

Tears of the Posterior Functional Segment of the Medial Meniscus – Four Pathophysiological Models (E-81)

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The following relationships exist:

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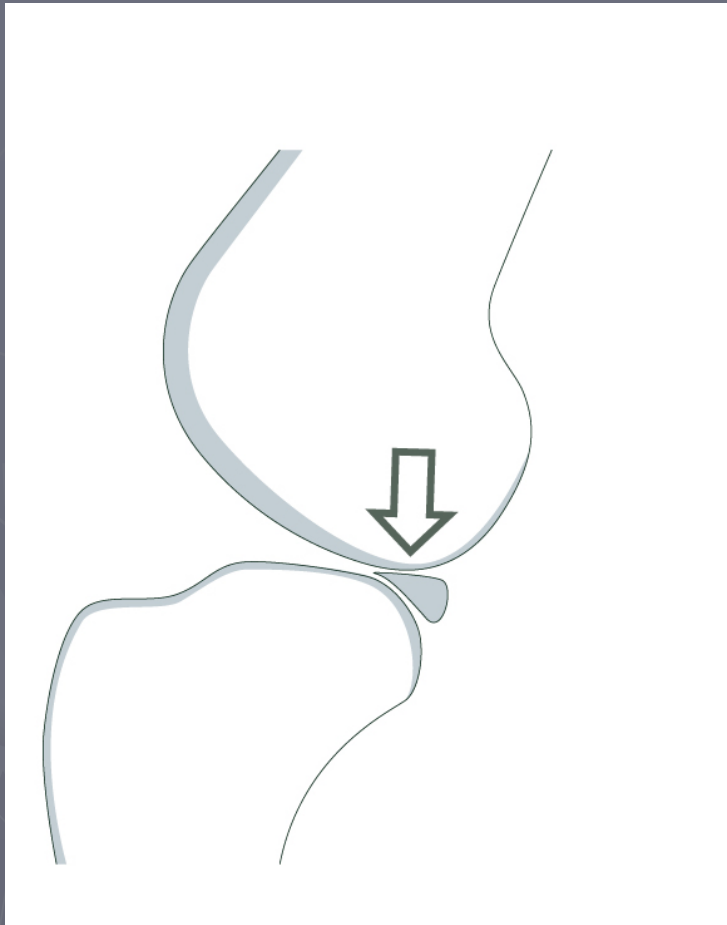
The Author is consultant for Synthes, Smith&Nephew and ITS

Form follows function

Julius Wolff (1836 – 1902)

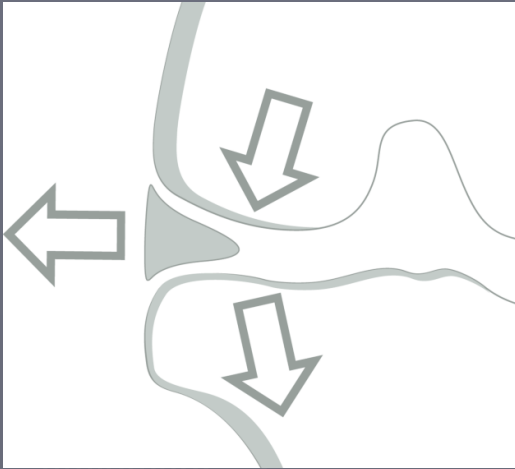
Mental models are constructs which, with the addition of verbal interpretations, describe observed phenomena. The justification is solely and precisely that they are expected to work
(John von Neumann 1903-1957)

The Instability Model:

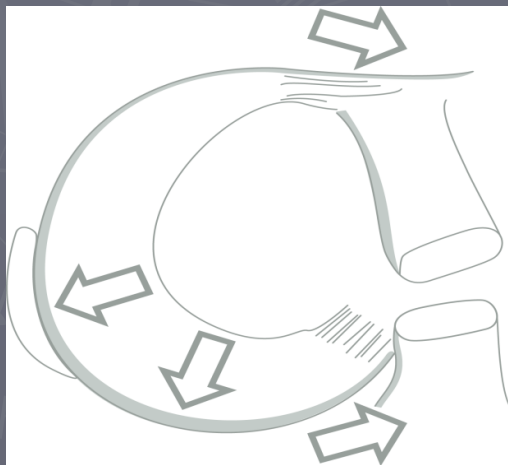


The anterior translation of the medial tibial condyle compresses the posterior horn leading to longitudinal tears and avulsion injuries of the posterior root of the meniscus. These tears can be seen in patients with ACL injuries.

The Peripheral Rim Failure Model (1) :

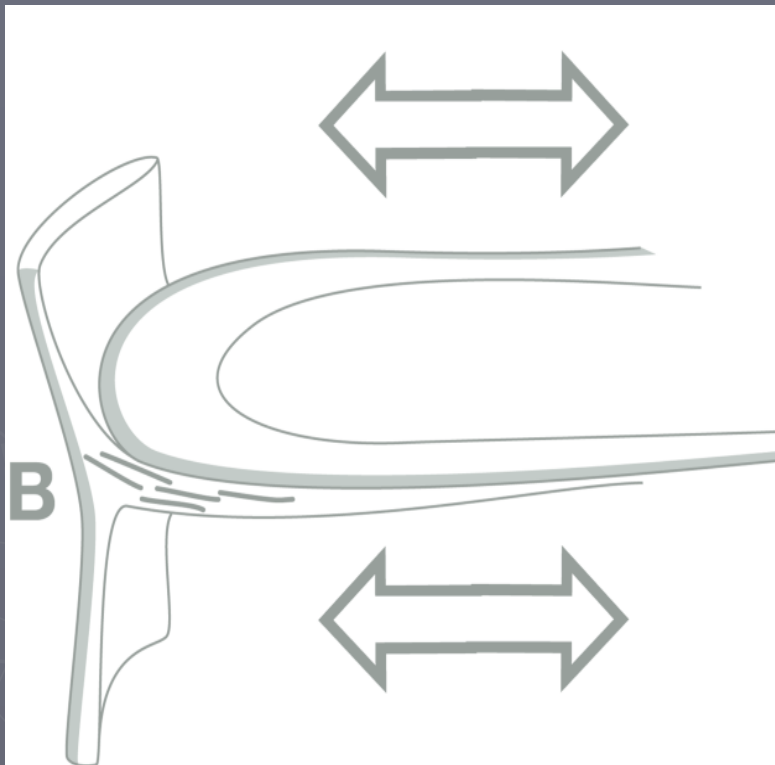


Under load the meniscus stays in place only, if the peripheral fibrous rim remains intact.



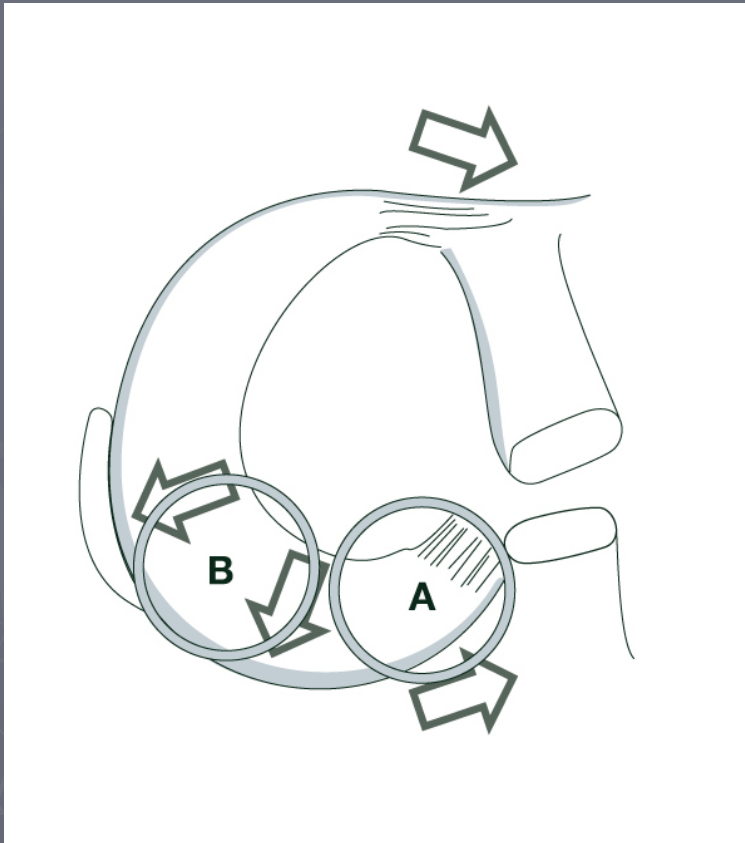
Everything else such as loose bodies or loose meniscal fragments are pushed out of the joint.

The Peripheral Rim Failure Model (2) :



The medial meniscus is firmly attached to the medial collateral ligament. There are two functionally different segments: anterior and posterior. Most tears are confined to the posterior functional segment.

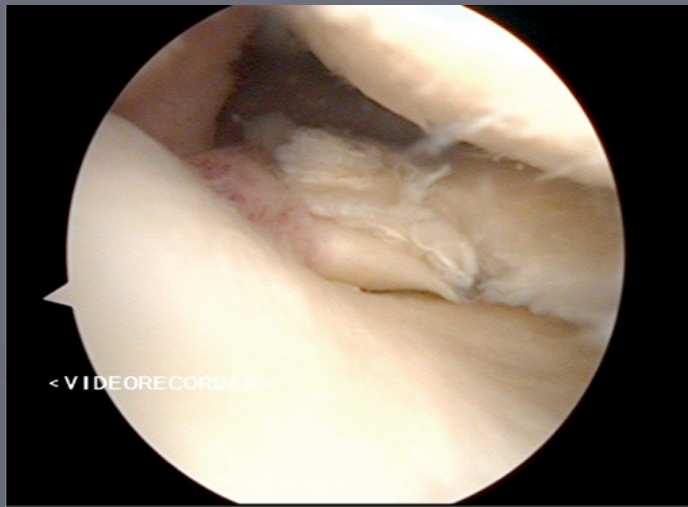
The Peripheral Rim Failure Model (2) :



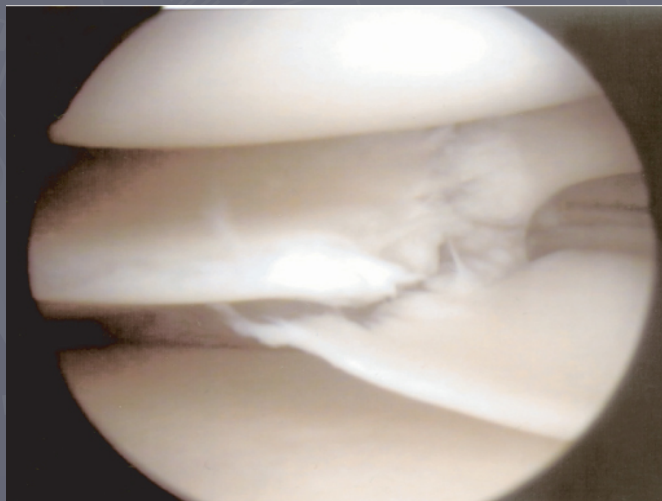
Loss of integrity of the peripheral meniscal rim occurs most often in two regions:

- A) Near the root
- B) At the posteromedial corner

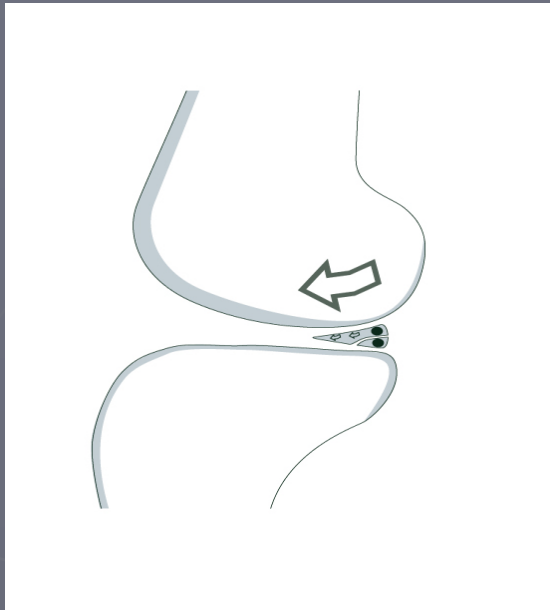
The Peripheral Rim Failure Model (3):



A) Near the root, where the unloaded part of the posterior horn continues into the loaded part.



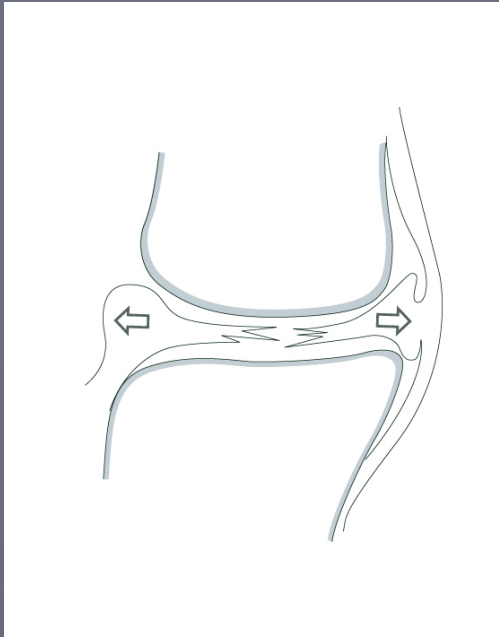
B) The area at the posterior margin of the medial collateral ligament.



The Horizontal Tear Model

Shearing forces during loaded flexion of the knee joint are the cause of horizontal meniscus tears. The tears start at the lower surface of the meniscus and split the longitudinal fibrous rim in an upper and lower bundle.





The Plastic Deformity Model

Through degenerative changes the meniscus softens and is mangled between the two condyles. The excess material forms pillow like structures at the peripheral sites.

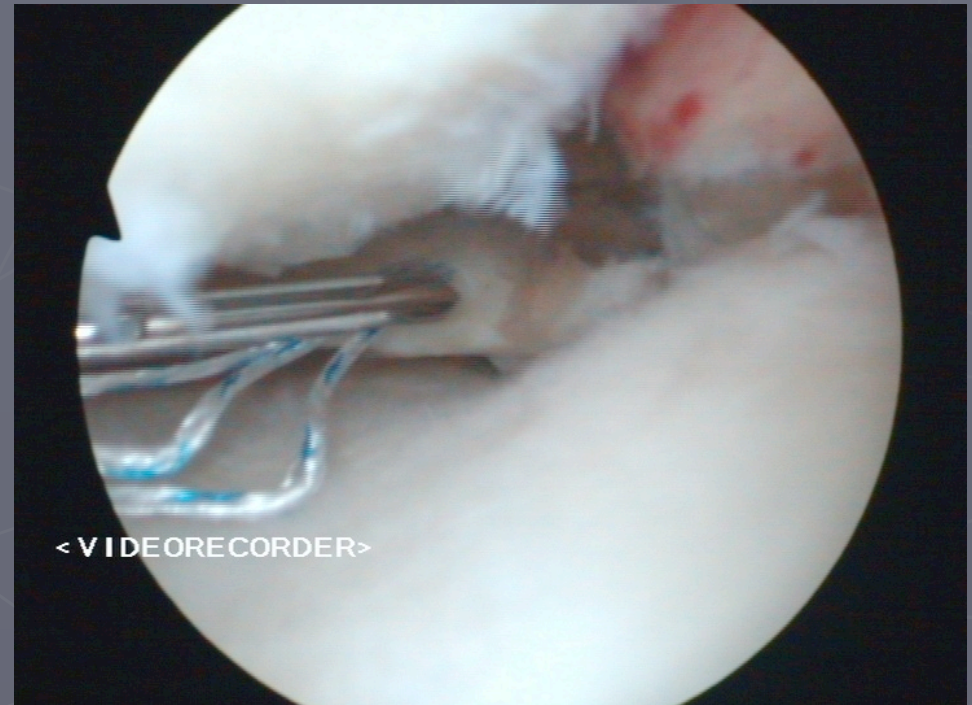
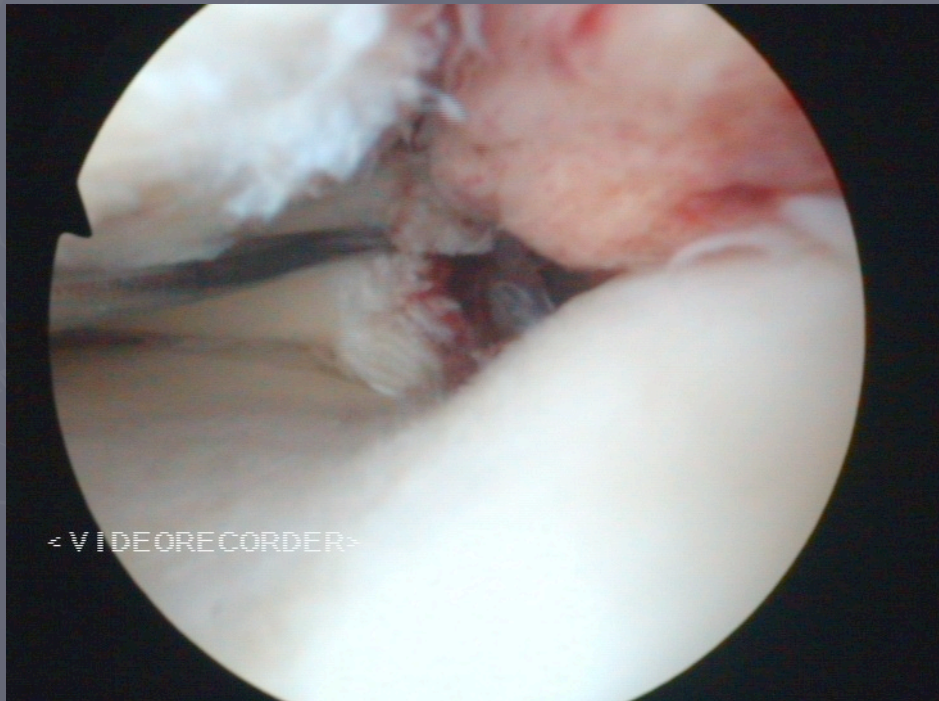


Discussion (1)

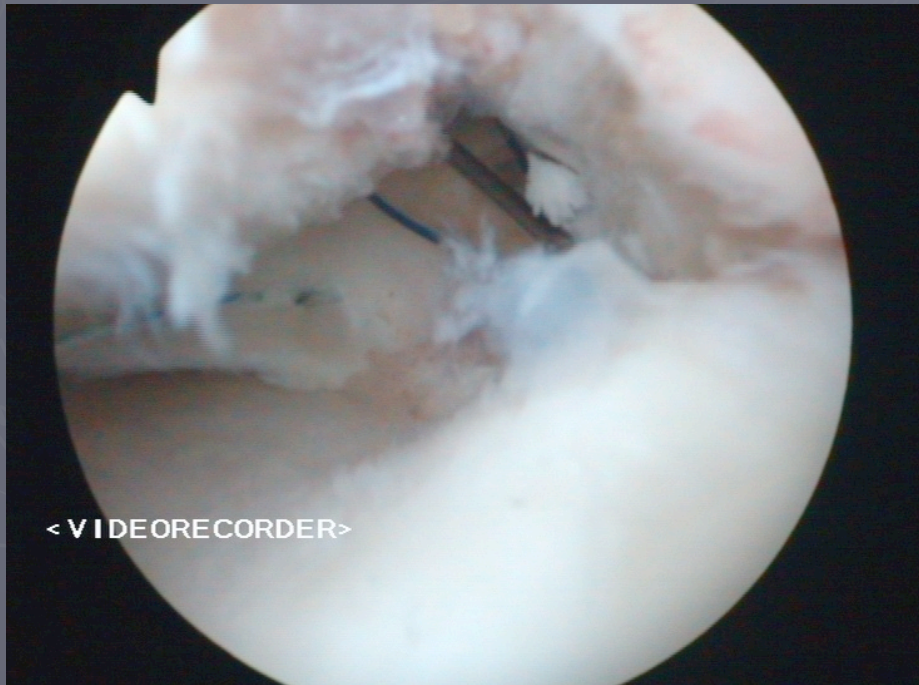
These four models can be combined and produce a variety fo complex meniscal tears.

Pheripheral rim reconstruction (PRR) and horizontal tear reconstruction (HTR) are new therapeutic principles giving hope to retain functional meniscal tissue in the joint and to slow down the process of degenerative arthritis.

Discussion (2): PRR with transosseous sutures of a left medial meniscus.



Discussion (3): PRR with transosseous sutures of a left medial meniscus.



Discussion (4):

HTR: Horizontal tear reconstruction in a medial meniscus of a left knee.



Summary:

Understanding meniscal pathology is the cornerstone for new ideas and therapies to help our patients. We introduced the instability model, the peripheral rim failure model, the horizontal tear model and the plastic deformity model. Peripheral rim reconstruction (PRR), and horizontal tear reconstruction (HTR) are new therapeutic principles waiting to be taken into clinical practice.