KNEE EXTENSOR MECANISM SURGICAL ANATOMY

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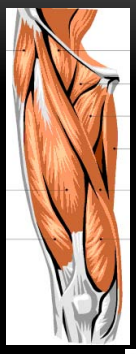
INTRODUCTION:

- Knee extensor mechanism is a complex anatomical structure:
- Gross anatomy is well described in classical anatomy textbook
- But fine anatomical details are also important to understand some of modern procedure
- But it's a real trap, because anatomical description could be to complex for a young fellow or resident or not so precice for a knee specialist, so I will try

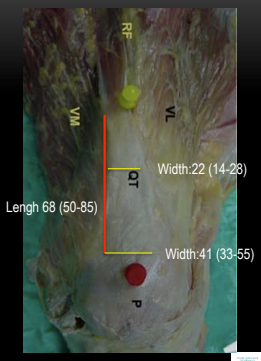
THE CLASSICS: QUADRICEPS MUSCLE

- **Well known , Nothing new …**
- **Four distinct muscle bellies:**
  - One bi-articular muscle :
    - Rectus femoris innervation: roots L2, L3 ,L4
  - Three monoarticlular muscle:
    - Vastus medialis innervation: roots L2, L3 ,L4
    - Vastus lateralis innervation: roots L3>, L2 ,L4
    - Vastus intermedius innervation: roots L3>, L2 ,L4
  - Vascularization: Profunda Femoris artery



QUADRICEPS TENDON

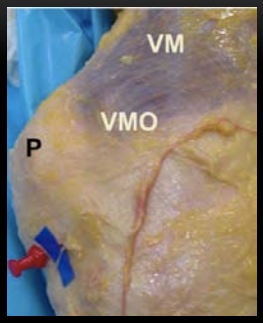
- More complex than in classics books
- The quadriceps tendon was normally trilaminar,
  - anterior layer = rectus femoris, directly on patella
  - intermediate layer =VM and VL
    - VL blended with the lateral patellar retinaculum : direct tibial insertion
    - VM: more distal muscle fibers
  - deep layer tendon of the vastus intermedius
- superficial fibers of this common tendinous attachment continue over the patella and become continuous with the patellar ligament



Andrikoula S et al, KSSTA(2006) 14: 214–220

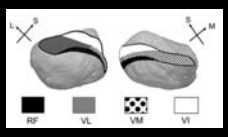
QUADRICEPS TENDON

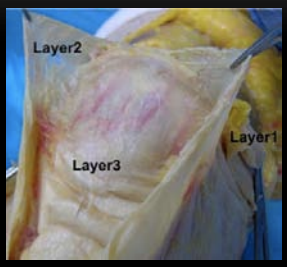
- Distal part of vastus medialis (more distal) is so called vastus medialis obliqus (VMO) and for some authors a separate muscle
- *« most distal fibers of the VM are almost horizontal as they pass anteriorly to the insertion into the common tendon and the medial border of the patella (P). »*
- Like the VL :, there's distal fibrous expansion that blended with the medial patellar retinaculum.



PREPATELALLAR FIBROUS SOFT TISSUES

- Three layers:
- superficial fascial layer:
- Intermediate layers (VM/VL/ Rectus femoris superficial fibers)
- Deep layer: rectus femoris





QUADRICEPS TENDON ANATOMICAL VARIATIONS

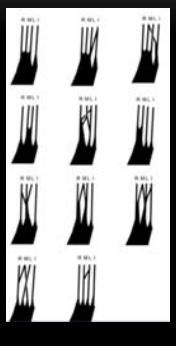
Zeiss J, Saddemi SR, Ebraheim NA.. AJR 1992;159:1031– 1034.

Two layers: 30%

Three layers: 56%

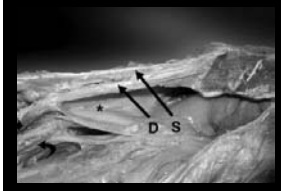
Fours layers: 5%

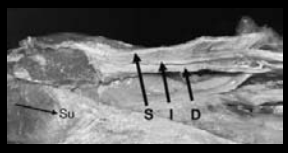
One layer : 7%



QUADRICEPS TENDON : CLINICAL RELEVANCE

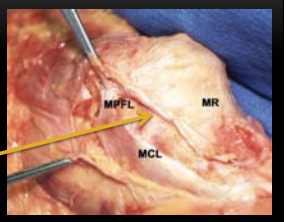
- Two or three layered quadriceps tendon:
  - Partial quadriceps tendon harvesting is possible:





MEDIAL PATELLAR RETINACULUM: LAYER I-II

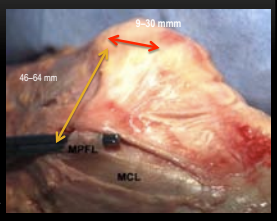
- I;II: Crural fascia, Medial retinaculum
- Fibers coming from
  - the crural fascia
  - the VMO tendon
  - and Quadriceps
  - which can only be identified independently in front of the MCL.



Warren LF, Marshall JL (1979). J Bone Joint Surg 61A:56–62

MEDIAL PATELLAR RETINACULUM: MPFL +++

- Between layer II and III
- Mediopatellofemoral ligament: (66,7 to 100%)
  - band of retinacular tissue
  - connected the femoral medial epicondyle
  - proximal two-thirds of the medial edge of the patella
  - 2parts: superior and inferior
  - Contribution to medial patellar stabilization: 50%.

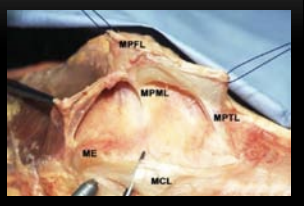


Near patella there's some fusion of the MPFL fibers to the fibers of the MR and VMO: dissection could be difficult

Amis AA et al , Knee. 2003 Sep;10(3):215-20.
Waligora et al;CORR (2009) 467:3297–3306

MEDIAL PATELLAR RETINACULUM: LAYER III

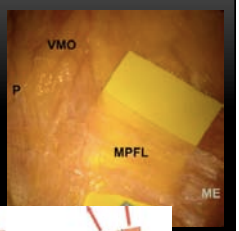
- Medio patellomeniscal ligament :
- connected the patella
- to the anterior horn of the medial meniscus
- Mediopatellotibial ligament: very thin
- Accessories patellar stabilizators
- Their contributions to static patellar stabilization was found to be
  - 24% for the patellomeniscal ligament
  - 13% for the medial patellotibial

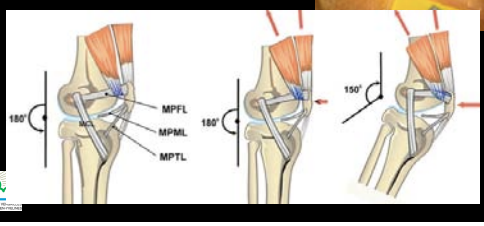


Panagiotopoulos E et al; KSSTA (2006) 14: 7–12

FUNCTIONNAL ANATOMY

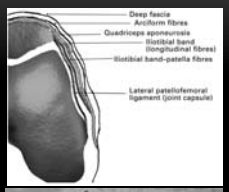
- During knee flexion:
- the MPFL, actively shortened by VMO pulls the patella into the patellofemoral groove at the initial (20°–30°) of flexion

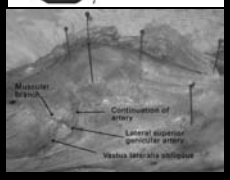




LATERAL PATELLAR RETINACULUM

- Two layers:
- superficial oblique retinaculum.
- deep transverse retinaculum : three structures:
  - transverse patellofemoral ligament (epicondylopatellar band)
  - the transverse retinaculum, (coursed directly from the ITB to the midpatella)
  - the patellotibial band,
- VASCULAR DANGER :
  - LATERAL SUPERIEIOR GENICULAR ARTERY





CONCLUSIONS:

- Learning anatomy should not concern only students;
- We must read not only biomechanical, clinical or surgical studies ; but also anatomical studies in the same journals

- Thank You !