KING SAUD UNIVERSITY

COLLEGE OF MEDICINE

FIRST YEAR

PBL; THIRD CASE

Knee Injury

Done by:

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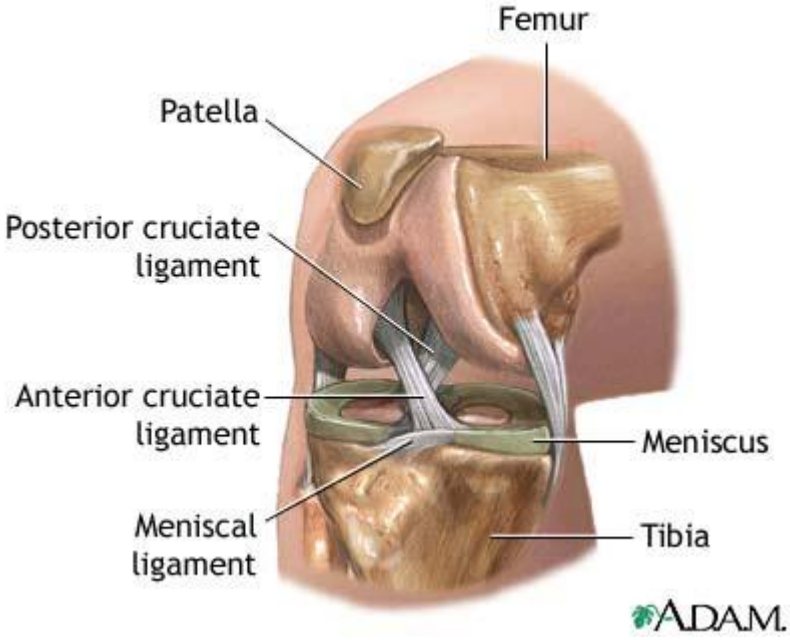
Anatomy of knee joint:



"The knee is the largest joint in the body.The femur, tibia, and patella combine to create a complex joint. This complex joint is comprised of three articulations: two tibiofemoral articulations (joints between bones or cartilages that are immovable when the bones are directly united) and one patellofemoral articulation.

The two tibiofemoral joints are created by the condyles (articular prominences of bones) of the femur and plateaus of the tibia. The medial and lateral condyles of the femur roll and glide across the medial and lateral meniscus (fibrous cartilage within a joint) respectively.

The knee joints contain two C-shaped fibrocartilage structures, **medial and lateral menisci**, that are attached to the medial and lateral tibial plateaus respectively. The two menisci help stabilize the joint by deepening the articular surface of the tibia. They also aid in the absorption of shock and the transmission of force by increasing the articular surface area, produce synovial fluid (a source of nutrients and lubrication to the joint), and help prevent the condyles of the femur from articulating directly on the tibial plateaus, which protects against friction wear of the femur and tibia."

(Original article is derived from:
http://www.experts.com/content/articles/IRSA1.pdf)

Recommended video: http://www.youtube.com/watch?v=fvTMzr3d_3s

Structure	Function
Anterior cruciate ligament (ACL)	Prevents excessive **anterior** translation of the tibia with respect to the femur.
Posterior cruciate ligament (PCL)	Prevents excessive **posterior** translation of the tibia with respect to the femur.
Medial collateral ligament (MCL)	Helps protect against excessive **valgus** forces on the knee.
Lateral collateral ligament (LCL)	Provides protection from excessive **varus** forces on the knee.

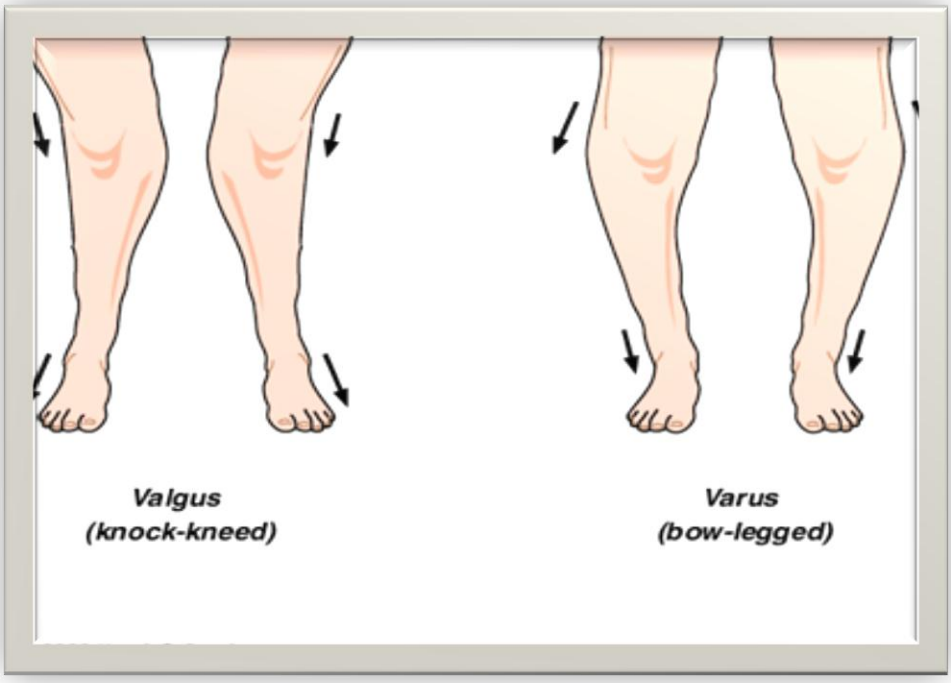
Note that:

The knee joint is crossed by **12 muscles** that stabilize the joint and produce the anatomical motions of the joint. These 12 muscles can be divided into three groups: the quadriceps femoris, the hamstring, and the unclassified group.

What's **valgus** and **varus**?

Valgus is an abnormal outward turning of a bone.

Varus is a deformity in which the distal part of a limb is turned inwards towards the midline

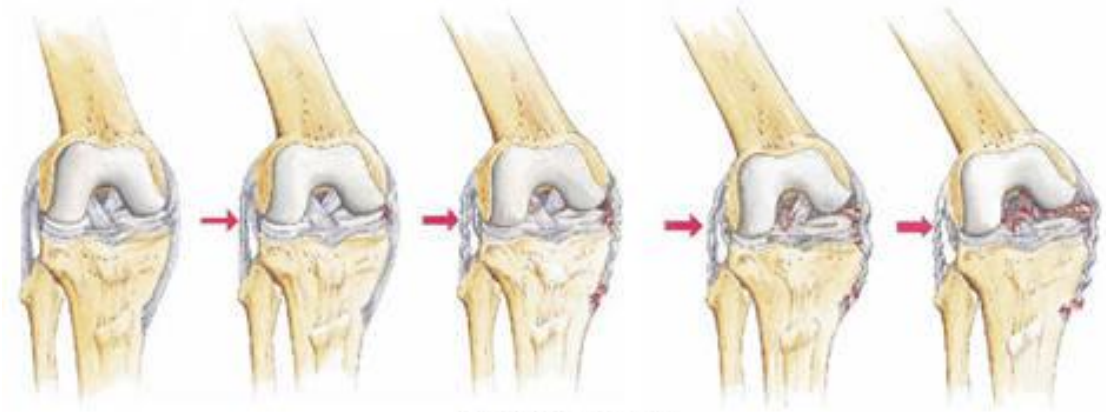


Most common types of knee injuries:

Type of injury	Cause
Meniscal Tears	Combination of compression of the knee joint (such as during weight bearing) in the presence of a rotary force and flexion or extension, or in the absence of synchronous rotation during flexion or extension.
Medial Collateral Ligament (MCL) Rupture	Direct **valgus** force applied to the knee, as well as by an external rotation of the knee joint.
Lateral Collateral Ligament (LCL) Rupture	A **varus** force applied to the knee joint.
Posterior Cruciate Ligament (PCL) Rupture	Created when a **posterior** force is applied to the head of the tibia while the knee is in flexion.
Anterior Cruciate Ligament (ACL) Rupture	Due to rotation, abduction, posterior translation of the femur with respect to the tibia, hyperextension, or dislocation of the knee joint.

VALGUS FORCE

توضيح:
Valgus force
هي القوة اللي تخلي
الساق منحنية على برا.



Notes:

- ➔ A MCL injury is usually **more severe** than a LCL injury. *(Because the medial collateral ligament is part of the joint capsule and is attached to the medial meniscus, while the lateral collateral ligament is not)*

- ➔ Injury to the posterior cruciate ligament most frequently occurs as a result of **motor vehicle accidents** and has been referred to as "the dashboard injury. (مثل بعض السواقين لما يجي يسوق يكون ثاني رجله فلما يحصل الحادث تحدث هالإصابة)

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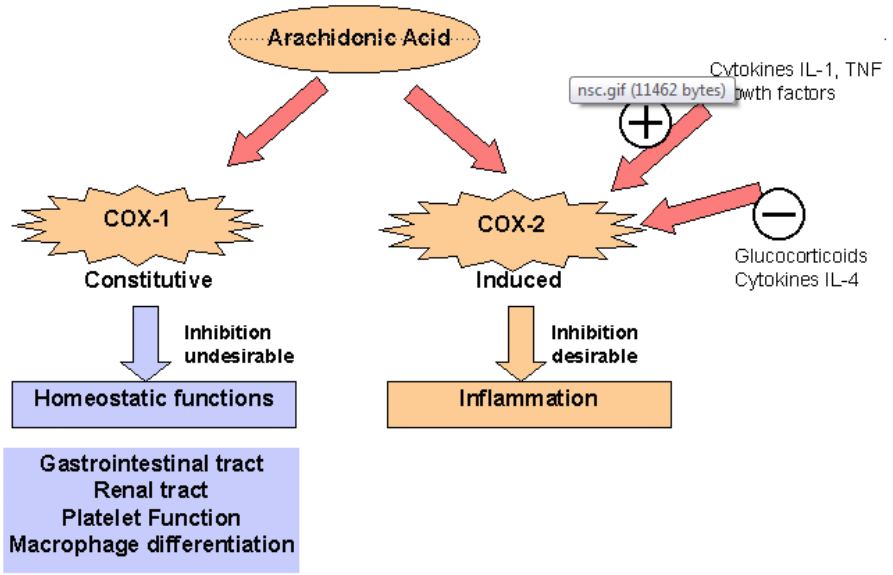
NSAIDs have multiple mechanisms of action, including inhibition of cyclo-oxygenase, competition with prostaglandin at receptor sites, and inhibition of WBC migration and of lysosomal enzymes from WBCs, etc.

-Main differences between cox1 and cox2:



The concept of the COX-2 to COX-1 ratio provides us with a mechanism to assess the balance of inhibition of the inducible COX-2. Analysis of these ratios and side effects of the older conventional non-steroidal anti-inflammatories show that the lower the ratio, the lower the COX-1 inhibition, and the lower the overall side effect profile.

Please back to the NSAIDs lecture.

-Management option of the patient:

Treatment

BY

Arthroscopy

then after the surgery we will choose an appropriate rehabilitation program

Arthroscopic:

Meniscal tear can be repaired with the arthroscope through two tiny (less than a half inch) incisions. The surgery can be performed on an outpatient basis in less than an hour.

For some patients, the surgery can be performed under local anesthesia with sedation so that there is minimal anesthesia risk. Occasionally, small stitches can be placed into the torn cartilage to sew it back together; this technique can successfully treat large tears in younger patients.

Here is a video shows Arthroscopic surgery:

http://www.youtube.com/watch?v=WuVHWZX91KY

-Role of long-term rehablation

- **Nonoperative Rehabilitation:** the principles of rehabilitation are to control swelling, protect the knee (bracing), reactivate the quadriceps muscle, and restore range of motion. Early weight bearing is encouraged as tolerated, using crutches as little as possible, with a goal of walking without a limp. Stationary biking is the preferred range of motion exercise, stimulating the ligament to heal faster. Time on the bike and resistance should be increased as tolerated by the patient. Side-to-side movement should be restricted until after 3 to 4 weeks to allow the adequate healing. Proprioceptive and balance activities can progress after clinical exam or valgus stress radiographs reveal healing. Athletes can often resume full activities within 5 to 7 weeks after an isolated sMCL injury.
- **Postoperative Rehabilitation:** Postoperative rehabilitation protocols for reconstructed or repaired medial knee injuries focus on protecting the ligaments/grafts, managing swelling, reactivating the quadriceps, and establishing range of motion. A safe range of motion ("safe zone") should be measured by the surgeon intraoperatively and relayed to the rehabilitation specialist to prevent overstressing the ligaments during rehabilitation. The ideal passive range of motion is 0 to 90° of flexion on postoperative day one after surgery and should be followed for 2 weeks, as tolerated, with a goal of 130° of flexion at the end of the 6th week. To protect the newly reconstructed ligaments, a hinged knee brace should be used. Swelling should be managed with cryotherapy and compression. Patellofemoral mobilization, quadriceps reactivation, and frequent ankle pumps are also utilized right after surgery to prevent arthrofibrosis. Non-weight bearing to touch-down weight bearing is recommended for the first 6 weeks, progressing to closed-kinetic-chain exercises thereafter. Light-resistance stationary biking is also started at 2 weeks and can be increased as tolerated. Gait mechanics are addressed when the patient is able to bear their full weight. The patient should be able to walk without limping or developing swelling in the joint. Rehabilitation can only move as fast as tolerated and effusion must be monitored and managed at all times to ensure good results. Once motion, strength, and balance are regained, plyometric and agility exercises are started at 16 weeks. Brisk walking for 1 to 2 miles should be well tolerated before the patient starts a jogging program. Return to sports may be assessed at this point, providing no functional or stability deficits are present. Rehabilitation should be supervised by a professional specialist working along with the surgeon. Protocols may be adjusted in the presence of concomitant ligament reconstructions or osteotomies. Valgus stress AP radiographs (mentioned above) are an excellent and cost effective way to monitor postoperative results and follow-up

Learning Objectives:

- ✓ Discuss the anatomy of the knee joint and the function of each anatomical structure.
- ✓ Discuss the possible mechanisms for an injury of the knee.
- ✓ Use basic science to interpret the patient's symptoms and clinical signs.
- ✓ Discuss the pharmacology of NSAIDs and the main differences between COX isoenzymes (COX-1 and COX-2).
- ✓ Form a brief management plan showing management options for a patient with a knee injury.
- ✓ Discuss the key principles for an educationally useful website.
- ✓ Discuss the role of long-term rehabilitation programs in injuries such as knee injury.

Best of luck,

Shaikha Al-Dossari and Mohammed Al-Ghammass