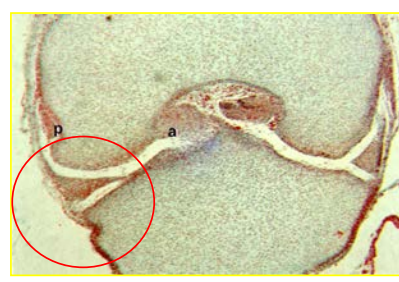
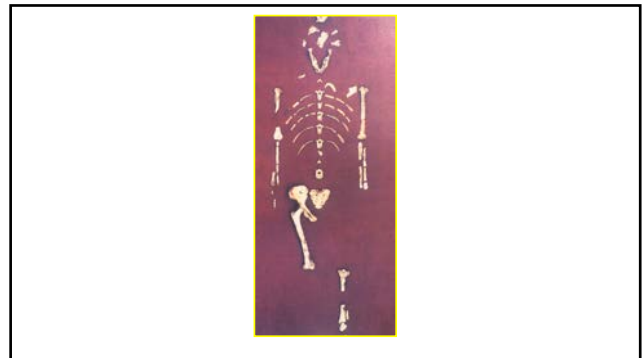


*Anatomie
Biomécanique*

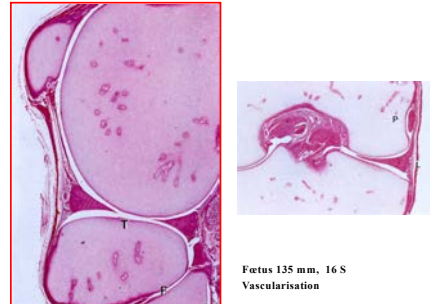
F. Dubrana

DIU : Brest 2022



Fœtus 50 mm , 10 s. Ménisque latéral et LCM

JM. ROGEZ



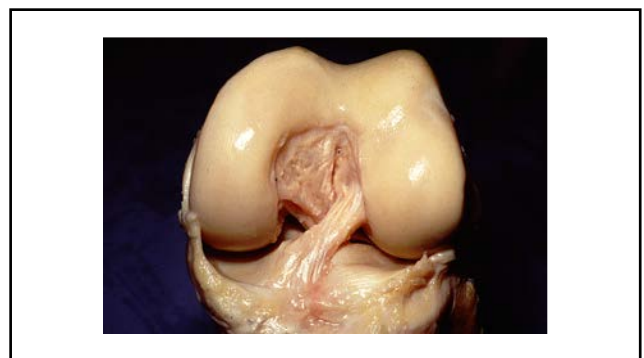
Fœtus 135 mm. 16 S
Vascularisation

JM. ROGEZ



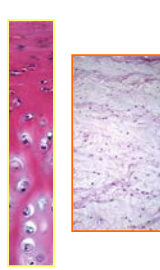
Fœtus 180 mm , 19 1/2 S .
Ménisque médial

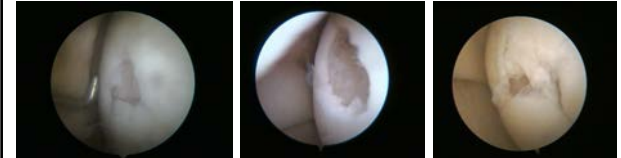
JM. ROGEZ

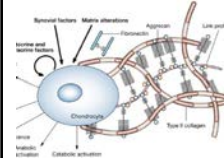


Les chondrones

- Chondrocytes et microenvironnement
- Unité fonctionnelle et métabolique
- Couche péricellulaire (collagène VI et IX)
- Intégrines: récepteurs (interactions MEC et transduction)

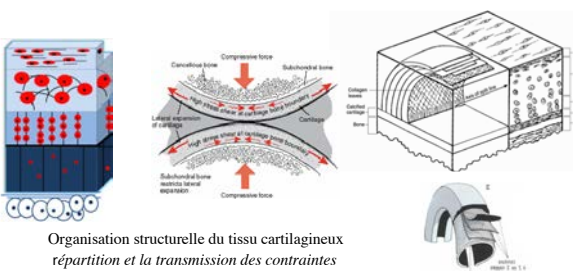







Chondrocytes

Organisation structurelle du tissu cartilagineux répartition et la transmission des contraintes




Régis Pailhé. Innovations relatives à l'évaluation du cartilage articulaire du condyle fémoral humain par une nouvelle modalité d'imagerie optique. Ingénierie biomédicale. Université Grenoble Alpes, 2017. Français.


healthy cartilage




grade 1

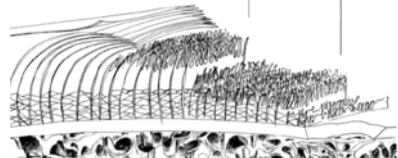


grade 2

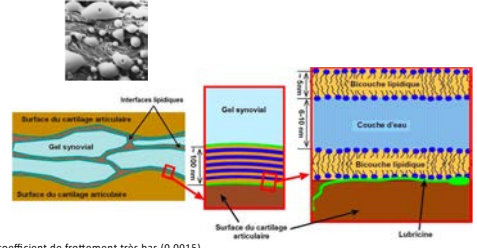


grade 3






Ana-Maria Tranjo D. MODELE BIO-TRIBOLOGIQUE DES ARTICULATIONS. ROLE MECANIQUE ET PHYSICOCHIMIQUE DES ASSEMBLAGES MOLECULAIRES DU FLUIDE SYNOVIAL. Sciences du Vivant [q-bio]. INSA de Lyon, 2002. Français



coefficient de frottement très bas (0.0015).

Modele bio-tribologique des articulations. Role mecanique et physicochimique des assemblages Moleculaires du fluide synovial. Thèse UMR CNRS 5514 - INSA de Lyon. 2006 Ana-Maria Tranjo



Exemples de rugosités absolues

Surface	Rugosité (microns)
Poli « miroir »	0
Verre courant	0,1
Surfaces polies	0,5
Tôle d'aviation	2
Excellente peinture au pistolet	5
Planche de bois rabotée	15
Peinture aéronautique de série	20
Acier galvanisé nu	50
Ciment bien lissé	50
Revêtement asphalté	100
Tôle galvanisée au bain	150
Avion mal peint au pistolet	200
Surface de fonte d'acier	250
Planche de bois brut	500
Surface de béton moyenne	1000

La rugosité absolue d'une surface, quant à elle, est prise comme la hauteur moyenne de ses aspérités, mesurée depuis le fond d'un creux jusqu'au sommet d'un pic (comme on mesure la hauteur des vagues, ce que les marins appellent le "creux").

Chondrocytes 1%
 (maintien MEC homéostatique
 faible concentration en oxygène à faible activité
 métabolique)

Matrice extracellulaire :
 Collagène type II (Type 9 et 11) ,
 Protéoglycane, eau

1/ Aggrecan core protein : 3 à 24 ans
 2/ Protéoglycane : ½ vie plus de 100 ans
 3/ Collagène : 100 ans

Articular Cartilage Aging: Potential Regenerative Capacities of Cell Manipulation and Stem Cell Therapy
 Roggenwala-Włodarczyk et al.
 Int J Mol Sci. 2018; Feb 22;19(2)

Traitement un challenge



Ch. HULET

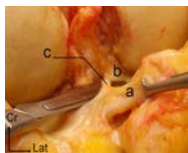
**Ménisques
 vue supérieure**

Ménisque externe **Ménisque interne**

HISTOLOGIE : TISSU COMPLEXE

- Cellules:
 - Semble se différencier selon leur localisation
 - Potentiel de cicatrisation?
- Vascularisation non homogène

**Meniscoligamentous band
between the posterior horn of the lateral
meniscus and the anterior cruciate ligament**



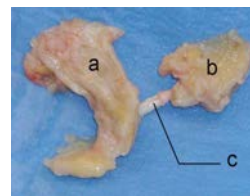
Surg Radiol Anat (2010) 32:129–133
A Zemirline, R Gérard, A Uguen, E Stindel, F Dubrana

Analysis of serie :

- 14 non-arthrotic knees of fresh non-injected cadavers (8 right and 6 left knees)
- Intact ACL always present
- 6-mm long and 2–3-mm wide

Histologically :

- Oriented dense collagene
- Coverings by tissu compatible with a synovial membrane.
- The histological aspects compatibles with ligamentous tissu



**Microscopic view of dense regular
conjunctive tissue**



Histological transition between the dense conjonctif tissue (a) and the synovial membrane (b). This membrane (b) covers the meniscoligamentous band (a) and separates it from the intra-articular space (c)



RACINES

- Rôle capital des racines
- Importance de la continuité circulaire
- Ultrastructure identique mais biomécanique différente

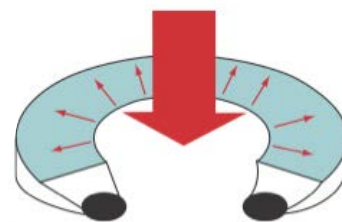
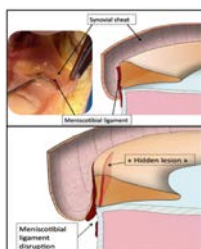


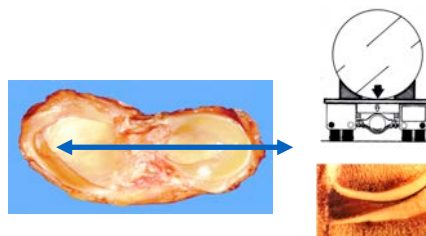
Fig. 4.2.1 The goal of meniscal repair is to restore the biomechanical properties of the meniscus by allowing the transformation of axial compression forces (large red arrow) into radially oriented force vectors (thin arrows). A prerequisite for this is that both the anterior and the posterior segments of the meniscus must be secured to the tibia (black dots) by the meniscotibial ligaments

LES ATTACHES DES SEGMENTS POSTÉRIEURS



B Sonnerby-Cottet, J Conteduc, J Thauvat, F-Y Gunepain, R Sell
Hidden lesions of the posterior horn of the medial meniscus: a systematic arthroscopic exploration of the concealed portion of the knee. Am J Sports Med. 2014 Apr;42(4):921-6.

Stabilisation des condyles sur le tibia



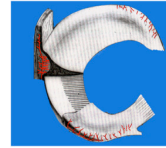
Forme triangulaire à la coupe

Rôle de cale stabilisatrice

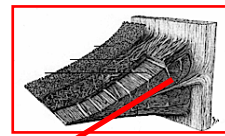
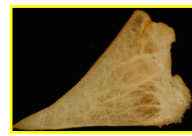
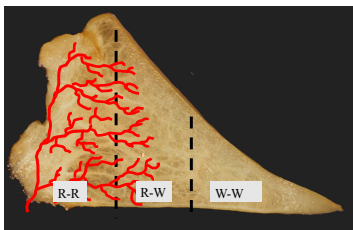
PARTICIPE À LA STABILITÉ

- In vivo, subluxation active plateau tibial médial
- Genou normal : 3,4 + 2,9 mm
- LCA isolé : 5,6 + 5,8 mm
- LCA + mén. méd. : 7,2 + 4,4 mm

PH. NEYRET (SFA 99)

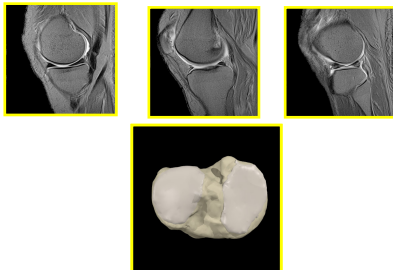


Vascularisation - innervation
uniquement périphérique

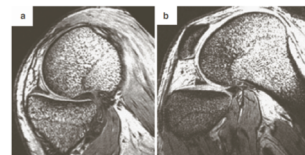


90% du collagène = type I
60% / 70% du poids
(lamellaire, radiaire, tie)

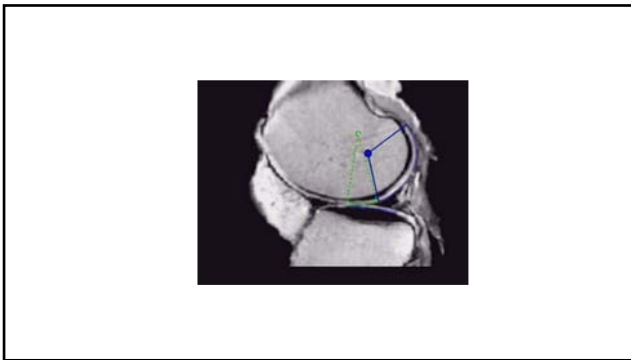
Extrémité supérieure du tibia



- Le ménisque latéral recule et ne rompt pas...(moins en tout cas)
- Importance de la l'intégrité du segment postérieur du ménisque médial → Stabilité



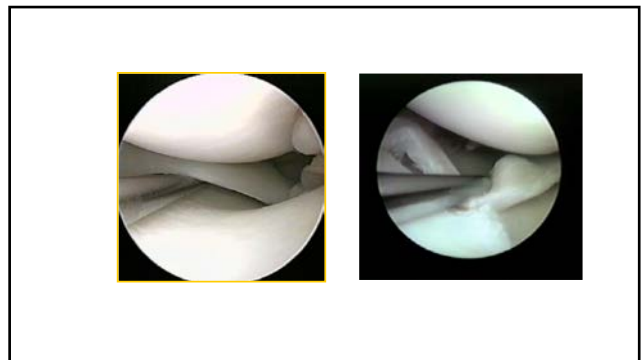
Yao J, Liancinese S, Hovinga K et al (2008) Magnetic resonance image analysis of meniscal translation and tibio-menisco-femoral contact in deep knee flexion. J Orthop Res 26:673-684



MÉMISECTOMIE

The diagram shows two cross-sections of a knee joint. The left one shows a normal meniscus, and the right one shows a meniscus after a partial meniscectomy. Below these are two heatmaps: the left one shows a normal distribution of stress across the joint, and the right one shows a significantly increased and concentrated area of stress on the femoral condyle after the meniscus is removed.

McDermott ID, Amis AA (2006) The consequences of meniscectomy – review. J Bone Joint Surg Br 88:1549–1556



CONCLUSION

A stylized illustration of a person in a white shirt and dark pants, holding a large, glowing blue letter 'C'. The person is standing on a white surface, and the background is white.

T. AIT SI SELMI

