

Biomechanics of the knee joint

Biomechanics of the knee joint deals with the principle, ranges and mechanism of movement of this joint.

Articulatio genus (knee joint)

It is the most complex joint in the human body.

Compound joint

- articulation of two bones and two menisci;
- **The knee joint is composed of the following parts:**
 - femur;
 - tibia;
 - patella;
 - meniscus lateralis;
 - medial meniscus.

The femur and tibia are in contact with their two condyles. 2 menisci are inserted on the condyles of the tibia (*meniscus medialis et lateralis*).

Strengthening knee ligaments

1. lateral ligaments (ligamenta collateralia mediale et laterale);
 2. frontal ligaments (retinacula patellae, ligamentum patellae);
 3. back ligaments (ligamentum popliteum obliquum, ligamentum popliteum arcuatum);
 4. intra-articular ligaments (ligamenta cruciata anterior et posterior, ligamentum transversum genus, ligamentum meniscomemorale);
 5. vases small;
- strengthening ligaments are of great importance for knee stability.

Moves

Flexion and extension

- Knee flexion also includes a rotational movement.
- **Flexion has 4 phases:**
 1. initial rotation (knee unlock = flexion 5°);
 2. rolling movement (flexion 10°–20°);
 3. sliding movement (from flexion 20° to about 140°);
 4. final rotation (knee lock).

Rotation

1. inner (shorter move);
 2. external (longer movement);
- rotation is part of flexion;
 - unlocks and locks the knee joint.

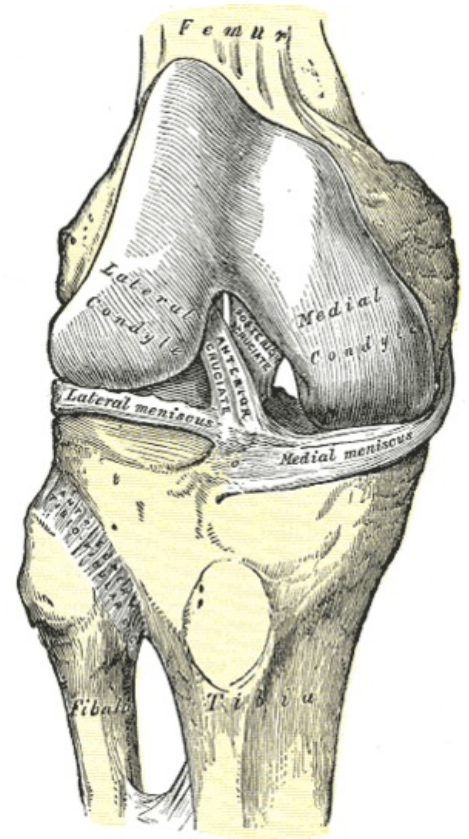
Flexion and extension are analogous movements in reverse order

- extension is considered a basic position;
- extended joint is firm and allows standing and walking;
- flexion up to 160° can be performed from the basic position;
- we also distinguish the middle position = the joint is in slight flexion, about 20°–30°.

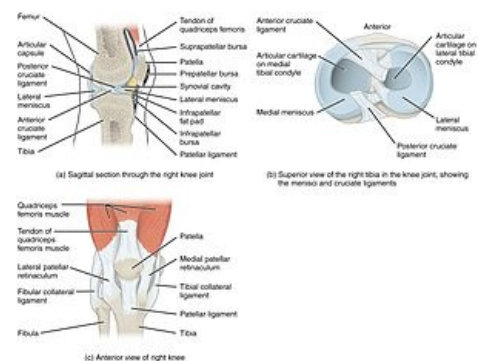
Overall movement of the knee joint

Initial rotation

- the internal condyle of the femur rotates externally;
- rotation is moderate - internal up to 17°, external up to 21°;
- initial rotation loosens the cruciate ligaments = unlocking the joint.



Articulatio genus



Knee joint

Rolling motion

- the condyles of the femur roll on the articular surfaces of the tibia and on the menisci;

Sliding Motion

- includes sliding movement and final rotation together = knee locking;
- the condyles of the femur together with the menisci slide backwards on the tibia.

Injury

- **Injuries occur most often in the following sports:**
 - football, skiing, handball, volleyball, tennis.
- The menisci are the most susceptible to injury - mainly the medial meniscus, anterior cruciate ligament, lateral ligaments.

Links

Related Articles

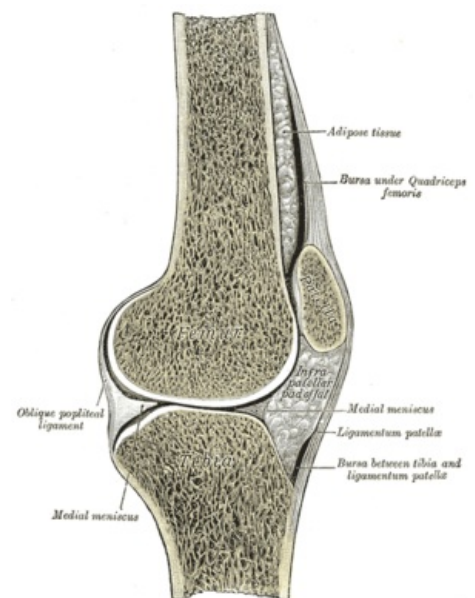
- Bones of the upper limb
- Joints of upper limb
- Bones of the lower limb
- Joints of the lower limb

External links

- Anatomina (<http://www.anatomina.org/>)

References

- ŠIHÁK, Radomír – GRIM, Miloš. *Anatomy*. 2nd, edit. and add edition. Prague : Grada Publishing, 2001. 497 pp. ISBN 80-7169-970-5.
- MARIÁNKOVÁ, Hana. *Anatomy and traumatology of the knee joint*. Brno, 2007,
- JANGLE, Mark. *An attempt to compare the forces acting on the knee joint in the squat and in the moderate squat in soccer players and table tennis players*. Brno, 2005,



Section of knee in sagittal plane



MRI knee