  - **Glucosamine/Chondroitin (**strong)
  - **VISCOELASTIC Injection** (strong)
  - **Needle Lavage** (moderate)

Operative:

- **HTO:**
  - Indications→young patients with unicompartmental disease.
  - AAOS guidelines→limited
  - **UKA vs HTO- no difference** (outcomes or complications) -MODERATE

- **Unicompartmental Joint Replacement:**
  - No difference in DVT rates compared to TKA
    - Limited
  - **UKA vs HTO- no difference** (outcomes or complications)
    - MODERATE
  - **TKA INSTEAD OF UKA to decrease revision surgery risk**
    - MODERATE

- **Total Joint Replacement**
  - Indications→advanced disease that has failed above management.
  - Timing:
    - **Delay to OR** of 8 months- no change in outcome:
      - Moderate
    - **Bilateral TKA Age <70 + ASA 1-2**
      - Limited (no increased complications)

Indications and Contraindications of TKA:

- Tricompartmental TKA:
  - Indications:
    - **PAIN RELIEF FROM SEVERE ARTHRITIS.**
      - MAIN INDICATION.
      - Always:
        - Confirm clinical diagnosis with **imaging.**
        - Rule out **other causes** of knee/leg pain:
          - Spinal cord/column, ipsilateral hip, PVD, meniscal pathology, knee bursitis etc.
        - Ensure adequate **trial + failure of conservative therapy.**
          - Including **NSAIDs, activity modification, PT, ambulatory aids, +/- injections.**

Contraindications:

- **Recent/current septic arthritis.**
- **Current remote septic source.**
- **Extensor mechanism dysfunction/discontinuity.**
- **Recurvatum deformity secondary to muscular weakness.**
- **Painless, well-functioning knee arthrodesis.**

Relative contraindications:

- Poor surgical candidate (multiple medical comorbidities).
- Significant atherosclerotic disease on operative leg.
- Overlying skin conditions/lesions.
- Venous stasis with recurrent cellulitis.
- Neuropathic arthropathy.
- Recurrent UTI.
- Morbid obesity.
- History of osteomyelitis around the knee.

(L) TKA

- Evo
- VCA 3°

- Cefazolin / TXA / Dex / Zofran / ASA

- Home POD#0

- f/u 2 weeks with GP for staple removal
- f/u July 16th, time TBD

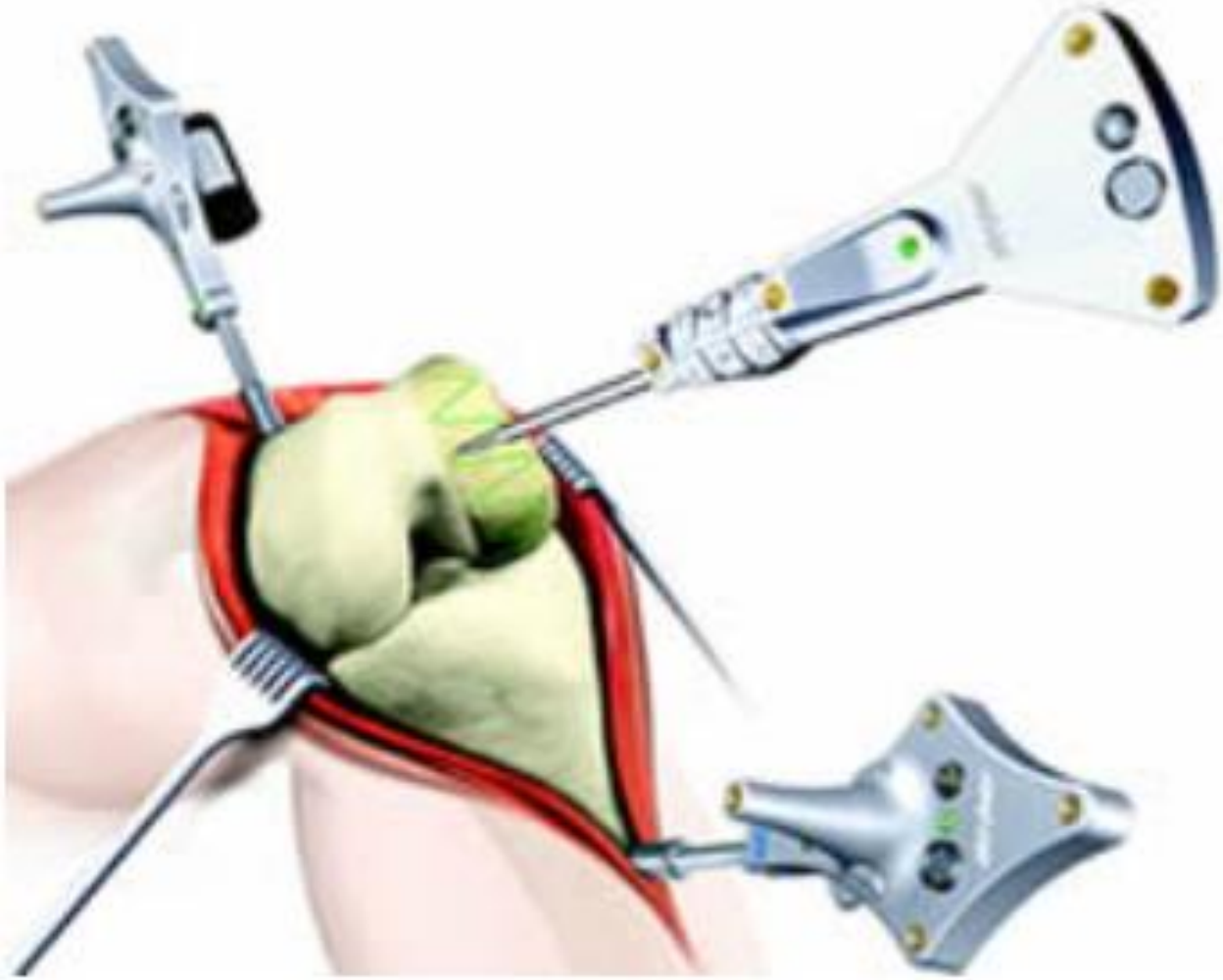
- 71M
- NKDA
- Asthma, Crohn's disease, hiatus hernia
- Hgb 129

Techniques:

- **Pre-Op PT**- improve post-op pain + physical function:
  - Limited
- **Neuraxial Anesthesia** (vs GA) improve periop outcomes + complication rates
  - Moderate
- **Peripheral Nerve Blocks-** decrease pain/opioid use
  - STRONG
- **Periarticular Local-** decrease pain/opioid use -STRONG

- **Tourniquet:**
  - Decreases blood loss
    - Moderate
  - INCREASES short term post-op pain
    - STRONG
  - DECREASES short term postop function
    - Limited
- **TXA** (with no contraindication)- decrease EBL/transfusion:
  - STRONG
- **Cement:**
  - **Cemented vs Cementless:**
    - No difference if all cemented, hybrid cemented or all uncemented
  - **NOT using ABx Cement** (limited)

- **Navigation or Patient Specific-** no difference
  - STRONG/Moderate
- **CR vs PS- no difference**
  - STRONG
  - MPTKA Much better satisfaction rates
- **All PE vs Modular Tibial Components- no difference**
  - STRONG



- **Patellar Resurfacing:**
  - **Pain/Function- no difference**
    - STRONG
  - **Decreased reoperation within 5 years**

    -Moderate

Post-Op:

- **Drains- Avoid** (complications/outcomes)
  - Moderate
- **Cryotherapy- not improved**
  - Moderate
- **CPM- no improvement**
  - STRONG
- **PT Same Day:**
  - Reduces LOS
    - STRONG
  - Reduces Pain + Function
    - Moderate

- **Supervised PT x 2 moths:**
    - Improves physical function
        - Moderate
    - Decreases pain
        - Limited
- **Late Stage PT for limited paitents:**
    - Limited

RF/Outcomes:

- **Obesity→**LESS IMPROVEMENT
  - STRONG
- **Chronic Pain→**LESS IMPROVEMENT
  - Moderate
- **Depression/Anexity→**Less improvement:
  - Limited
- **Diabetes→**higher risk of complications
  - Moderate
- **Cirrhosis/HCV→**higher risk of complications

  -Limited

Inconclusive:

- **Arthroscopy + Partial Menisectomy** (with OA + torn meniscus)

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A Randomized Trial of Arthroscopic Surgery for Osteoarthritis of the Knee

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CONCLUSIONS

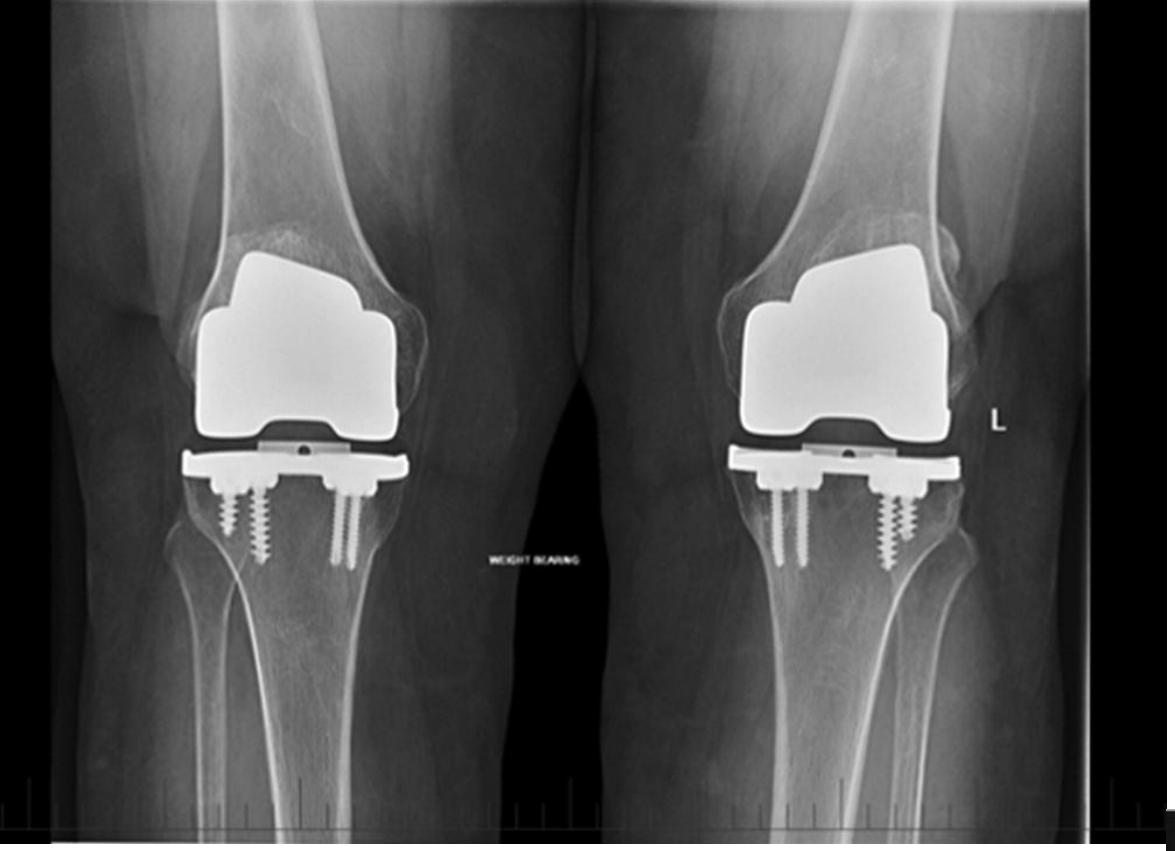
Arthroscopic surgery for osteoarthritis of the knee provides no additional benefit to optimized physical and medical therapy. (Clinicaltrials.gov number, NCT00158431.)

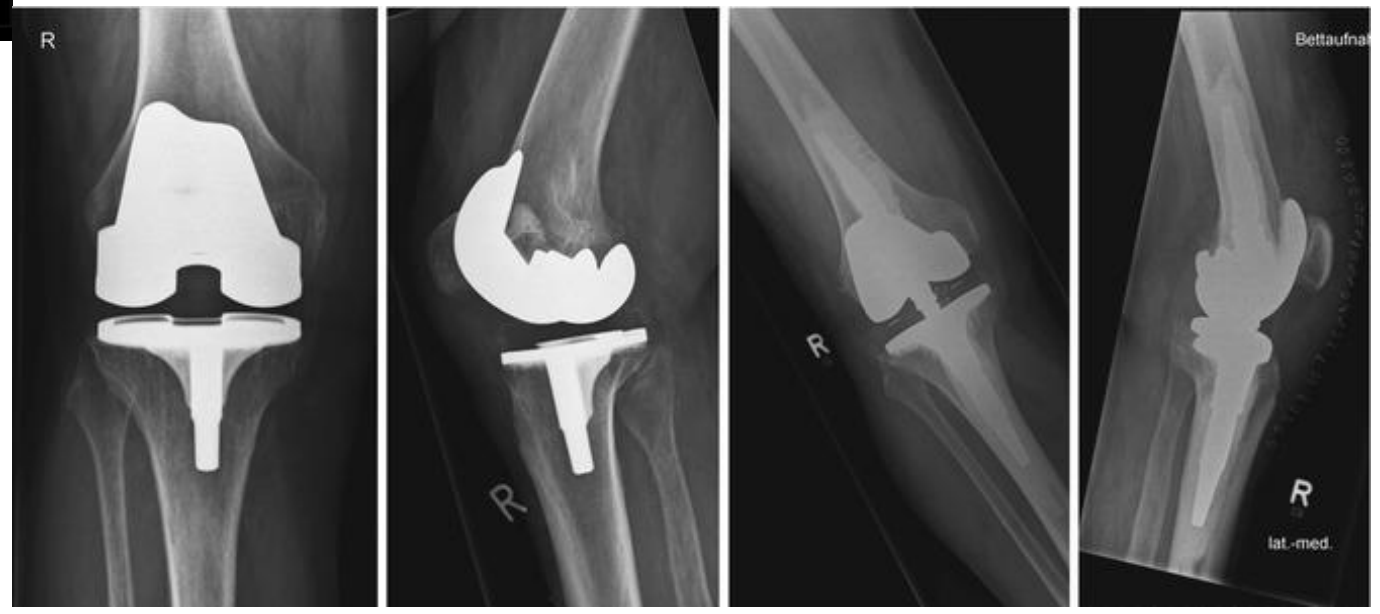
Recommend AGAINST:

- **Arthroscopic Lavage/Debridement** (with primary diagnosis of OA)
  - **STRONG**
- **Interpositional Devices** (consensus)

TKA

- Goals of TKA:
  - **Restore Mechanical Alignment** of 0^0.
  - **Restore Joint Line.**
  - **Balanced Ligaments.**
    - Correct flexion and extension gaps.
  - **Maintain a Normal Q Angle.**
    - Ensures proper patellar femoral tracking.


L
WEIGHT BEARING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Stages of Knee OA (varus OA):

- **Medial compartment:**
  - **Anteromedial→**primary WB surface on heel strike
- ACL then becomes attenuated
  - Allows **posteromedial involved**
- MCL then stiffnes + becomes contracted
  - **Malalignment**
- Allows **lateral subluxation**

-Tricompartmental changes

TKA Prosthesis Design:

- Design concepts:
  - **Femoral Rollback-** posterior translation of femur with progressive flexion.
    - This is important, as it improves quadriceps function and knee flexion by preventing posterior impingement with deep flexion.
    - Rollback is **controlled by ACL/PCL in NATIVE knee.**
    - Rollback is accounted for in CR and PS TKA:
      - CR→**native PCL** promotes posterior displacement of femur during flexion.
      - PS→**tibial post contact the femur cam** causing posterior displacement of the femur.

- **Constraint-** ability of a prosthesis to provide varus-valgus AND flexion-extension stability in the face of ligamentous laxity/bone loss.
  - Least to most constrained implants:
    - CR.
    - PS.
    - Varus-valgus constrained, non-hinged.
    - Varus-valgus constrained, hinged.

- **Modularity-** ability to augment a standard prosthesis to balance soft tissues/restore bone loss.
  - Includes:
    - **Metal tibial baseplate with modular polyethylene insert.**
      - I.e. ALL MODERN TKA PROSTHESES.
    - **Metal augments for bone loss.**
    - **Metaphyseal/diaphyseal cones.**
    - **Modular femoral/tibial stems.**


A
B
C
D
tibial tray
sleeve
stem

- Advantages→increased customization to meet individual patient needs.
- Disadvantages→increased rate of osteolysis with modularity + **backside polyethylene wear** (poly vs tibial baseplate).
  - Reduce with:
    - **Polished tibial baseplate**
    - **Tighter locking mechanisms**

TKA Prostheses:

- Overview:
  - **Unconstrained vs Constrained:**
    - **Unconstrained:**
      - **Posterior-cruciate retaining (CR).**
      - **Posterior-cruciate substituting (PS).**
    - **Constrained:**
      - **Nonhinged.**
      - **Hinged.**
- **Fixed vs Mobile Bearing.**
- **TKA vs Unicompartmental.**

- **Cruciate-Retaining (CR):**
  - Relies on **INTACT PCL** to provide stability in flexion.
  - Indications:
    - **INTACT PCL.**
    - Arthritis with:
      - Minimal bone loss.
      - Minimal soft tissue laxity:
        - Varus $<10^0$.
        - Valgus $<15^0$.

- CONTRAindications:
  - **Previous patellectomy**
  - **Inflammatory arthritis**
  - **PCL injury/incompetence**
    - Incl. **excessive PCL release during OR**
  - **Significant deformity:**
    - Varus $>10^0$.
    - Valgus $>15^0$.
    - Flexion contracture $>15^0$
  - **Previous HTO**
  - **Damaged extensor mechanism**

- XR→lateral view- no box in femoral component seen on XR.
- Advantages:
  - **Preserves /mimics femoral rollback**
    - May **improve flexion**
  - **Minimizes flexion instability**
  - **Avoid tibial post-cam impingement/dislocation** (seen with PS knees).
  - **Less distal femur needs to be cut than PS**.
  - **Improved proprioception** with preservation of native PCL.
  - **Easier to maintain joint line**
  - PCL keeps flexion gap smaller

Disadvantages:

- **More difficult to balance**
- Requires **flatter PE** to allow rollback
  - **Increased contact stresses + sliding wear**
- **Tight PCL may accelerate polyethylene wear.**
- **Risk of LATE FLEXION (sagittal) INSTABILITY**
- **Loss/ruptured PCL**

PCL Substituting→Posterior Stabilized (PS):

- **Sacrifices PCL** and relies on **femoral cam that engages tibial polyethylene post** during flexion.
- Indications:
  - Same as CR.
  - Additionally:
    - **Deficient/absent PCL.**
    - **Inflammatory arthritis-** may lead to late PCL rupture.
    - **Previous patellectomy-** reduces risk of potential AP instability in setting of weak extensor mechanism.
- XR→lateral view- outline of cam (box) in the femoral component.


A
B

- Advantages:
  - **Easier to balance knee without PCL.**
  - **Improved mechanical rollback + flexion**
  - **Congruent PE minimizes contact stresses**

- Disadvantages:
  - **More femur resected→**increased **FRACTURE RISK**
  - **"Cam Jump"-** with loose flexion gap (or in hyperextension), the cam can rotate over the post and dislocate.
  - **Tibial post polyethylene wear.**
  - **Patellar clunk syndrome-** scar tissue gets caught in box as knee moves into extension.
  - **Flexion instability with poor balancing**

- Note: **PCL Substitutiing→Anterior Stabilized:**
  - Uses an **extended anterior PE lip**
    - PCL is removed (or highly recessed)
    - PE has NO MECHANISM FOR ROLLBACK
  - Advantages:
    - **Easier to balance coronal plane deformities**
      - As with PS knee
    - **Less bone removed**
      - As with CR knee
    - **Do not have to change femoral component with PCL loss/injury/overrelease**
      - As would need to do with CR knee

Disadvantages:

- **Increased PE surface area→increased wear debris**
- **Vulnerable to a loose flexion gap (midflexion instability)** (as with PS knee)
  - Can lead to femur subluxing anteriorly in midflexion.
  - No post to prevent this

- **Constrained Non-Hinged Design:**

  - Constrained prosthesis WITHOUT axle connecting the tibial and femoral components.
    - Constrained feature is due to **large tibial post and deep femoral box.**
      - Provides:
        - Varus/valgus stability.
        - Rotational stability.
    - Must use **STEMS** to distribute force

- Indications:
  - LCL attenuation/deficiency.
  - MCL attenuation/deficiency.
  - Flexion gap laxity.
  - Moderate bone loss in the setting of neuropathic arthropathy.

- **Constrained Hinged Design:**
  - Constrained prosthesis WITH axle connecting the tibial and femoral components.
    - **Requires STEM** to distribute force
    - Potentially can limit ROM compared to less contrained

- Indications:
  - **Failed previous hinge**
  - **Recurrent instability**
    - Incl. **mid-flexion instability** that cannot be reconstructed
  - **Hyperextension instability.**
    - I.e. polio, tumor resection.
  - **Unreconstructable MCL**
  - **Global ligamentous laxity.**
  - **Massive bone loss:**
    - **Tumor**
    - **Neuropathic arthropathy**in the setting of neuropathic arthropathy.
  - **Unstable knee in low demand patient**

Mobile Bearing Design

- Allows the **polyethylene to rotate on the tibial baseplate.**
- Advantage (theoretical):
  - **Increased ROM**
  - **Lower PE stress**
    - **Reduces polyethylene wear**→increased contact area reduces the pressure on the polyethylene.
      - Recall: pressure = force/area
  - **Better knee kinematics**
  - **Better patellar tracking**

- Disadvantages:
  - **Increased stress at tibial fixation interface**
  - Bearing spin-out- with a loose flexion gap, the tibia can rotate behind the femur.
  - Note: MINIMAL DATA

Unicompartmental Knee Replacement:

- Note: usually the MEDIAL compartment.
  - Outcomes identical to LATERAL compartment
- Subtypes:
  - **Fixed Bearing.**
  - **Mobile Bearing:** Increases conformity and contact without increased constraint
    - Theoretically **less wear**
  - Cons:
    - Technically MORE DEMANDING
    - **Extruded bearing**
  - Realize:
    - NO DIFFERENCE IN CLINICAL OUTCOMES (incl. ROM, function)
    - NO DIFFERENCE IN CLINICAL WEAR

Indications:

- **Isolated unicompartmental arthritis.**
  - 2 main populations:
    - **Elderly** (age >60), **thin,** +/- lower demand.
      - Would otherwise undergo TKA.
    - **Young patients with deformity** in which UKA is considered a “first arthroplasty”.
      - UKA performed instead of HTO.
      - This group remains somewhat controversial.

CONTRAindications:

- **Bi/Tricompartmental OA.**
- **Inflammatory arthritis.**
- **ACL deficiency.**
- **Fixed varus deformity >10^0** (i.e. cannot correct on Px).
- **Fixed valgus deformity >5^0** (i.e. cannot correct on Px).
- **Flexion contraction >15^0.**

Continue C/Is:

- **ROM <90^0.**
- **Young + highly active patient.**
- **Overweight patient (>82kg).**
- **Previous menisectomy in other compartment.**
- **Grade 4 patellofemoral chondrosis (anterior knee pain).**

- **Advantages (vs. TKA):**

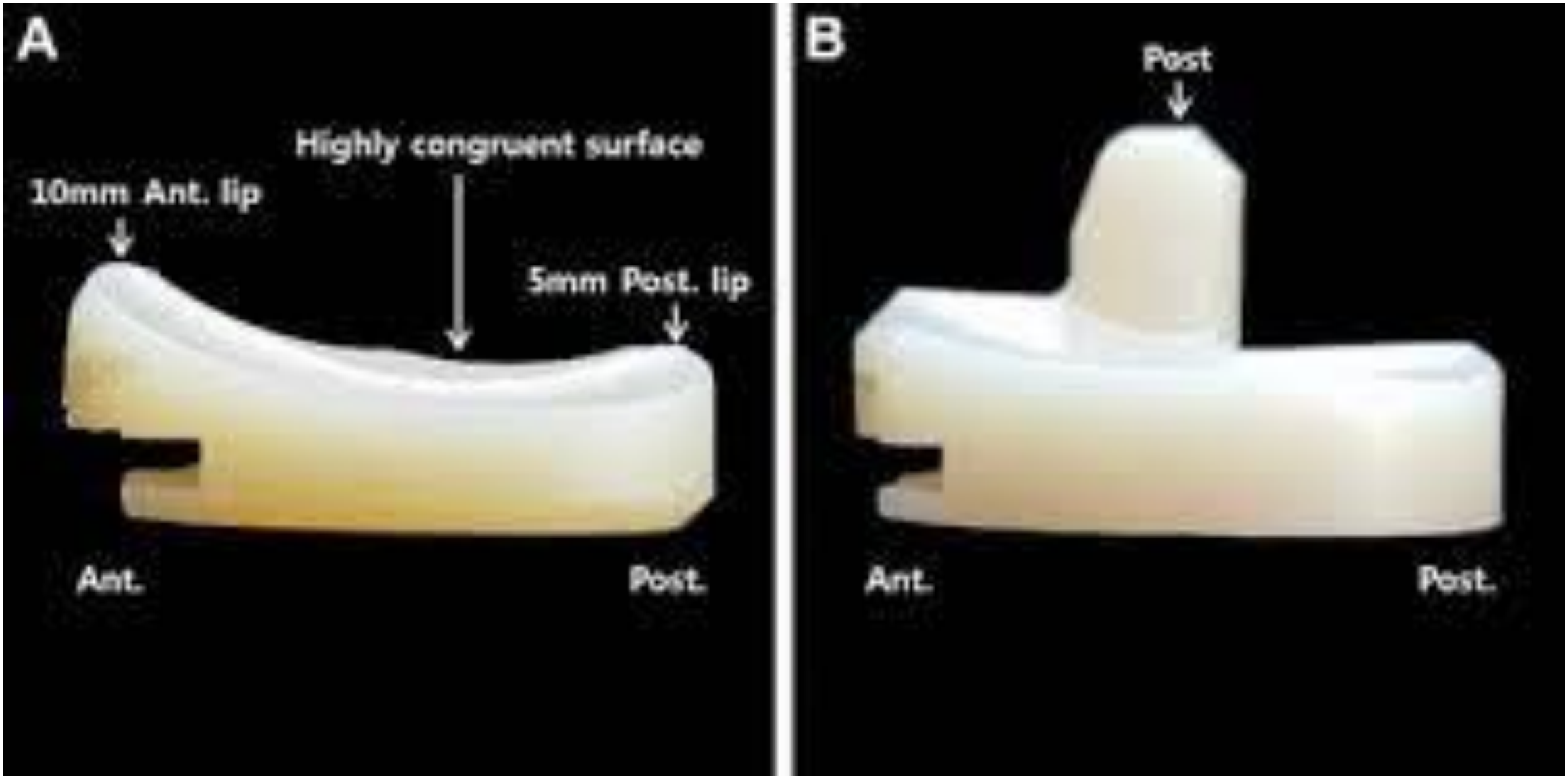
  - **Faster rehab/recovery.**
  - **Less blood loss.**
  - **Smaller incision.**
  - **Less morbidity- shorter hospital stay.**
  - **Preservation of normal knee kinematics** (retain ACL, PCL and other compartments).
    - Helps to maintain **proprioceptive function.**
  - **Cheaper.**

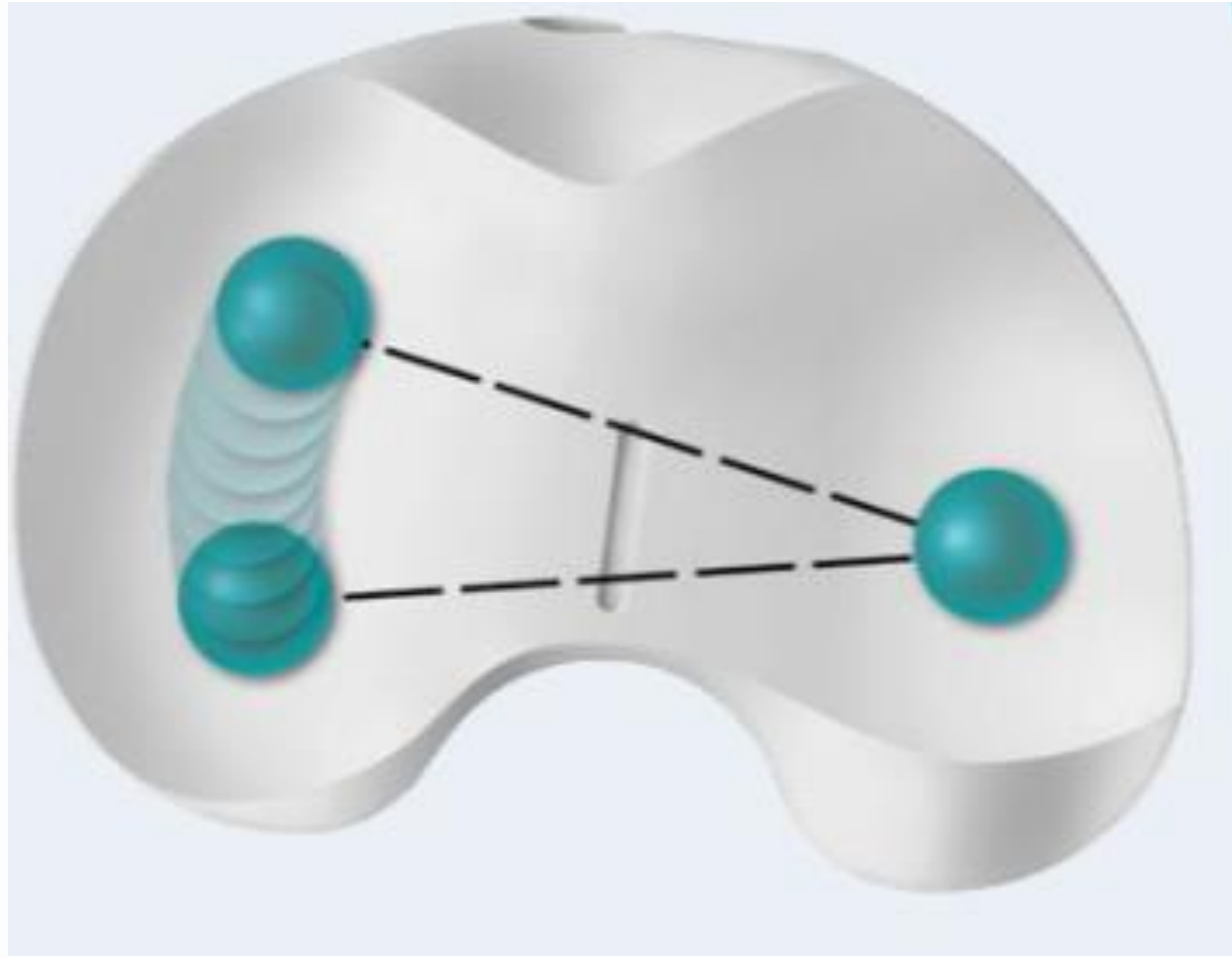
Polyethylene Spacers:

- Polyethylene Conformation:
  - Knee prostheses demand a **nonconforming** (i.e. nonuniform) **spacer** due to the complex ROM through the knee joint.
    - Spacers must account for **femoral rollback.**
      - Asymmetric with **greater lateral rollback than medial.**
  - This leads to the risk of **contact stress/edge loading** and the risk of **polyethylene wear.**
  - To avoid this, the spacers are designed with **DISHING.**
  - Must be in BOTH the **saggital** AND **coronal planes.**

- Polythelene modification/preparation:
  - There have been many failed efforts to modify polyethelyene liners in an effort to strengthen them:
    - Heat pressing, carbon fiber reinforcement.
  - Polyethlyene sterilization also affects wear properties:
    - Sterilization in air (with O_2 present) leads to accelerated oxidation and wear.

- Should be done in an **inert gas environment.**
- currently use highly cross-linked polyethylene produced by high-dose gamma irradiation with annealing


A
Highly congruent surface
10mm Ant. lip
5mm Post. lip
Ant.
Post.
B
Post
Ant.
Post.



Component Fixation:

- **Cement Fixation:**
  - TKA fixation with PMMA (**polymethyl methacrylate)** has a very strong well-supported history.
    - Cementless fixation with bone ingrowth has been less reliable.
      - Higher rates of failure.
      - Higher rates of osteolysis.
      - Higher rates of component loosening.

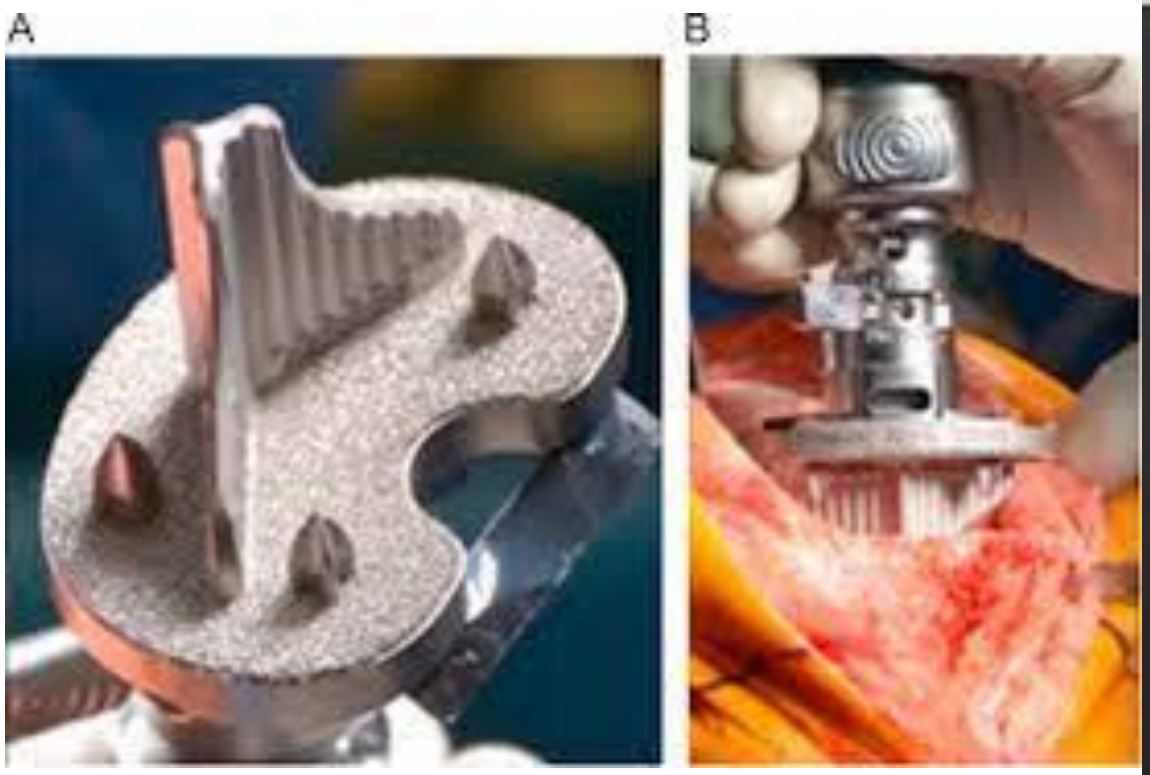


Fig. 3a

Fig. 3b

Surgical Approaches:

- Considerations:
  - Surgeon preference.
  - Previous incisions.
  - Degree of deformity (i.e. varus, valgus).
  - Patella baja.
  - Patient size (i.e. obesity).
- Incision considerations:
  - If multiple previous incisions→choose **most lateral incision**.*
  - Ensure **adequate skin bridges** (size controversial).
  - Safe to **cross transverse incisions at right angles**.

- Basic Cases (simple primary):
  - **Medial Parapatellar.**
  - **Midvastus.**
  - **Subvastus.**
  - **Lateral Parapatellar.**
  - Minimally Invasive.

- Complex Cases (difficult primary, revision):
  - May need to augment with **extensile exposures:**
    - **Quadriceps Snip.**
    - **V-Y Turndown.**
    - **Tibial Tubercle Osteotomy.**

- **Medial Parapatellar Approach**→MOST COMMON:
  - Advantages:
    - Most familiar to surgeons.
    - Great exposure.
  - Disadvantages:
    - Possible failure of medial capsular repair.
    - Increased risk of lateral patellar subluxation.
    - Less access to lateral patellar retinaculum.
    - Can jeopardize patellar blood supply with lateral release.

Technique:

- Incision→**midline incision.**
  - Knee in flexion- allows SC tissue to fall medial/lateral.
  - Length should be sufficient to prevent skin tension.
    - Risk of skin necrosis.
- Make a **medial skin flap.**
  - Keep it THICK, just superficial to extensor mechanism.
- **Arthrotomy:**
  - Leave a 3-4mm cuff of quadriceps tendon proximally.
  - Curve medial to the patella.
  - Extend distally 3-4cm on the tibia.
  - Remain MEDIAL to patellar tendon.

- **Extend knee + evert/sublux patella.**
  - Release **patellofemoral plicae.**
  - May need to develop a **lateral subcutaneous flap** to help with patellar eversion.
- **Medial release-** subperiosteal elevation of the anteromedial capsule +/- deep MCL.
- **Flex knee.**
- Improve exposure:
  - **Resect ACL, +/- PCL (for PS knee), anterior horns of menisci.**
  - **Remove osteophytes.**
  - **Resect infrapatellar fat pad.**

TKA Bone Preparation and Basic Steps:

- General principles:
  - **Appropriate component sizing.**
  - **Alignment to restore mechanical axis.**
  - **Plane balancing:**
    - **Saggital (flexion/extension gaps).**
    - **Coronal (medial/lateral, varus/valgus).**
    - **Patellofemoral joint tracking.**

- **Distal Femoral Cut:**
  - Alignment Instrumentation:
    - **Intramedullary alignment→**MOST COMMON.
      - Landmark→**a few mm medial to midline, just anterior to PCL origin.**
    - **Extramedullary alignment→**rare:
      - Indications:
        - Severe lateral femoral bowing.
        - Femoral nonunion.
        - Stenosis from previous #.
        - Hardware in-situ.

- Angle→**4-7^0 valgus**.
  - This places the cut perpendicular to the predetermined mechanical axis of the femur.
- Amount→usually aim to cut exactly the same amount of bone that is replaced by the prosthesis.
  - Flexion contracture→**resect additional bone.**

- **Anterior/Posterior Femoral Cut ("Sizing the Femur"):**
  - This determines the rotation (IR/ER) of the femoral component AND the shape of the flexion gap.
    - Excessive ER→widened medial flexion gap, flexion intability.
    - Excessive IR→patellofemoral maltracking (risk of lateral subluxation).
  - Angle→**3^0 External Rotation.**

- Cut at **3^0 External Rotation.**
  - 3 (or 4) methods:
    - **Transepidconylar:**
      - Line from the medial to lateral epicondyles.
      - This should be parallel to the cut tibial surface.
    - **Posterior Condylar Axis:**
      - Line running across the tips of the two posterior condyles.
        - This line is in 3^0 IR relative to the transepicondylar axis.
        - Therefore, cut in 3^0 of ER to produce a balanced flexion gap.

- This is not possible with:
  - **Hypoplastic lateral femoral condyle.**
  - **Severe degeneration of lateral femoral condyle (valgus knee, RA).**

- **AP Axis (Whiteside's Line)→MOST ACCURATE:**
  - Line from center of trochlear groove to the top of the intercondylar notch.
  - Perpendicular to epicondylar axis

- **Gap Technique:**

•Use the pre-cut tibial surface→cut should be parallel to this once the soft tissues have been balanced in extension.

- Amount (**Referencing):**
  - **Posterior Referencing**→the amount of posterior bone removed should equal the thickness of the posterior condyle of the femoral component.
    - Pros:
      - More accurate than anterior referencing.
      - Can specifically **determine amount of posterior bone cut.**
        - **BEST at flexion gap balancing**
    - Cons:
      - **Risk of anterior notching.**
      - **Risk of overstuffing PF joint**

•NOTE: If between sizes, use the LARGER size (prevent anterior notching)

- **Anterior Referencing→**the AP dimension of the femoral component should be equal to (or slightly) less than the measured AP dimension of the native knee.
  - Pros:
    - **Less risk of notching**.
    - **Less risk of overstuffing PF joint**
  - Cons:
    - **Risk of loose flexion gap**
    - Less accurate than posterior referencing.
  - NOTE: if between sizes, use the SMALLER SIZE

- **Complete anterior + posterior chamfer cuts on the femur:**
  - Anterior→grand piano sign.
  - Posterior→protect MCL/LCL + popliteal.

  - **Cut intercondylar box** (ONLY FOR PS KNEE).

- **Tibial Cut:**
  - Alignment Instrumentation (controversial):
    - **Extramedullary Alignment.**
    - **Intramedullary Alignment:**
      - Possible concerns regarding **fat embolism syndrome** (controversial).
        - Risks reduced with fluted rod + oversized drill hole.
  - Angle→**perpendicular to mechanical axis.**
  - Slope→**0-7^0 of slope:**
    - Note:
      - More slope in a CR knee because still have PCL as a flexion stabilizer.
      - Less slope in a PS knee because do not have PCL as a flexion stabilizer.

- Amount→**typically 6-10mm** off the UNAFFECTED (high) compartment.
  - **Don’t move >8mm.**
- Must maintain the joint line- measurement of the joint line:
  - **15mm proximal to head of fibula.**
  - **3cm distal to Medial epicondyle.**
  - **2.5cm distal to Lateral epicondyle.**
  - **Level of the meniscal scar.**
  - **1 finger distal to inferior pole of patella in extension.**

- At this point **PLANE BALANCING IS PERFORMED.**
  - Refer to below.
- **Patellar Preparation:**
  - Do not leave less than 13mm thickness.
  - Place component superior + medial.
  - Resect lateral osteophyte.
- Once satisfied with balancing→**trial components.**

- **Final Components:**
  - **Insert femoral autograft bone plug.**
    - Shown to DECREASE blood loss by 20-25%.
  - Note: insert tibial autograft bone plug if intramedullary instrumentation used.
  - **Pusaltile lavage irrigation**→NS + antibiotic/antiseptic solution (i.e. bacitracin).
  - **Dry surfaces with clean sponges.**
    - Avoid soft tissue/blood mixing with cement.

- **Implant Tibial Tray-** cement onto the prosthesis and/or bone.
  - **Impact + remove excess cement.**
  - Rotation:
    - **Center tibial component over the junction of the medial + middle third of the tibial tubercle.**
- **Implant Femoral Component-** cement onto prosthesis and/or bone.
  - Note: DO NOT apply cement to posterior femoral condyles.
    - MUST apply to the prosthesis→limited access to the posterior compartments once the prostheses are in place- this limits cement extrusion.
  - **Impact + remove excess cement.**

- Insert **thick PE spacer and keep knee in extension** while cement hardens.
- **Implant Patellar Component-** cement onto prosthesis and/or bone.
- **Impact + remove excess cement.**

- **Wound Closure:**
  - **Release tourniquet after prosthesis implantation.**
  - **Cauterize bleeding.**
    - +/- Pack the knee with sponges to obtain hemostasis.
      - Remove sequentially.
  - Position knee at 30-40^0 of flexion:
    - **Close arthrotomy incision:**
      - WATER TIGHT.
    - **Approximate SC.**
    - **Close skin.**
  - Drains:
    - **Patients with drains have more blood loss and are more likely to need transfusion.**
    - HOWEVER, patients without drains need dressing reinforcement more often.

- **Gap Technique:**
  - Use the pre-cut tibial surface→cut should be parallel to this once the soft tissues have been balanced in extension.
  - Insert a **spacer block.**
    - Test gap in extension and flexion.
  - Perform **soft tissue releases** to balance the gap.
  - Ensure all **posterior osteophytes are removed.**

- Errors:
  - Internally rotated Femoral component:
    - Increases Q angle + tightens medial compartment in flexion.
  - Medialized Femoral component:

    -Increases Q angle.

A Case Presentation

50 you M with medial sided knee pain

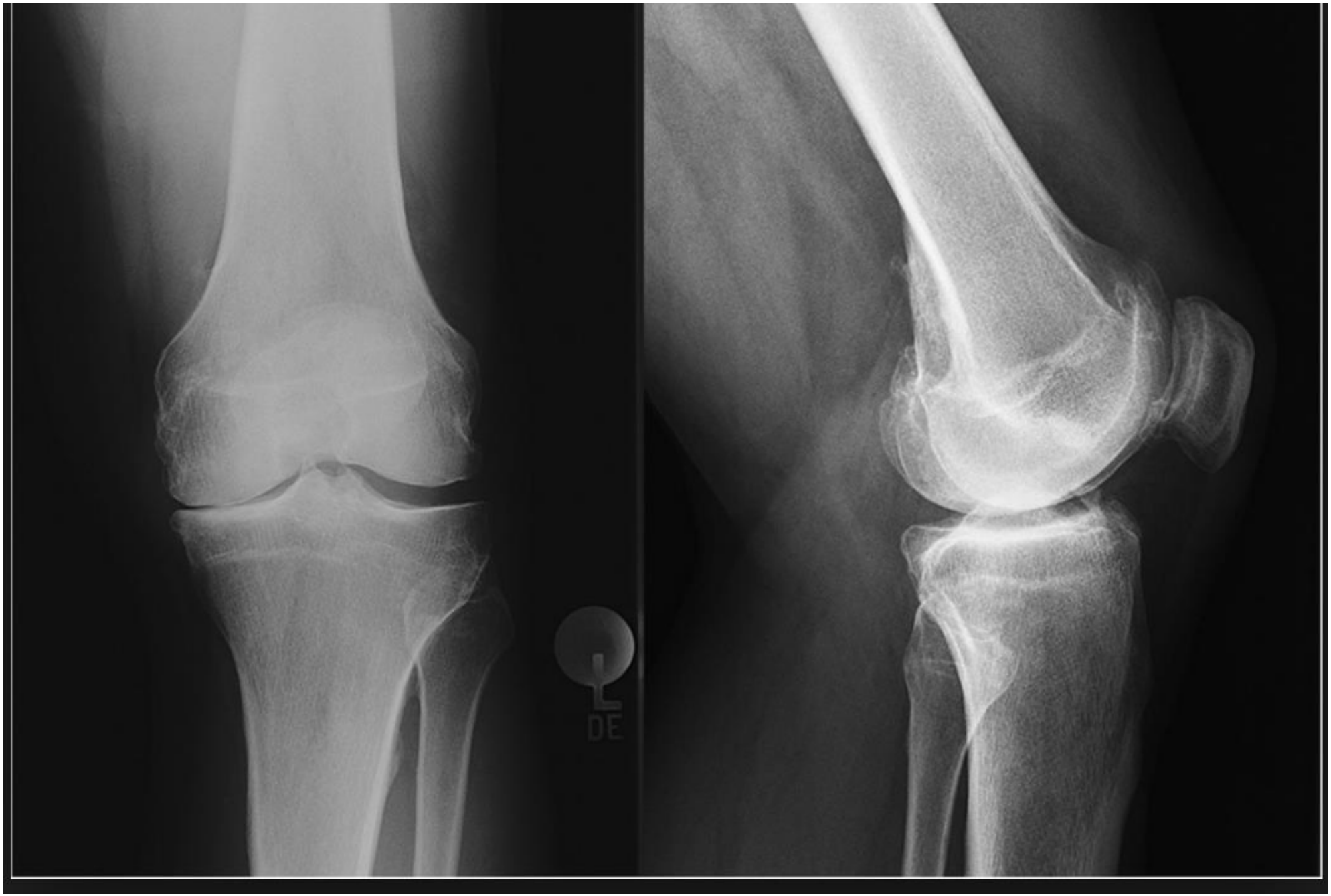
Ongoing for 2 years

Wakes him up at night at times

Affects his activity level

PMHx – GERD

Meds- none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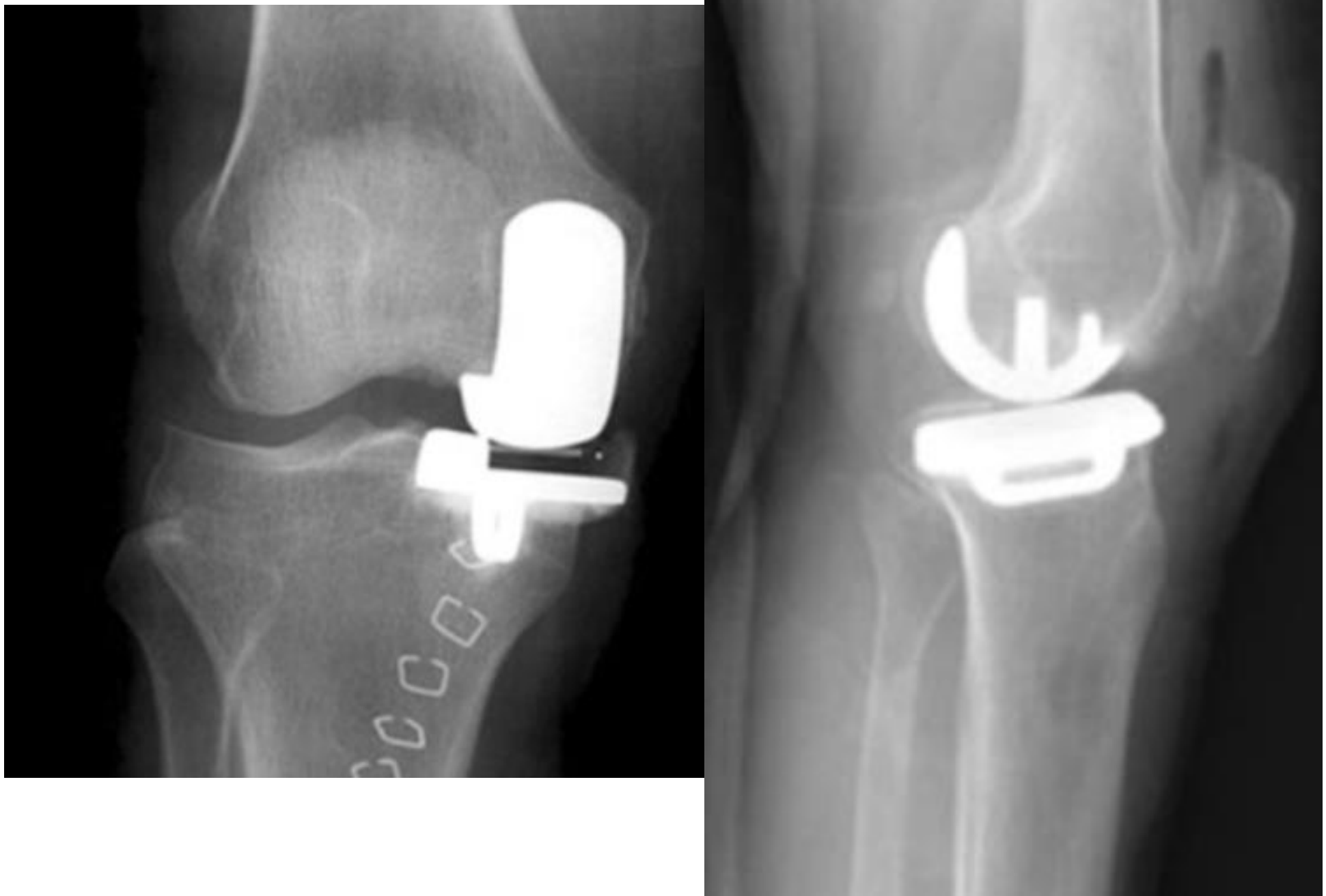
1. What non surgical and surgical treatment would you offer?

2. Which would you choose?



3. What are the contraindications for unicompartment Knee arthroplasty?

4. What are the benefits of Uni vs TKA?

2 Month post op patient seen in emerg

Pain difficulty bending knee

Onset sudden

No trauma reported

You get xrays.

5a. Describe x-rays?

5b. Diagnosis?

6a. How would you like to proceed?

6b. Please comment on x-ray

Patient leaves to another country for many years, comes to your clinic years later with ongoing knee pain in the same side the Uni performed.

Getting worse

The knee was great but now finds the pain too much

Failed NSAID and Tylenol use

7. Describe x-rays?

8a. Diagnosis?

8b. How would you like to proceed?

9. What surgical difficulties can you foresee in this case and how would you prepare for them?