

# **The Mechanical Link between the Infrapatellar Plica and the Fat Pad**



## **Role in the Etiology of Anterior Knee Pain**

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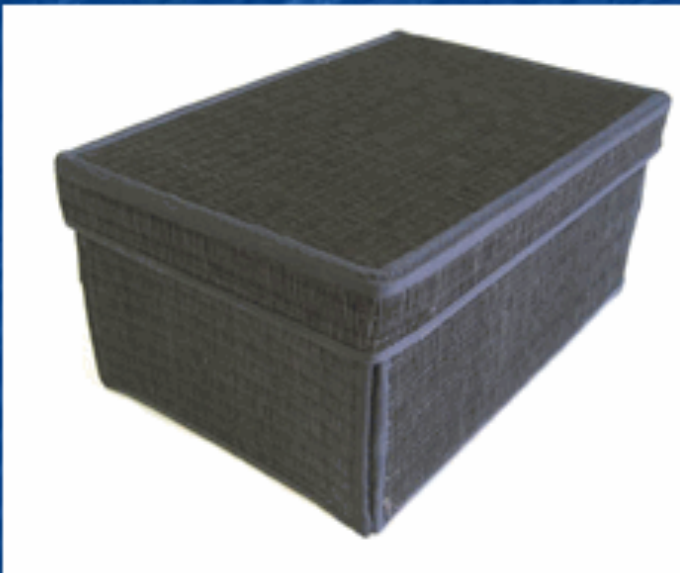
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**Kris Shekitka, MD**

# Disclosure

**The authors, T V Smallman, Amos Race, Kris Shekitka, have no financial arrangement or affiliation with commercial interests whose products or services may be mentioned in this activity**

# Is there a biomechanical explanation for the black box of anterior knee pain?

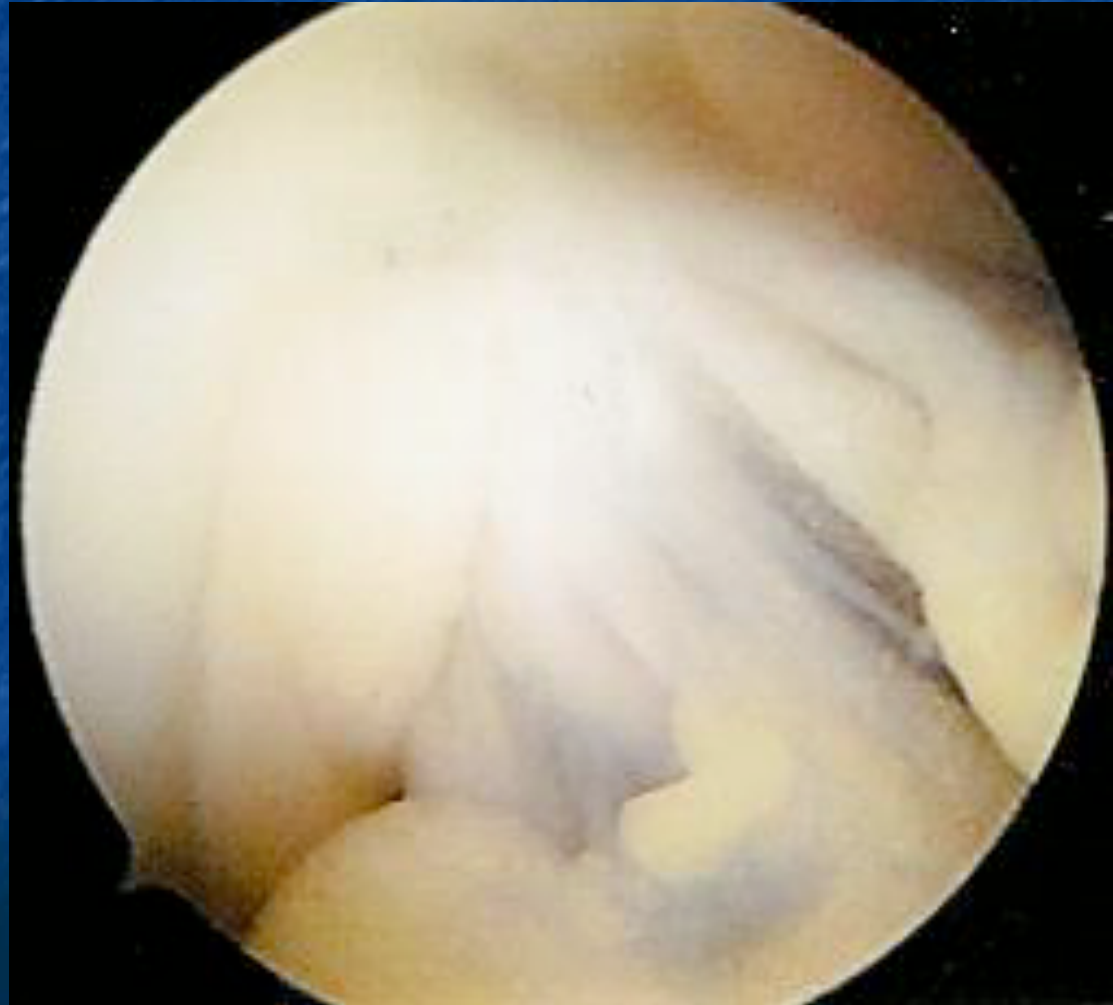


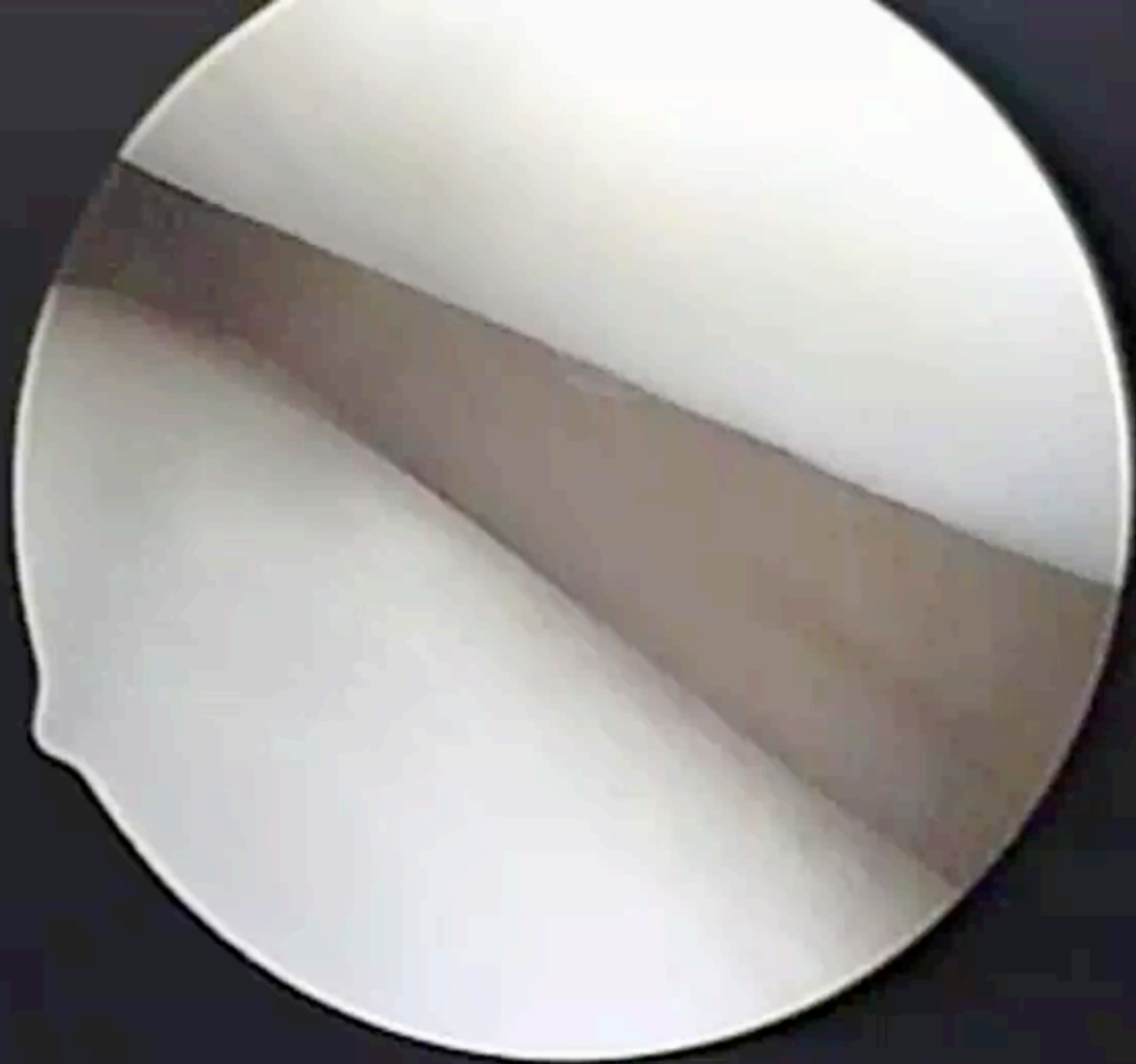
**Thinking  
“outside the box”  
of current dogma**

# WHERE THIS ALL BEGAN

Sentinel patient:

- Military triathlete
- Possible expulsion from the CF
- Arthroscopy
- Resection of plica





# Empirical observation: releasing the IPP “cures” anterior knee pain

- Supported by 4 reports on small series of patients
  - Boyd: Clin J Sport Med (2005) – 11 patients, 12 knees
  - Demirag: Knee Surg Sports Traumatol Arthrosc (2006) – 14 patients, 14 knees
  - Kim: *Arthroscopy: The Journal of Arthroscopic and Related Surgery* 2002 – 2 separate reports, total 3 patients, 3 knees

# DOGMA

**“...It is generally agreed that the infrapatellar plica does not cause symptoms...” references by:**

- **Hardaker W, et al: Diagnosis and treatment of the plica syndrome of the knee. *J Bone Joint Surg Am* 1980**
- **O’Dwyer KJ, Peace PK. The Plica Syndrome *Injury* 1988**

**FACT: no clinical paper documents this opinion.**

# HISTORY- MISSING DATA

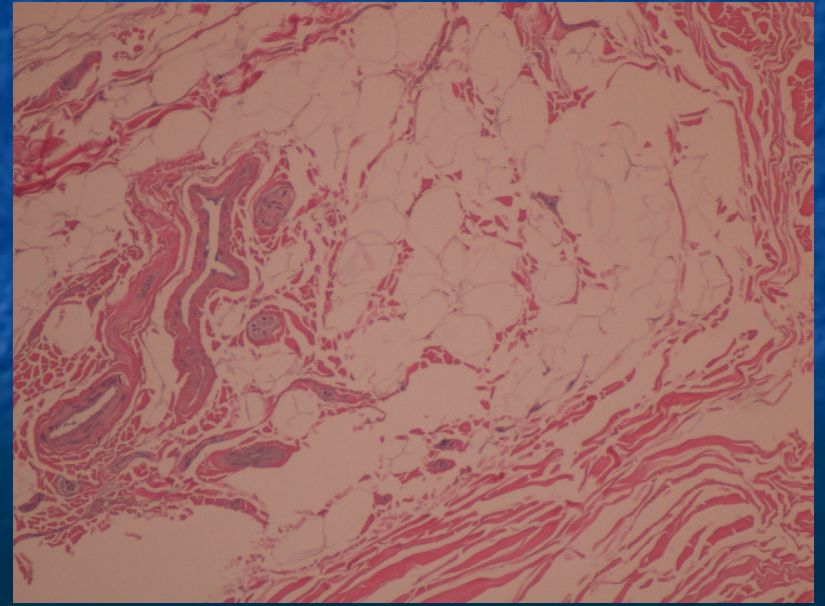
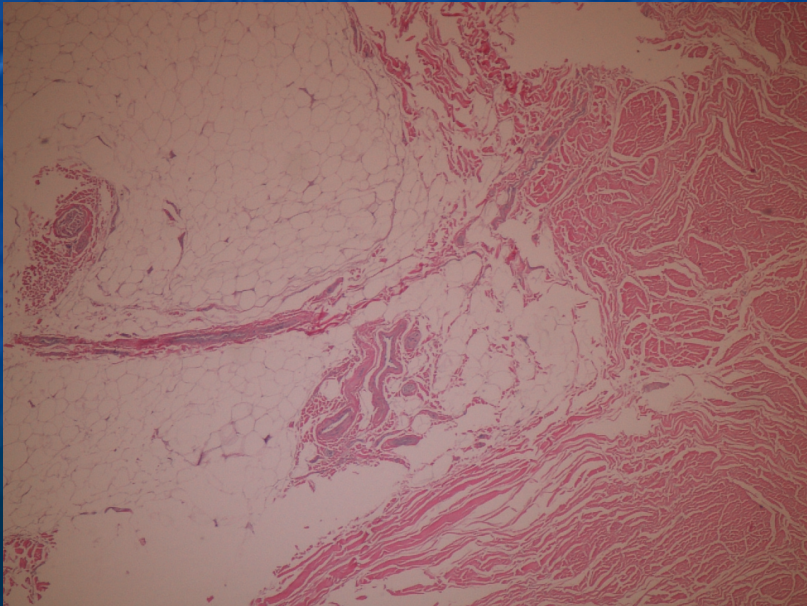
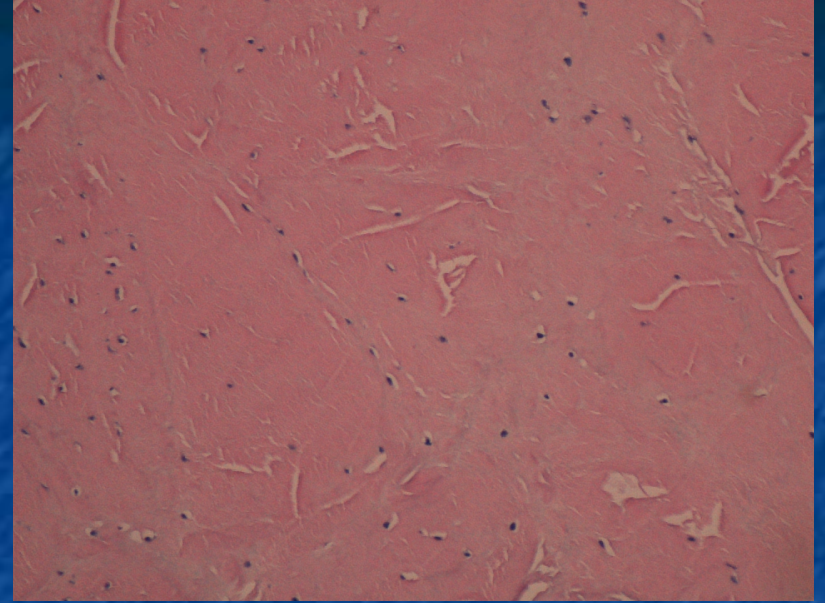
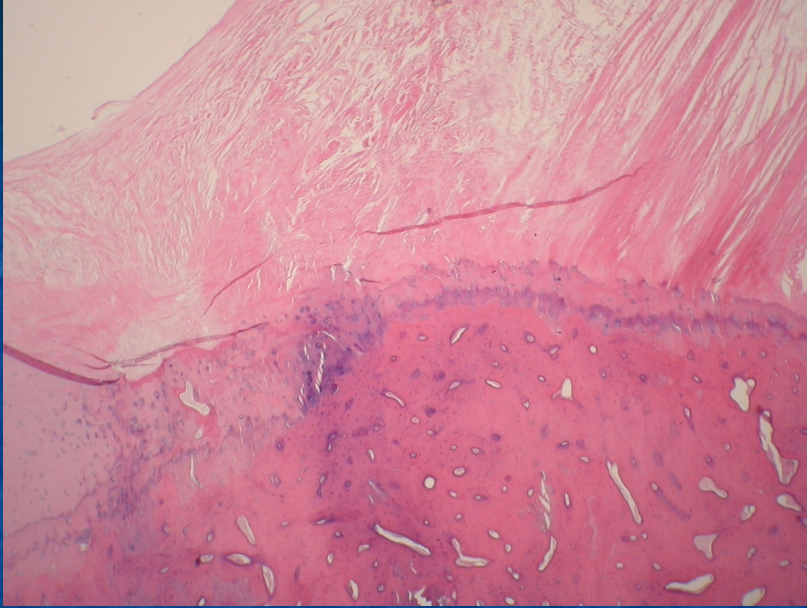
- **IPP HISTOLOGY – Wachtler: Die Plica synovialis infrapatellaris beim Menschen**
  - Acta Anat (Basel) 1979
- **FP HISTOLOGY – Gallagher: The infrapatellar fat pad: anatomy and clinical correlation**
  - Knee Surgery, Sports Traumatology, Arthroscopy, 2005, 13, 4, 268-272



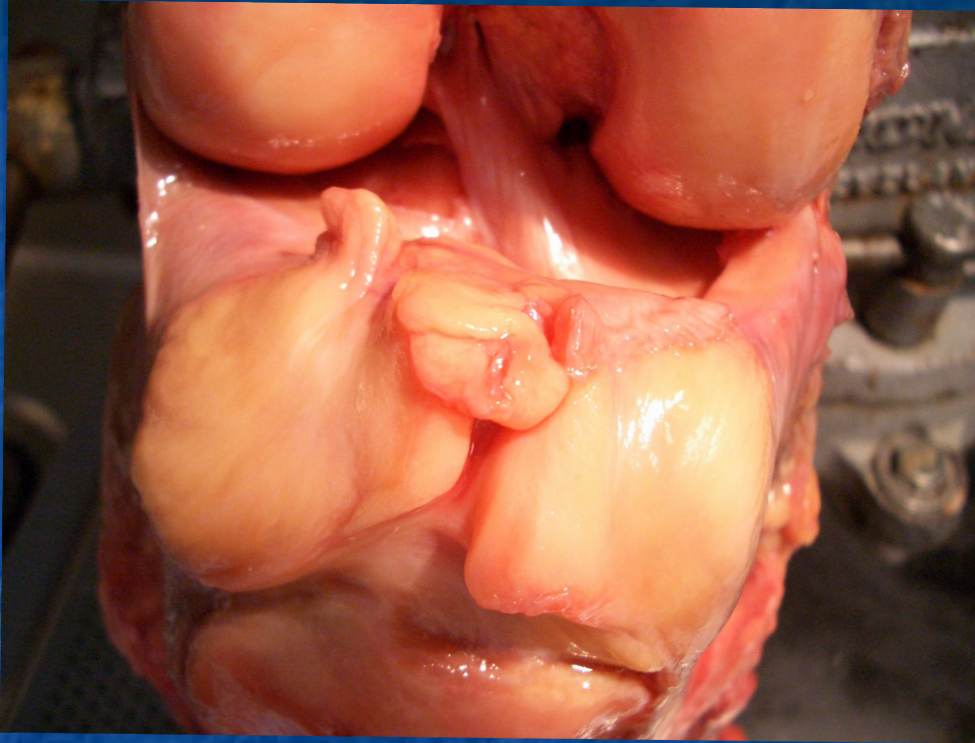
# **BIOLOGICAL FACT**

*Structure and Function are Linked*

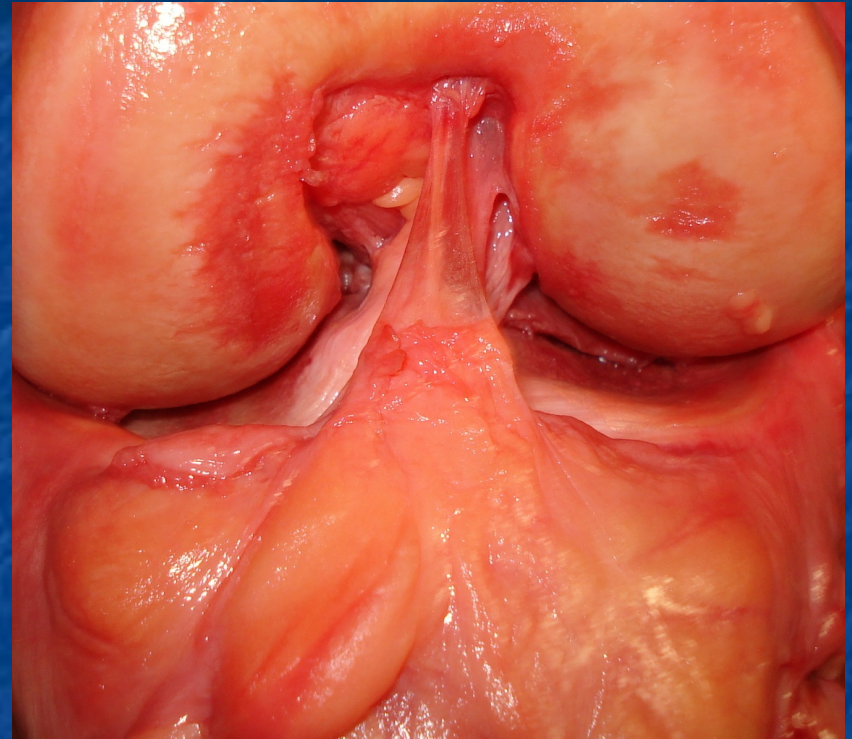
# IPP HISTOLOGY – MISSING DATA



# IPP/FAT PAD GROSS ANATOMY -- MISSING DATA



Unconstrained

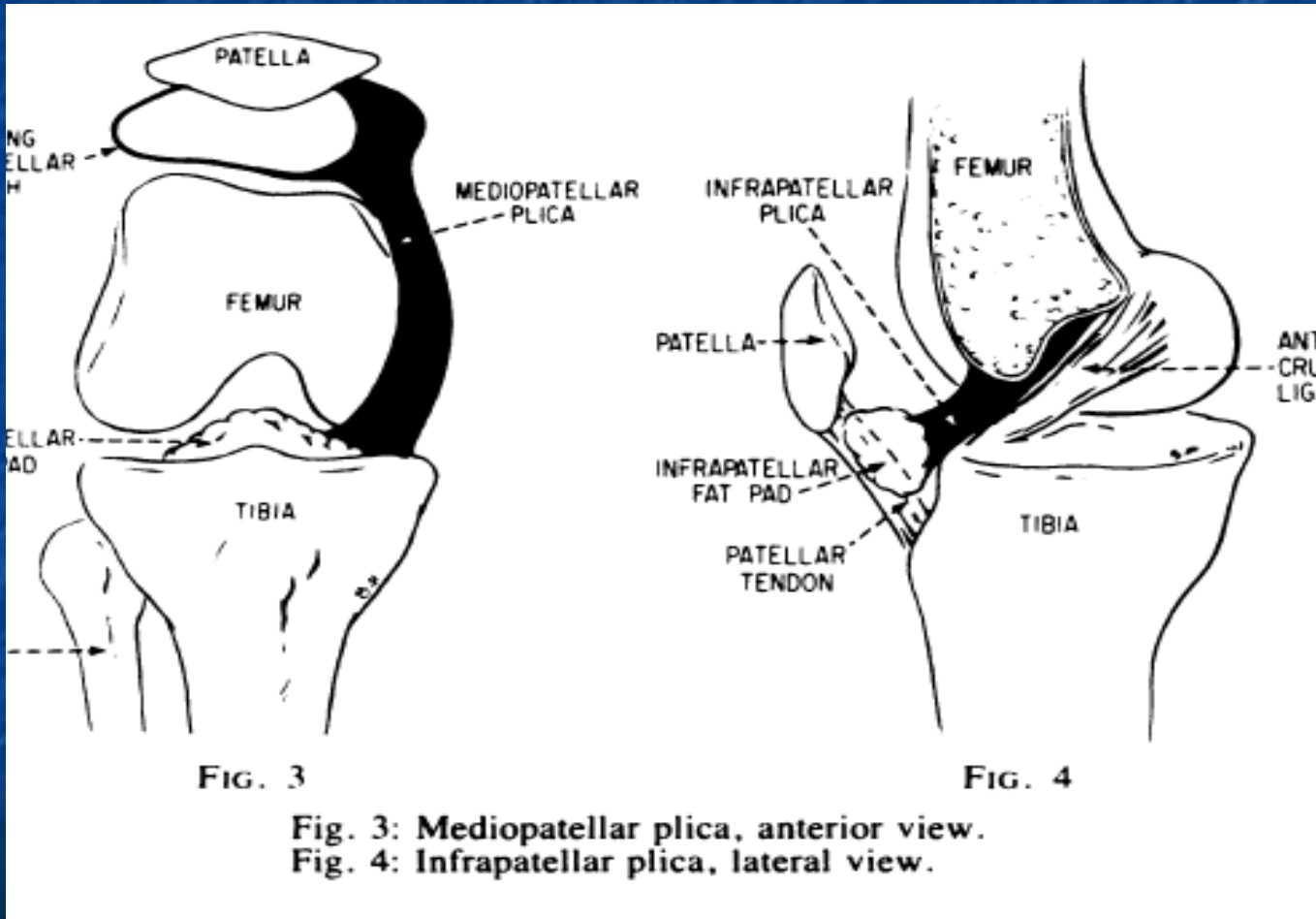


Constrained

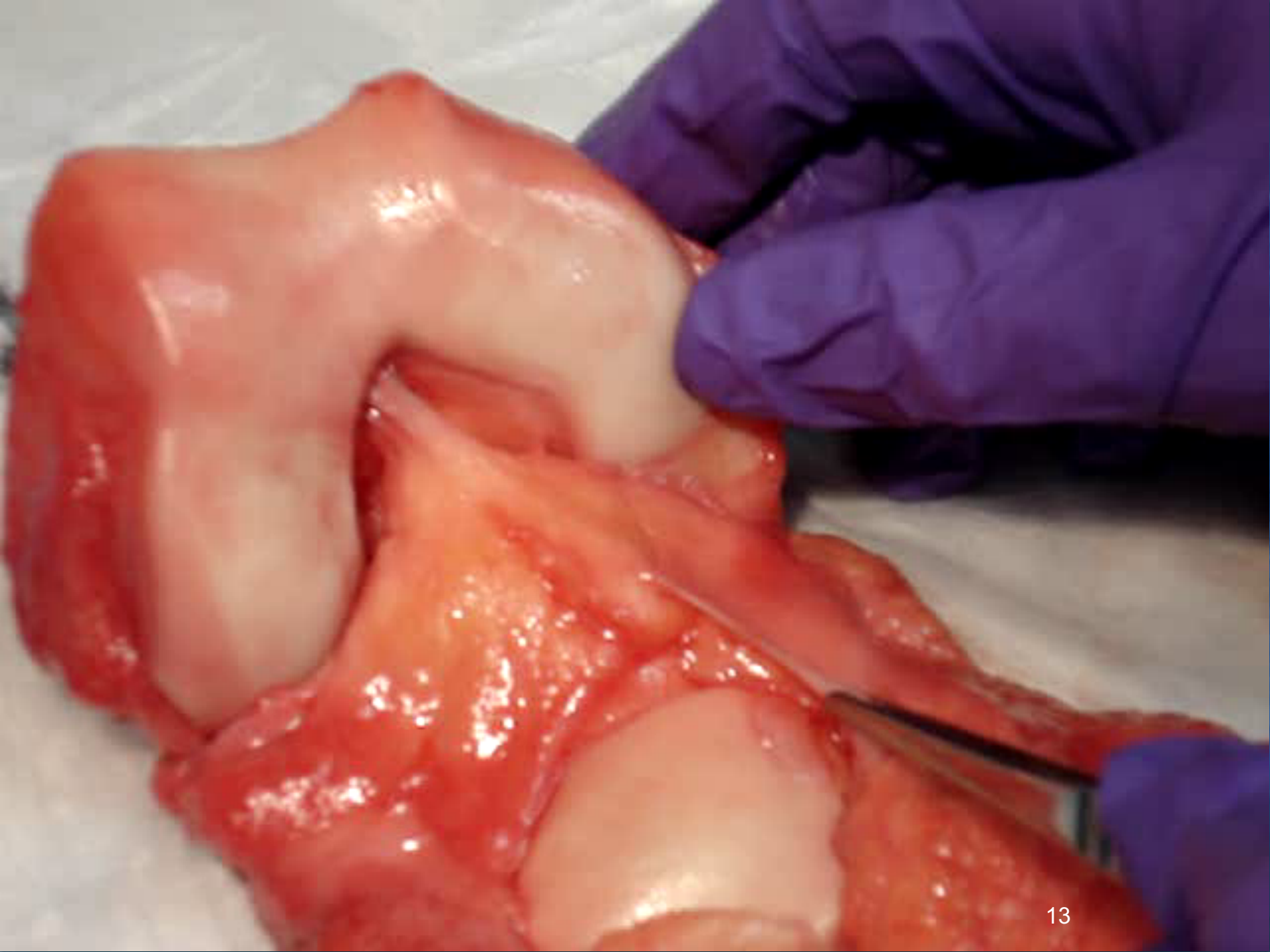
# HISTORY- MISINTERPRETATION OF DATA

Mediopatellar plica

Infrapatellar plica



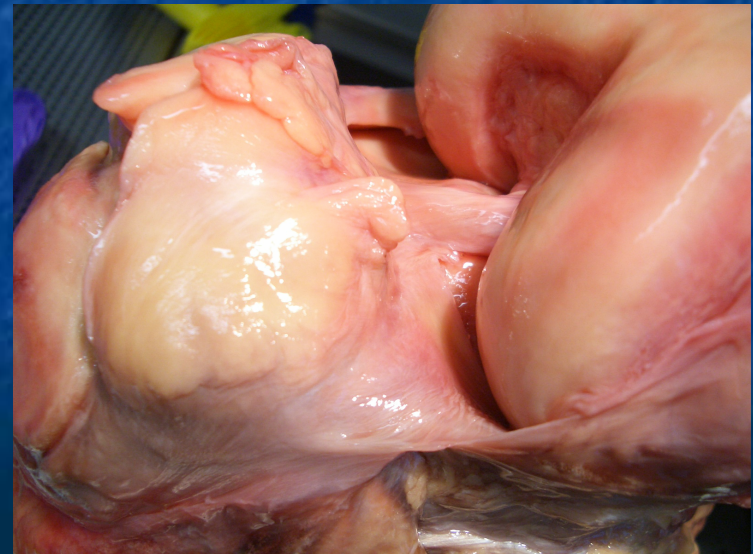
From Hardaker, Diagnosis and Treatment of the Plica Syndrome of the Knee, JBJS 1990



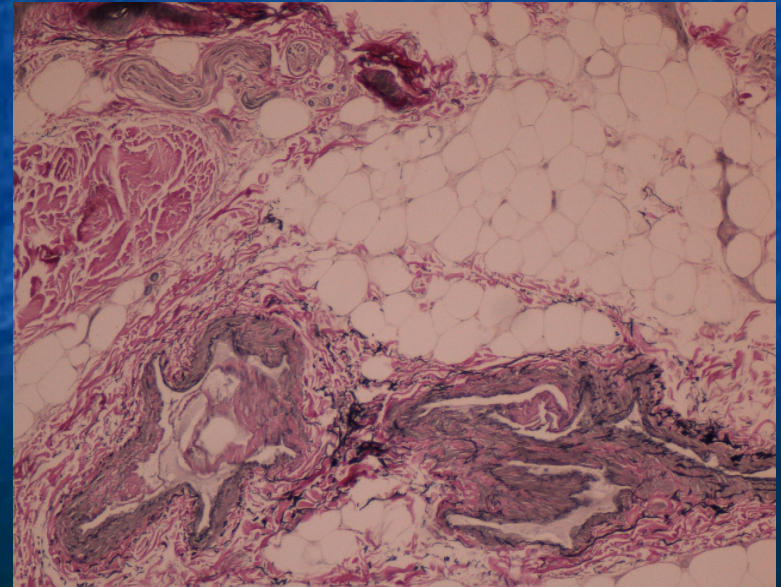
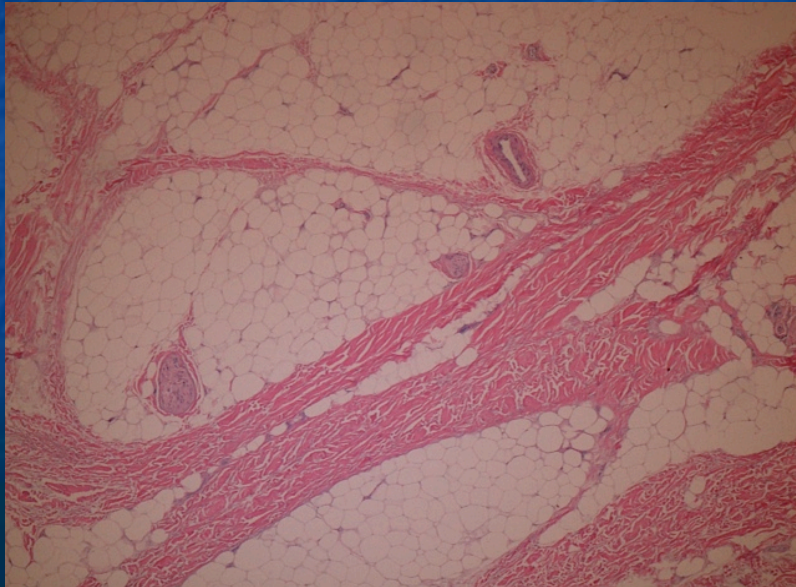
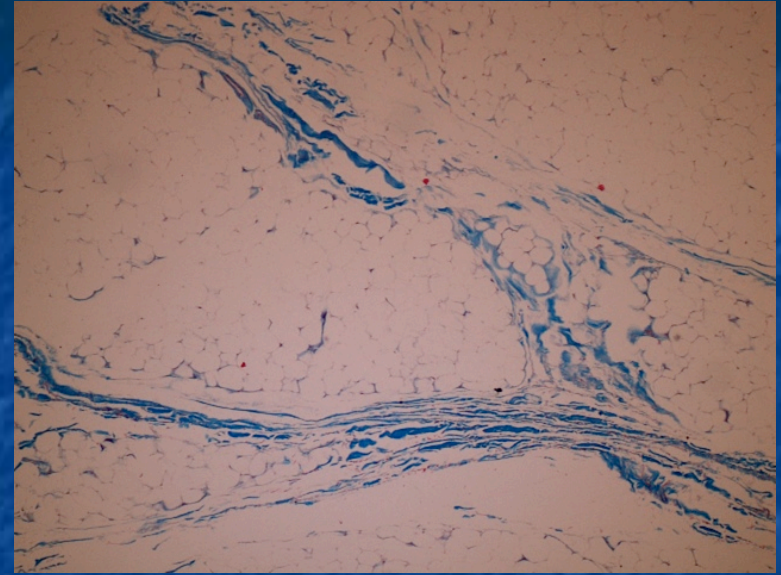
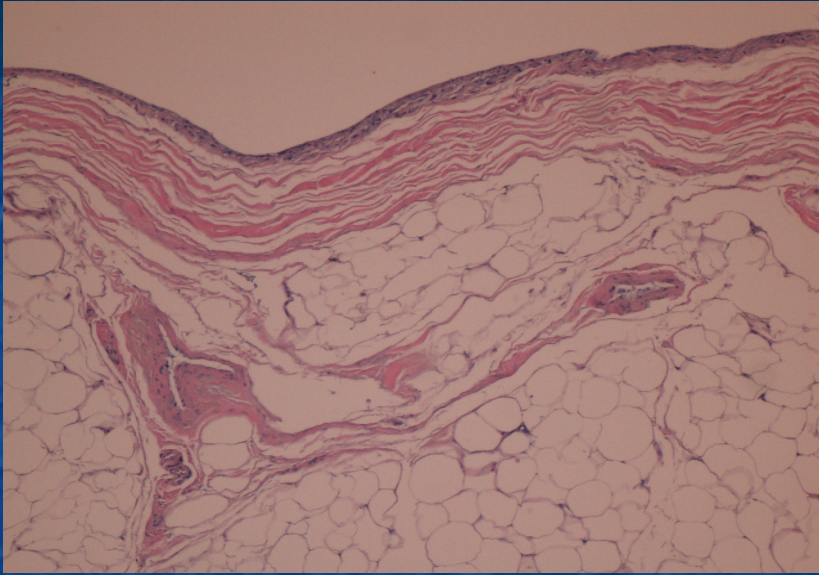
## Function of the Fat Pad without an IPP

### Protection; Shock absorption

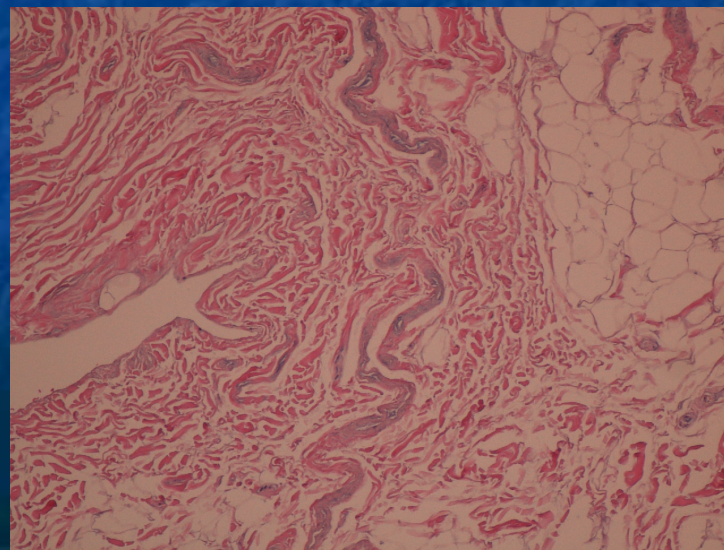
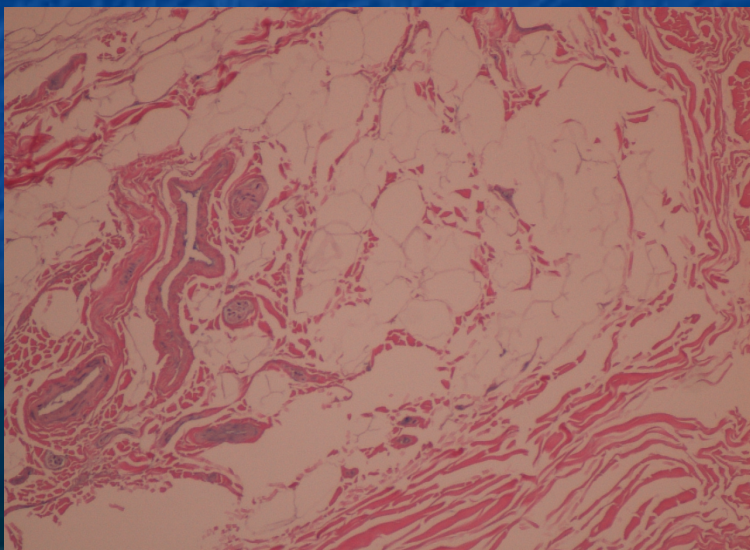
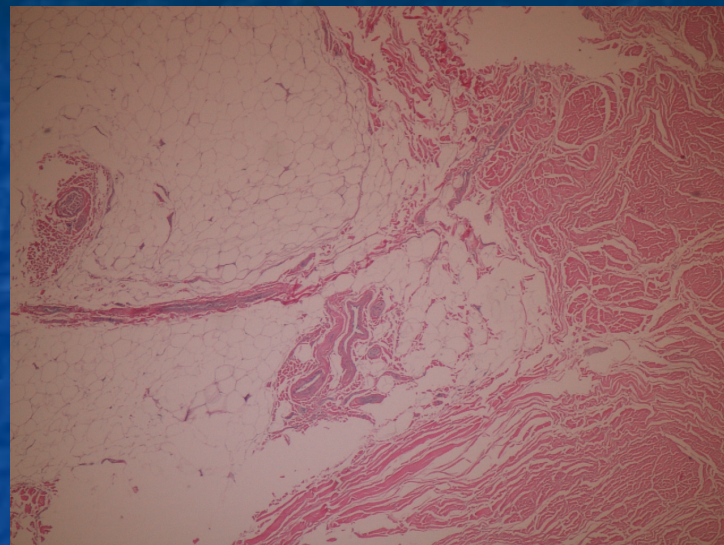
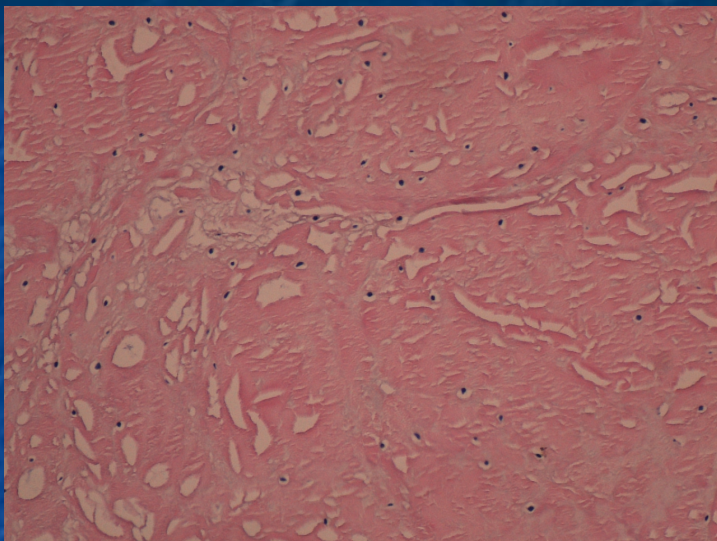
- Central body fits into notch
- Lateral bodies conform to condyles
- Lateral and medial sheets of fibrous synovium merge with menisci



# FAT PAD HISTOLOGY – KNOWN DATA



# FAT PAD – NEW DATA CENTRAL BODY





# ANATOMIC/HISTOLOGIC SUMMARY

- **The IPP is an intra-articular ligament.**
- **The unconstrained fat pad (without an IPP) is a semifluid, deformable structure that conforms to the changing anatomy of the “anterior compartment”.**
- **The fat pad with an IPP is constrained by its stretchable, highly innervated central body.**

# Key Reference

## **Die Plica synovialis infrapatellaris beim Menschen**

Wachtler, F. 1979 Plica synovialis infrapatellaris in man  
Acta Anat (Basel)

- **English Abstract**
- “...Mechanical importance of the plica synovialis infrapatellaris must be denied...”
- Described, but did not demonstrate the histology not the injection study

**Reproduced this experiment**

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0.78 rad/cm2

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# The Mechanical Role of the IPP in the Normal Knee

The plica's effect in the knee is to constrain the fat pad, holding it against the end of the femur throughout the arc of motion; any motion of the knee perturbs the fat pad.

In a situation of homeostasis, there is no pain, for the knee is in physiologic balance with the forces applied.

# THEORY

- **The IPP/fat pad complex is the site of the pain.**
- **The pain perseveres because of the mechanical link between knee motion and perturbation of the painful complex.**
- **Release of the IPP relieves the pain through:**
  - **Severing the mechanical link**
  - **Altering the innervation**

