



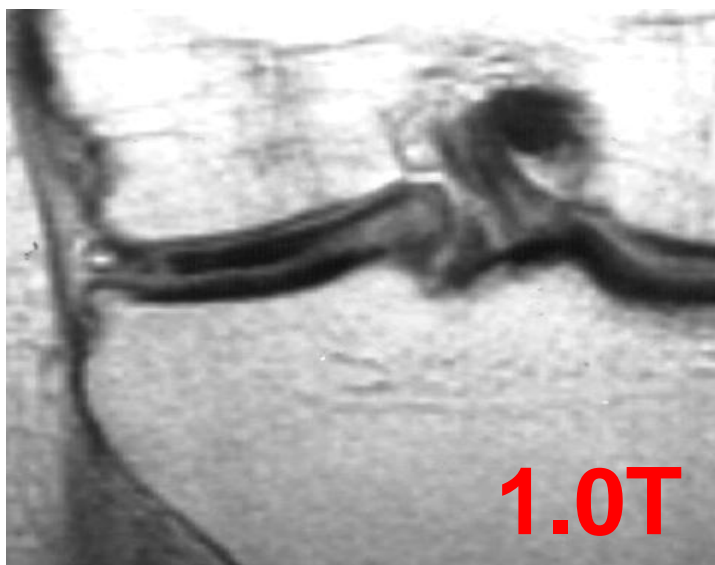
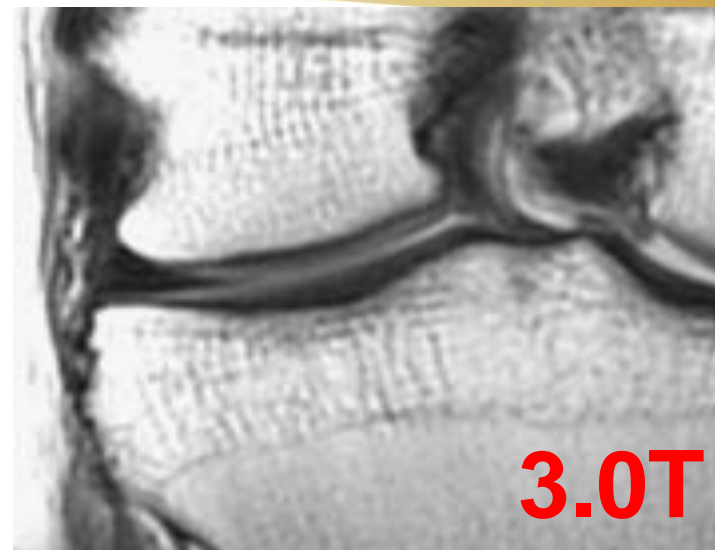
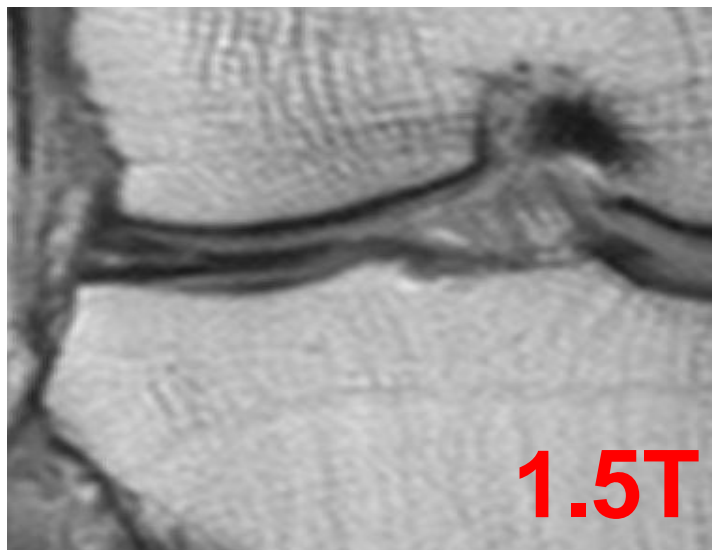
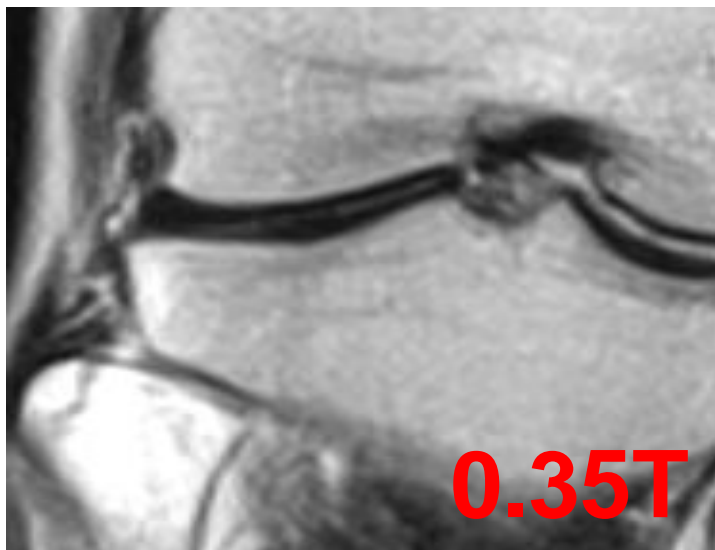
浙江省人民医院
ZHEJIANG PROVINCIAL
PEOPLE'S HOSPITAL

膝关节半月板损伤 MR扫描与诊断

龚向阳

浙江省人民医院

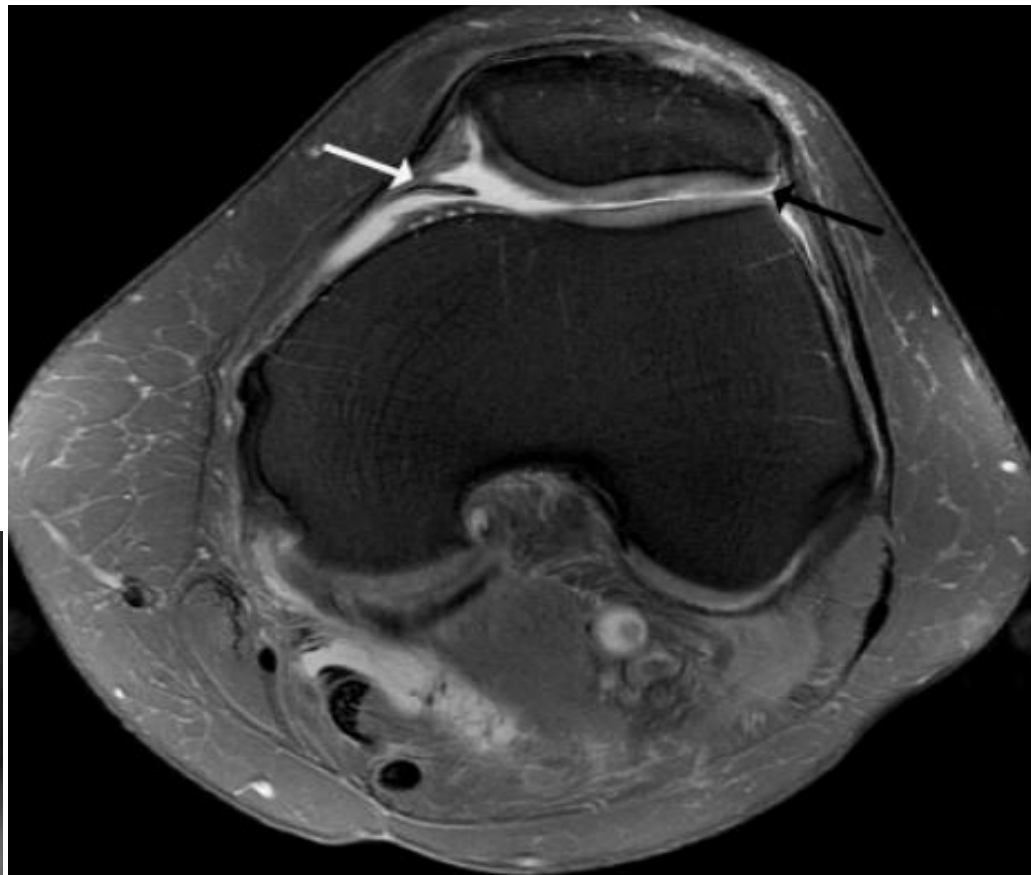
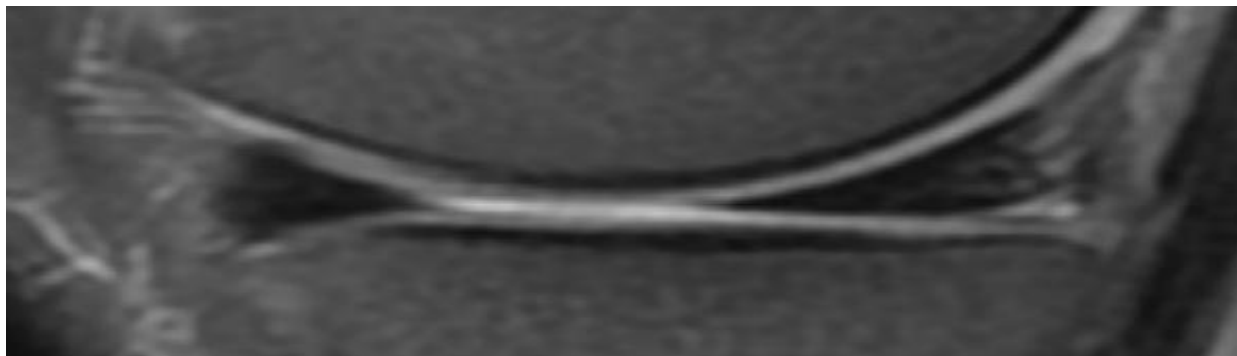
仁爱 | 卓越 | 奉献 | 创新
Love Excellence Dedication Innovation



膝关节扫描 设备选择

使用3T的优点：

1. 扫描速度快：减少运动模糊
2. 图像分辨率：诊断精细损伤



MR膝关节线圈选择

柔软表面线圈

圆形极化线圈

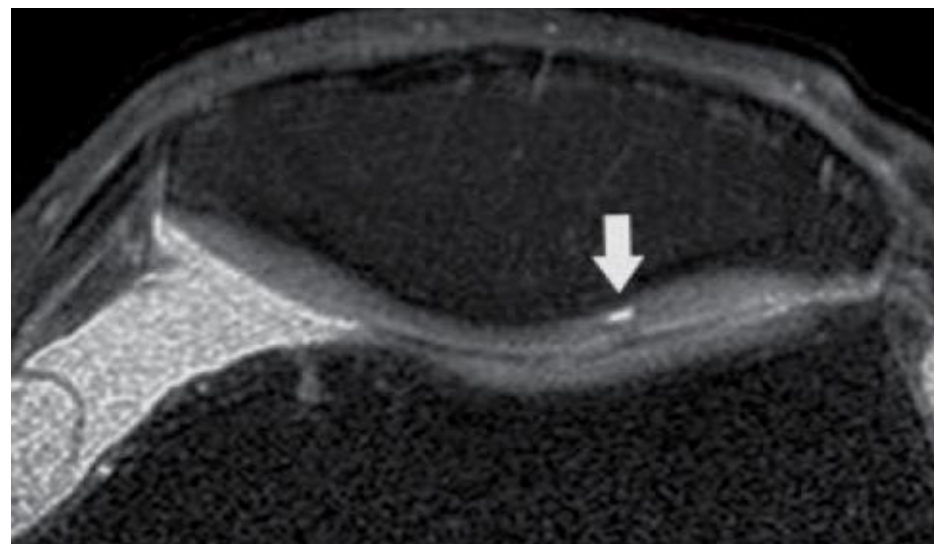
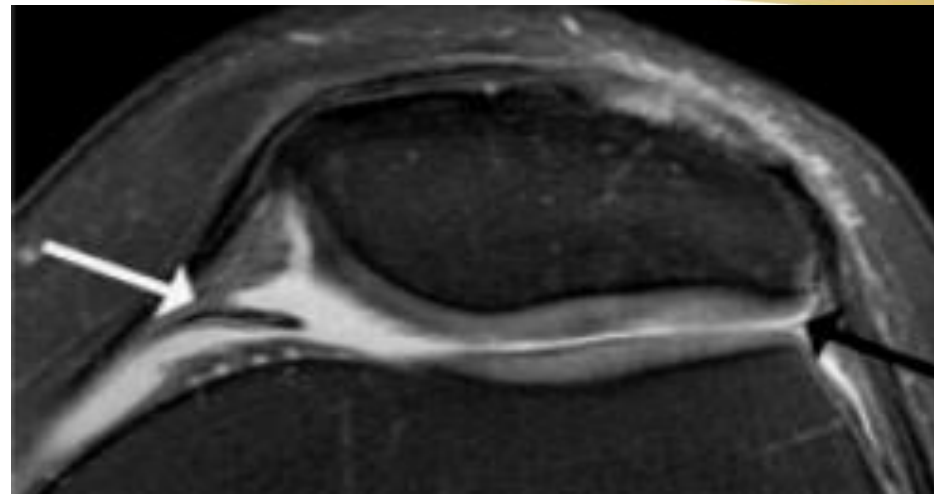
相控阵线圈/多通道相控阵线圈

数字线圈

显微线圈



显微线圈的应用



Hyun-joo Kim, et al. *Korean J Radiol.* 2011 Jan-Feb; 12(1): 78–88.

膝关节规范扫描序列

1. COR PD
2. COR STIR
3. SAG PD
4. SAG GRE T2
5. SAG PD FS TO ACL
6. AXIAL PD FS

Page 50 of 123 MSK MRI PROTOCOLS March 2010

Field strength (T)	Plane	TR ms	TE ms	FOV cm	SL mm	ETL	NEX	MAT Pixels
1.5	1. sag fs iw FSE	3,200	46	13	3	8	3	224×224
1.5	2. sag iw FSE	2,000	20	13	3	4	3	224×224
1.5	3. cor fs iw FSE	3,200	46	13	4	8	3	224×224
1.5	4. cor T1 FSE	600	15	13	4	3	3	224×224
1.5	5. axial fs iw FSE	3,700	46	13	4	8	3	224×224
3.0	1. sag fs iw FSE	4,300	51	13	3	9	2	320×256
3.0	2. sag iw FSE	3,300	13.7	13	3	8	2	320×256
3.0	3. cor fs iw FSE	4,300	51	13	4	9	2	320×256
3.0	4. cor T1 FSE	675	15.4	13	4	5	2	320×256
3.0	5. axial fs iw FSE	4,300	51	13	4	9	2	320×256

iw : intermediate Weighted

Skeletal Radiology 2009;38:761-769

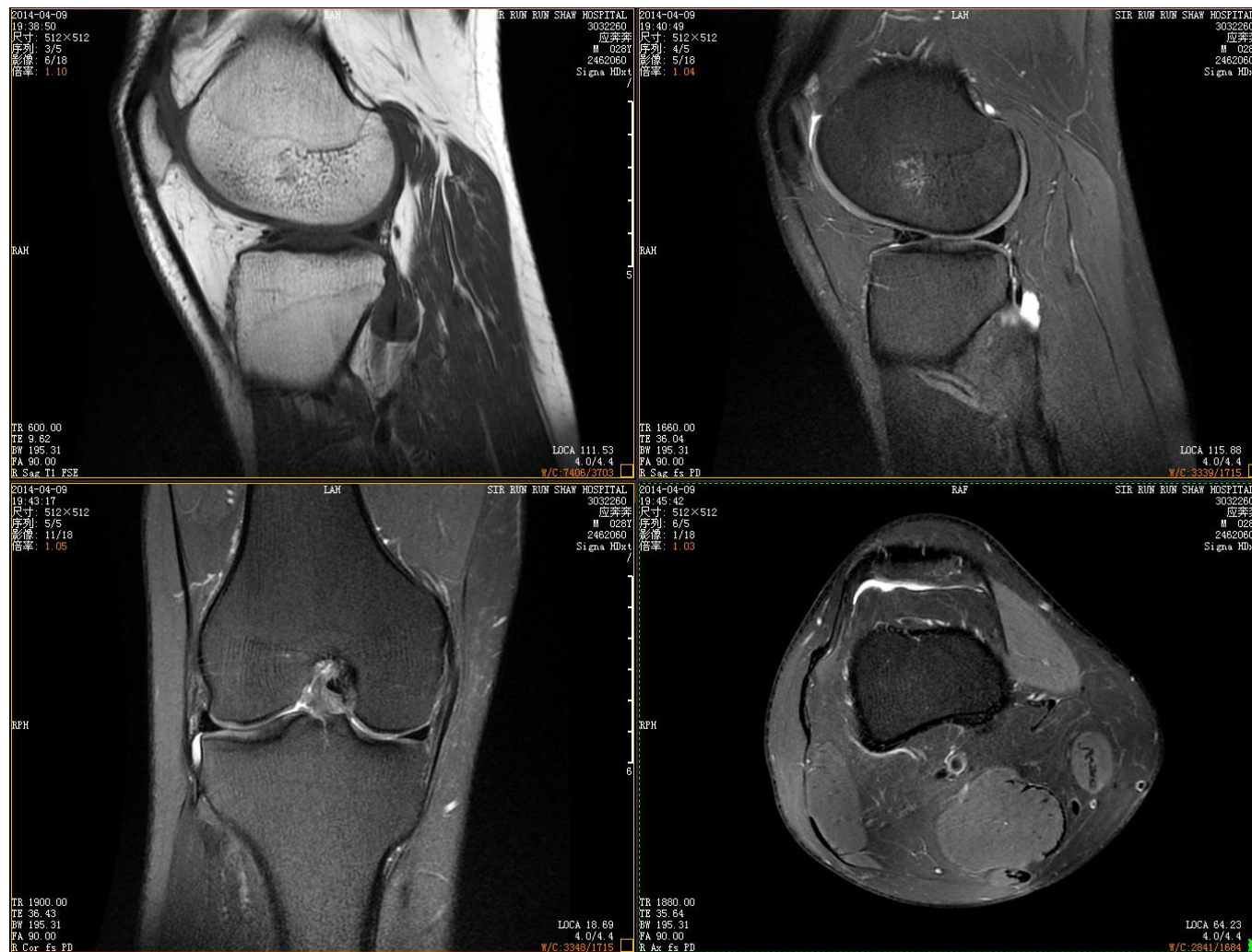
膝关节基本扫描序列

SAG T1WI

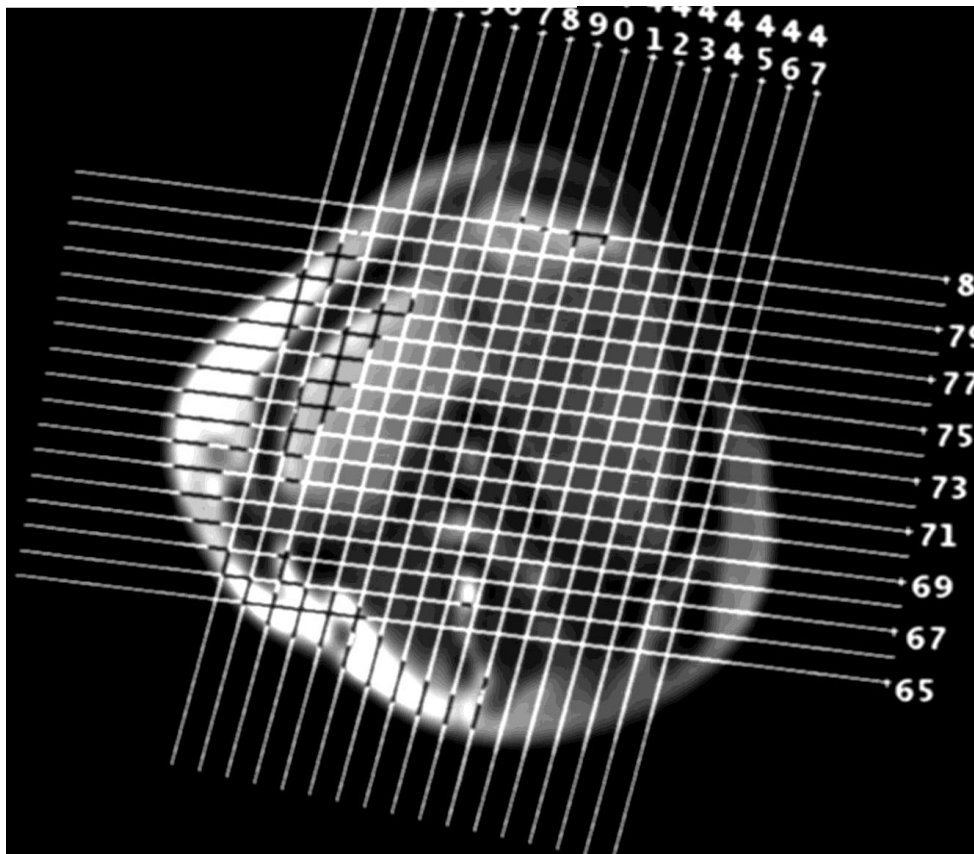
SAG PDWI (TE \approx 40)

COR PDWI (TE \approx 40)

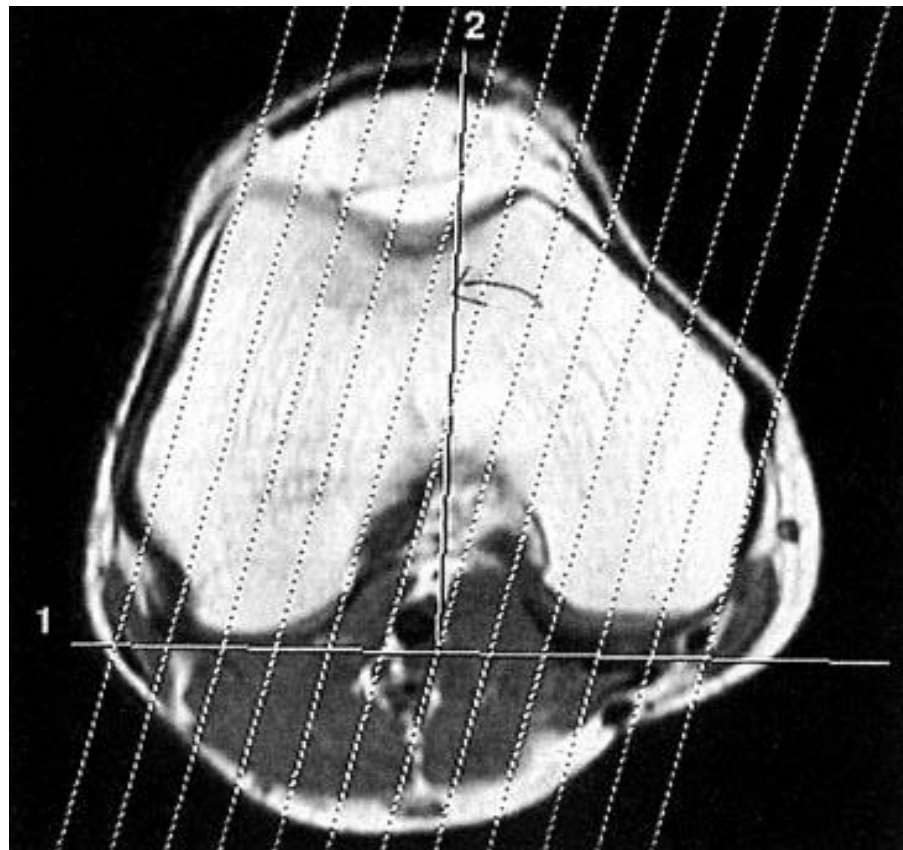
TRA PDWI (TE \approx 40)



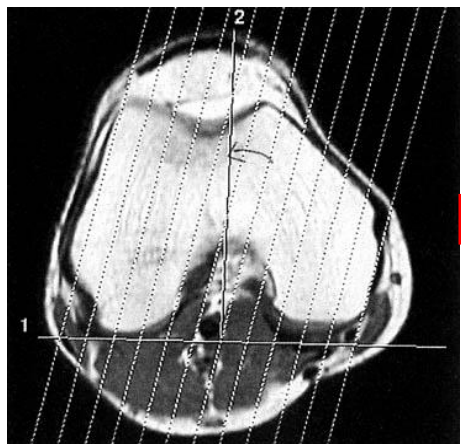
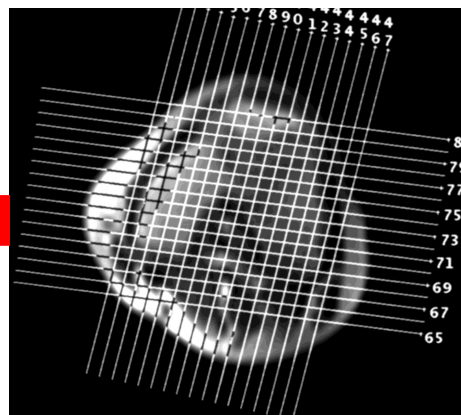
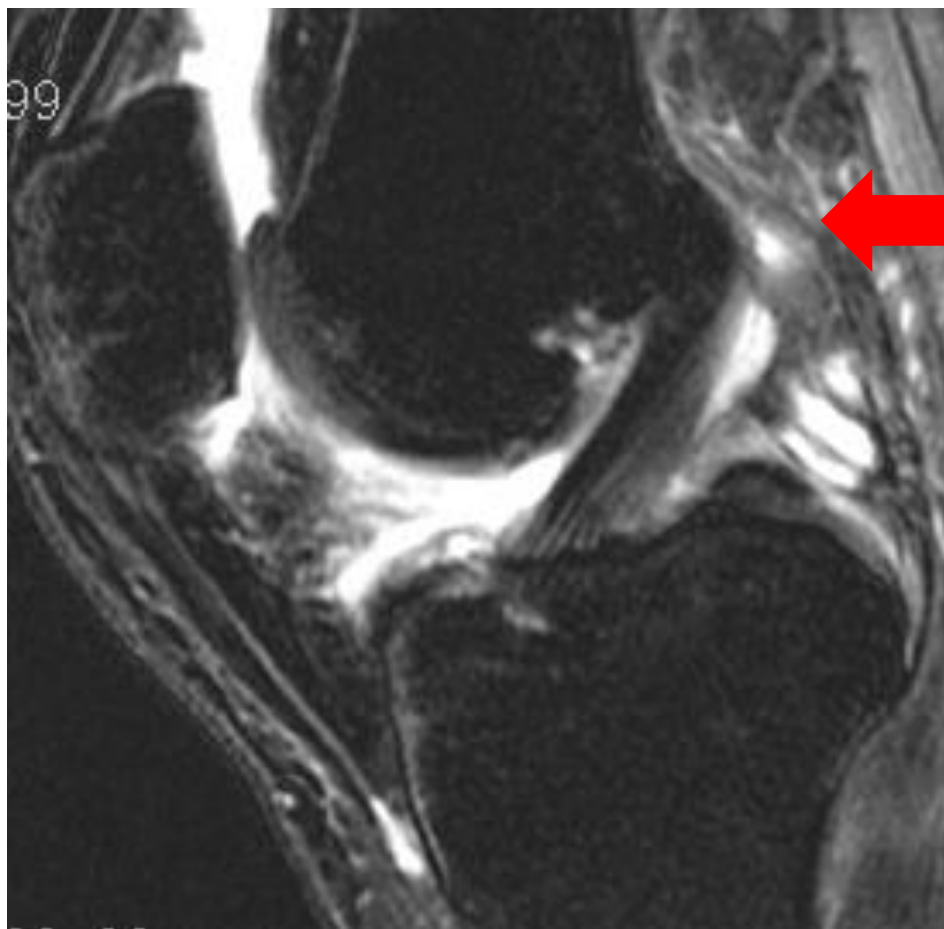
层面选择



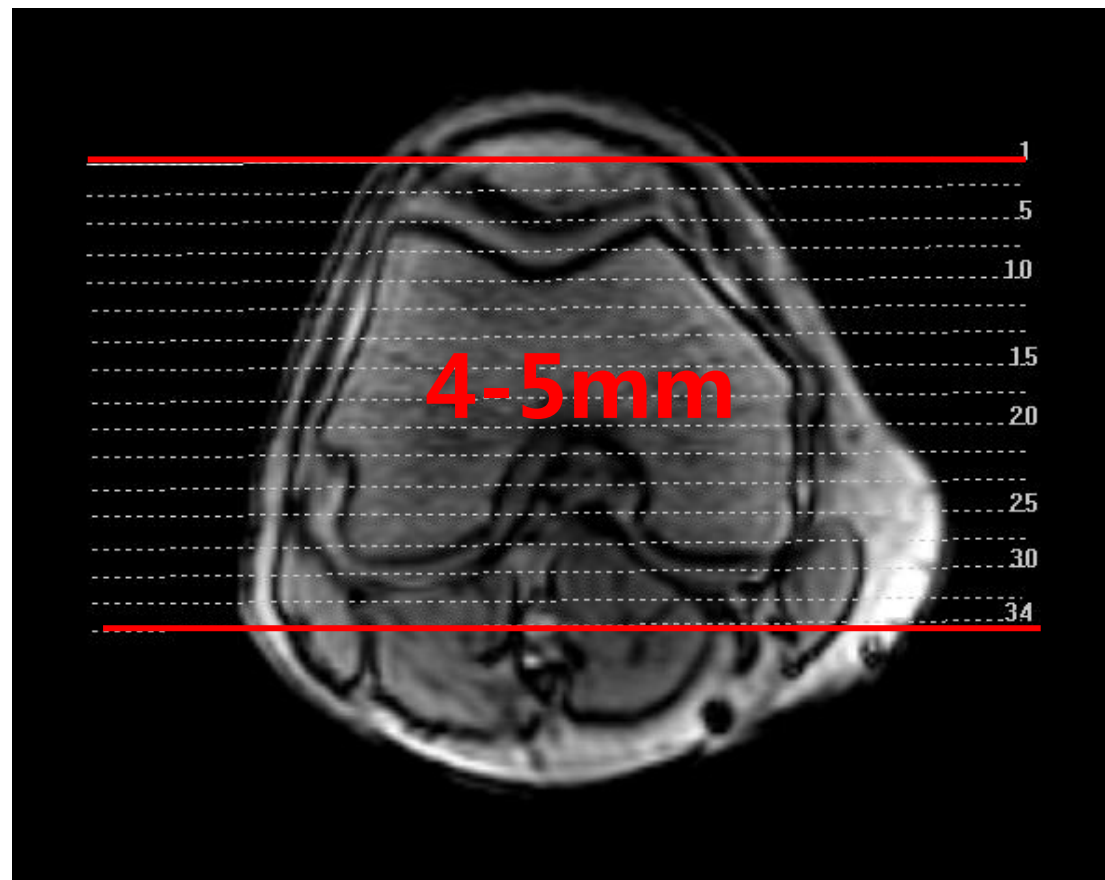
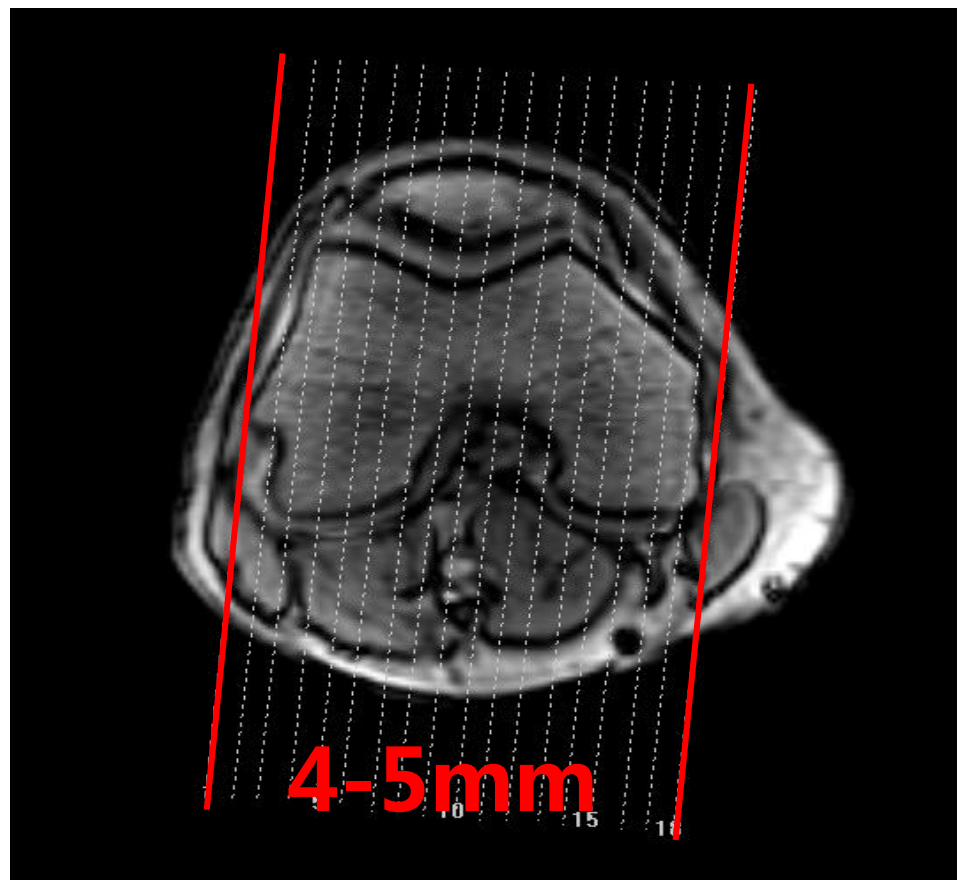
股骨髁间窝-髌骨中点连线



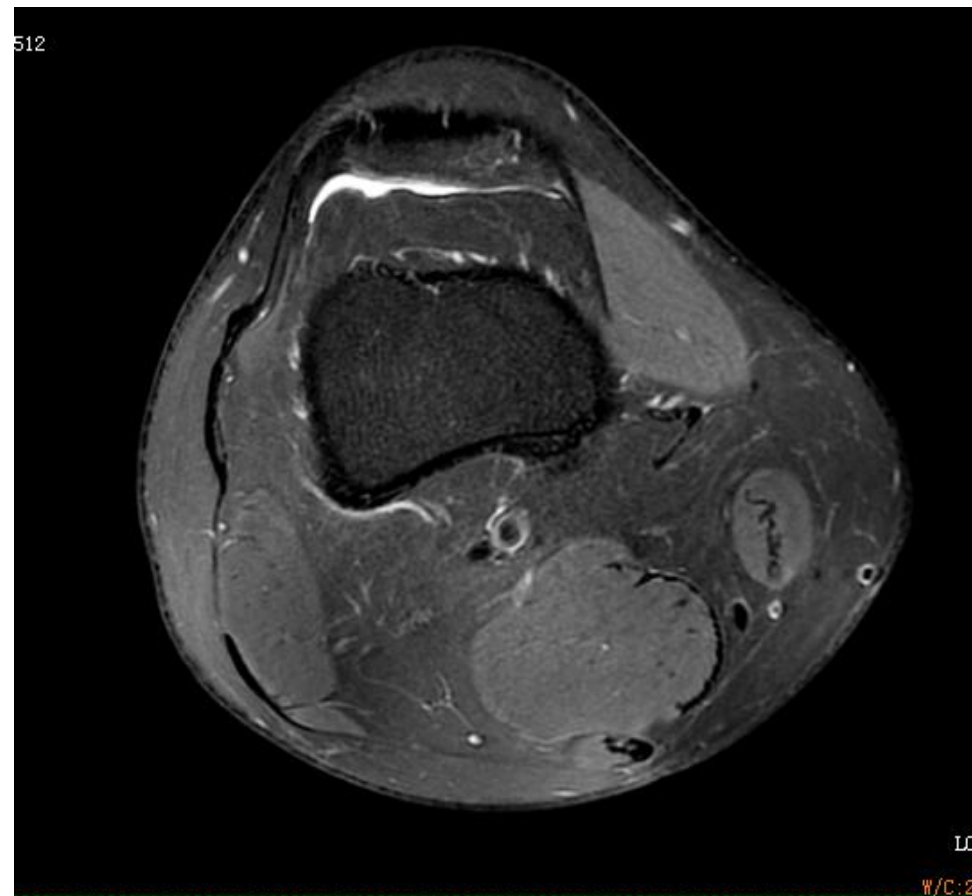
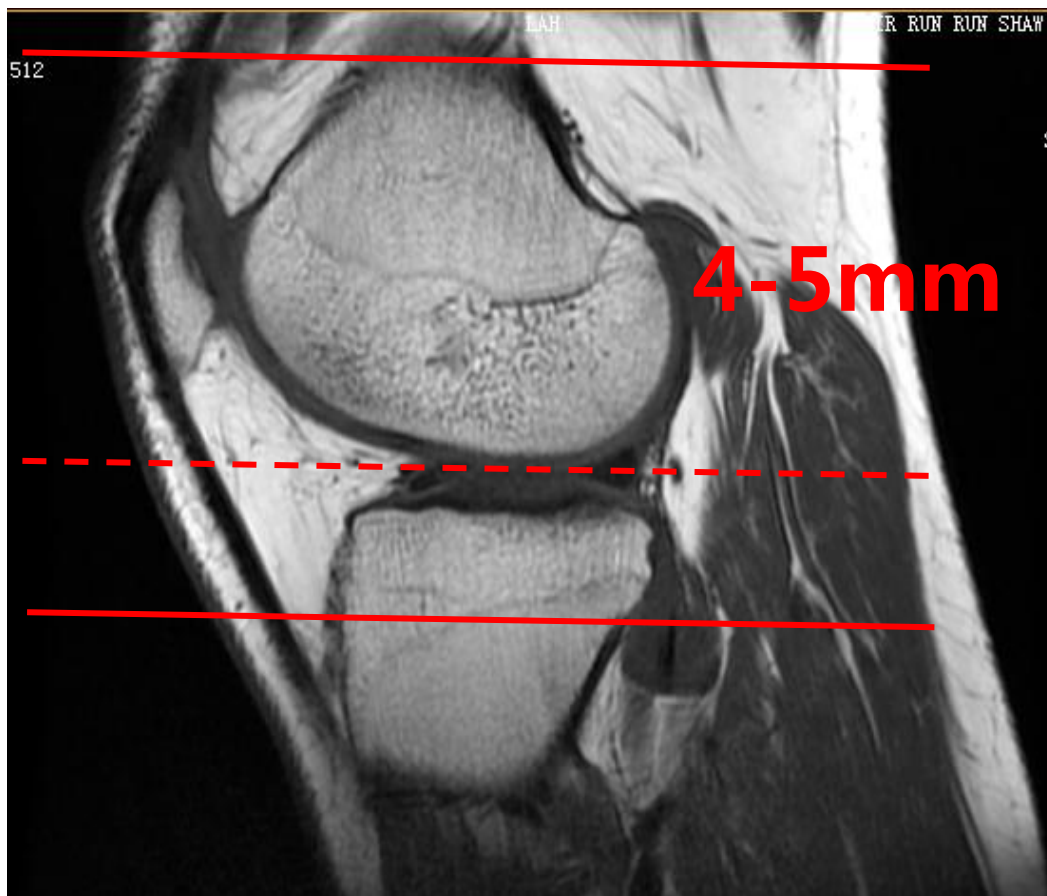
内前-外后15~20度倾斜角



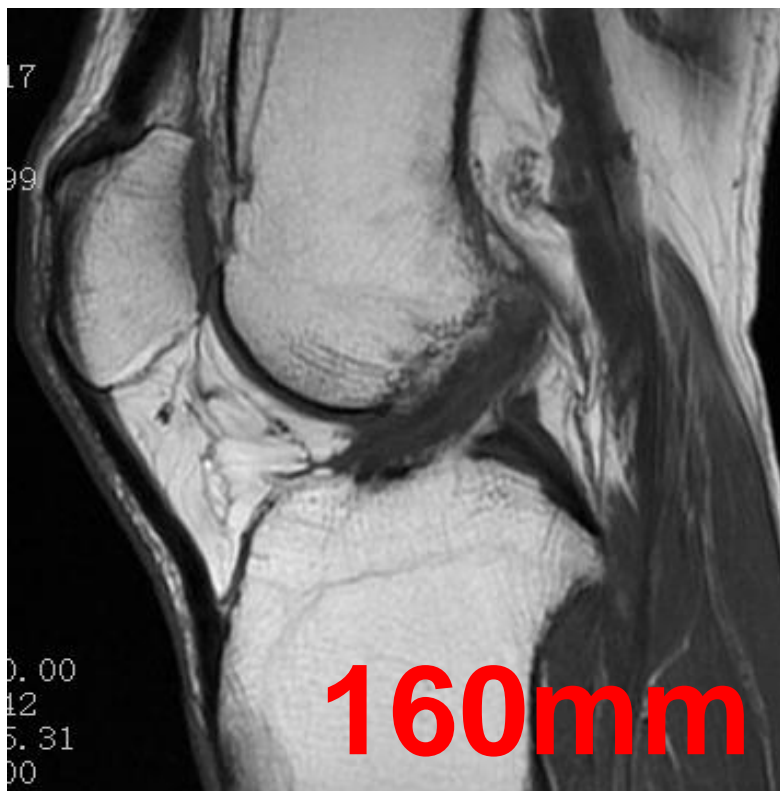
范围选择



范围选择

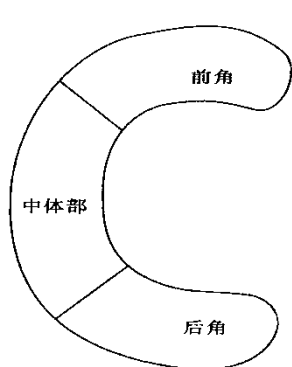


FOV选择 (15-17cm)

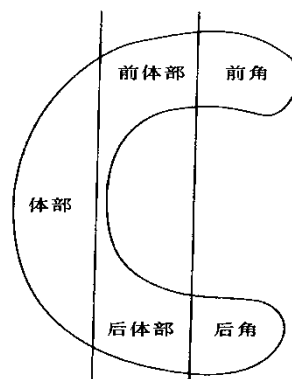


膝关节半月板解剖

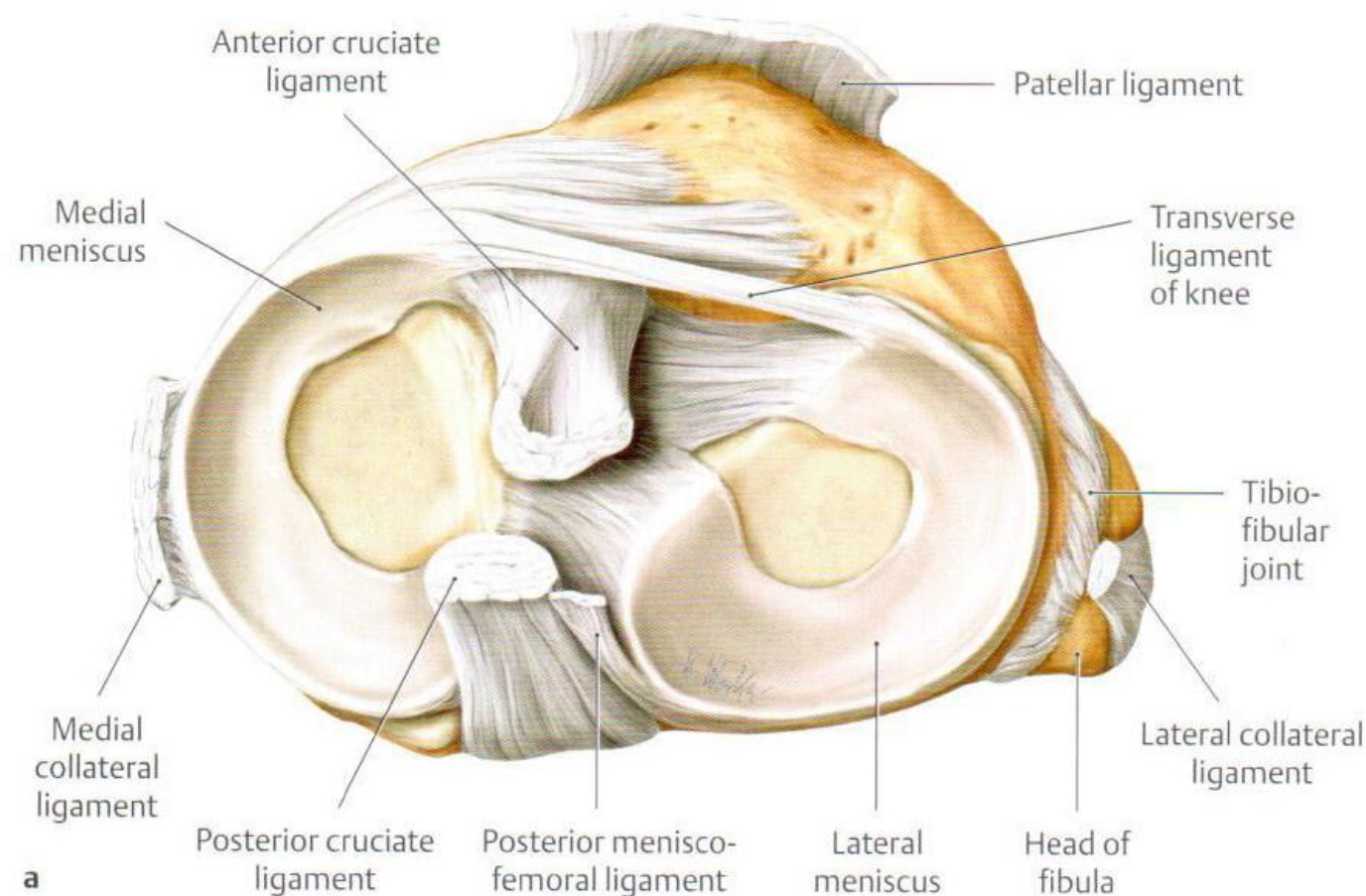
- 外侧半月板呈“O”形，宽度较均匀；内侧半月板呈“C”形，前窄后宽。
- 按照“1/3规则”，将半月板分为前角、体部和后角。



三分之一规则



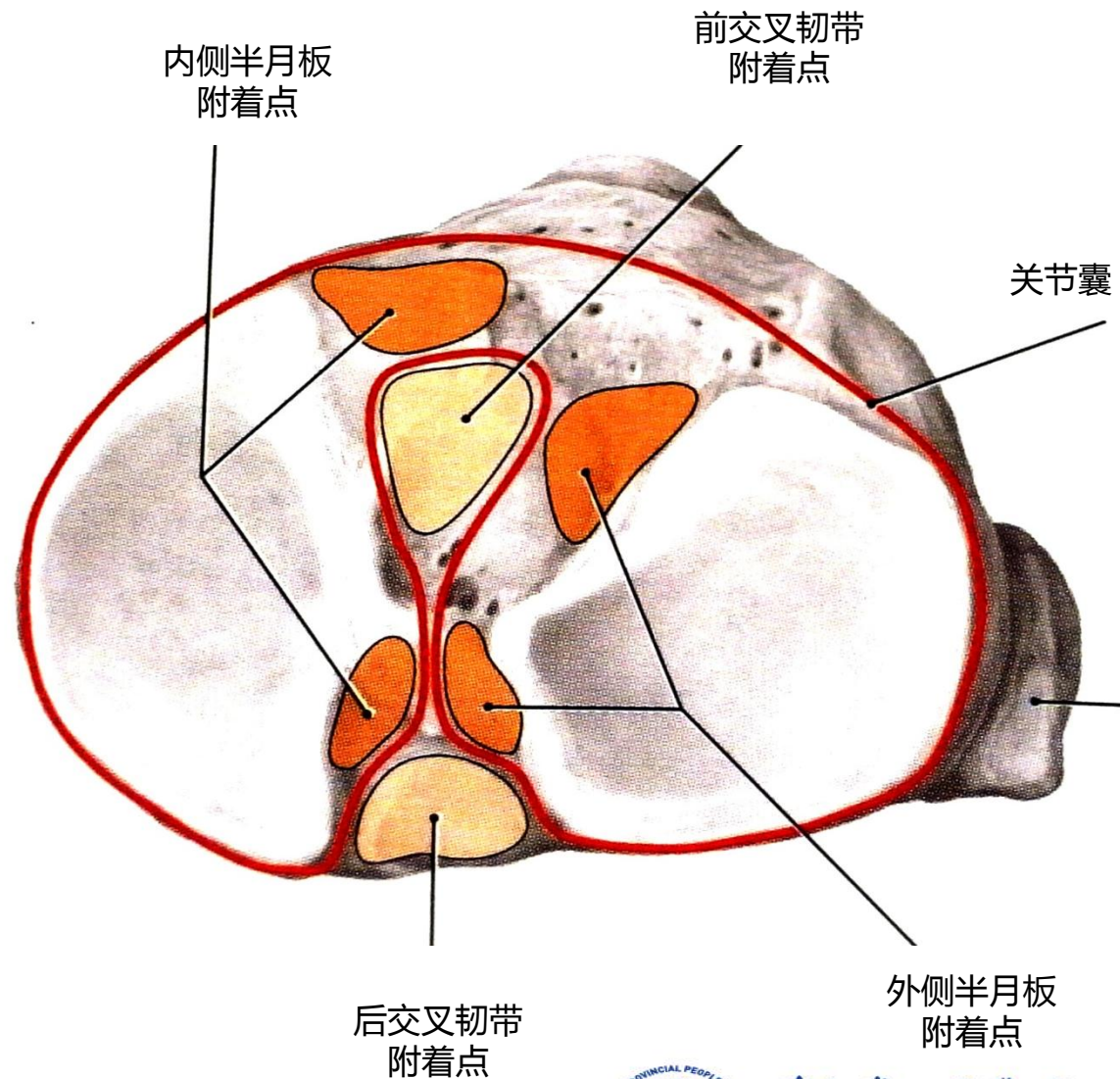
25-50-25 规则



a

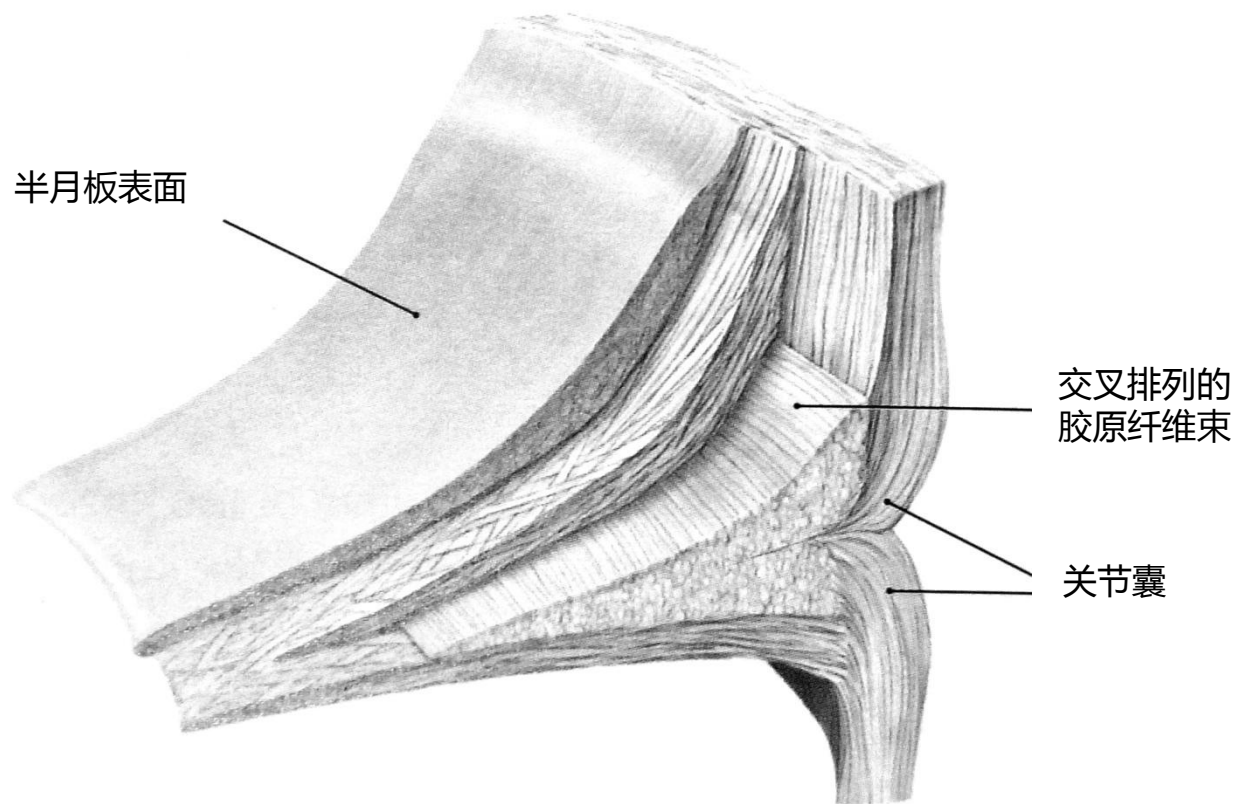
膝关节半月板解剖

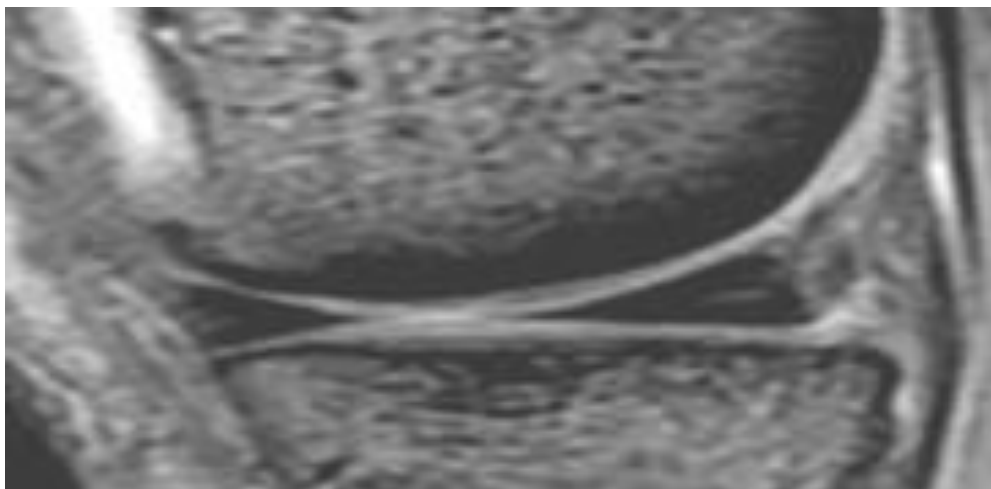
- 半月板的前后端分别附着在胫骨平台中间部非关节面的部位，在髁间棘前方和后方。
- 内侧半月板外周部与关节囊和内侧副韧带紧贴；而外侧半月板与外侧副韧带则不接触。因此，内侧半月板活动度较小，外侧半月板则具有较高的活动度。



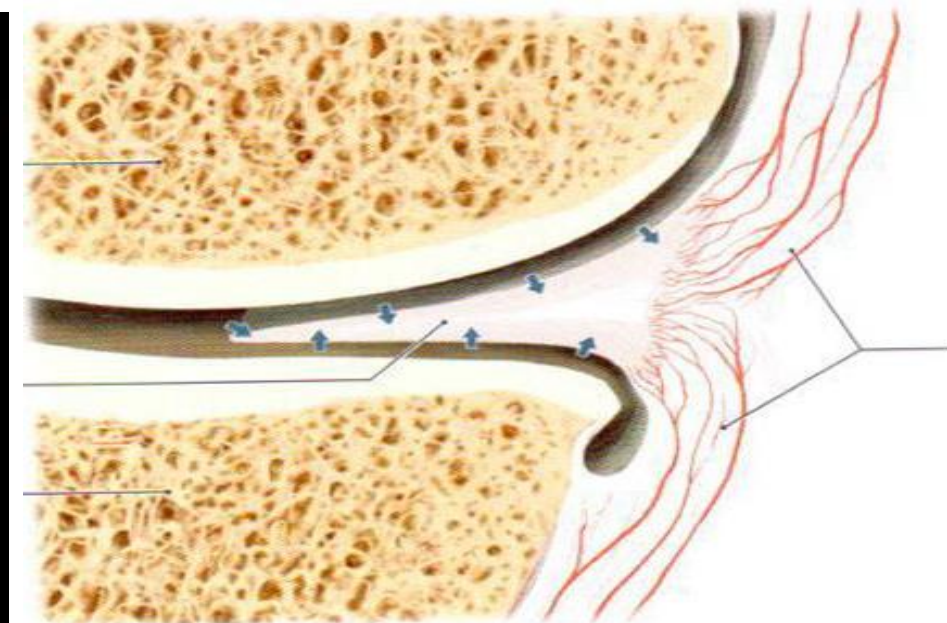
膝关节半月板解剖

- 由纤维组织和致密的软骨样组织构成；胶原纤维束呈交叉排列，主要为环形排列，使半月板在压力下有很好的延展性。
- 半月板切面呈楔形，上表面呈弧形，下表面较平坦，边缘与关节囊直接附着。





半月板信号分区



半月板信号：

均匀低信号

半月板形态：

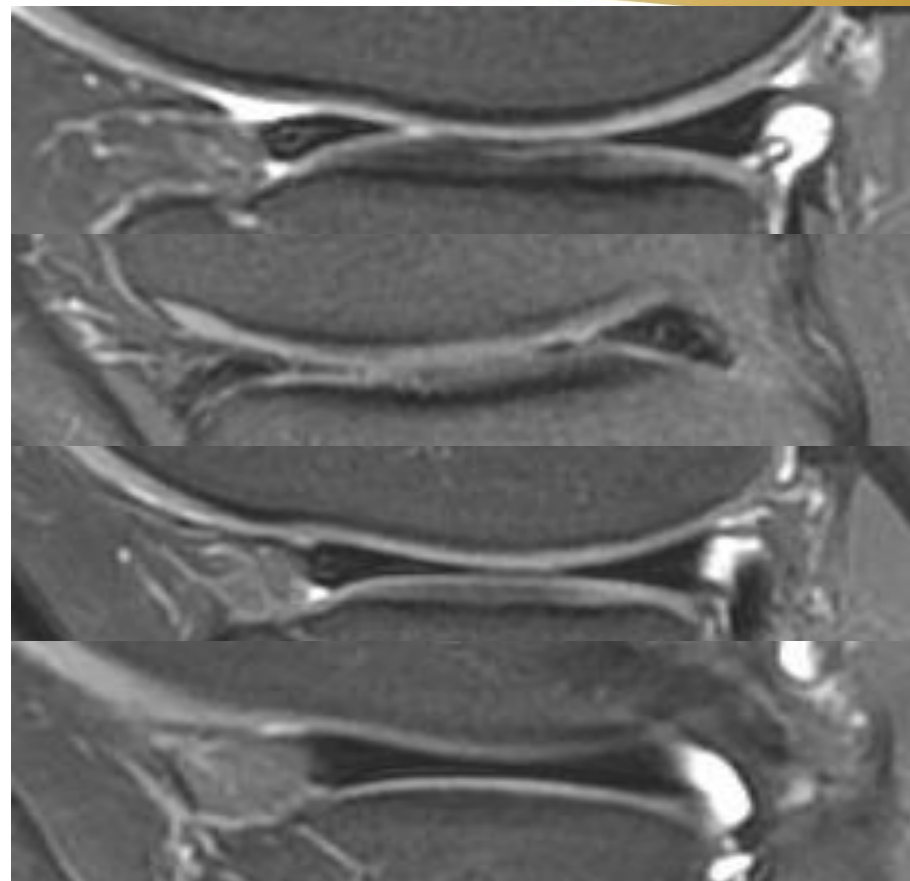
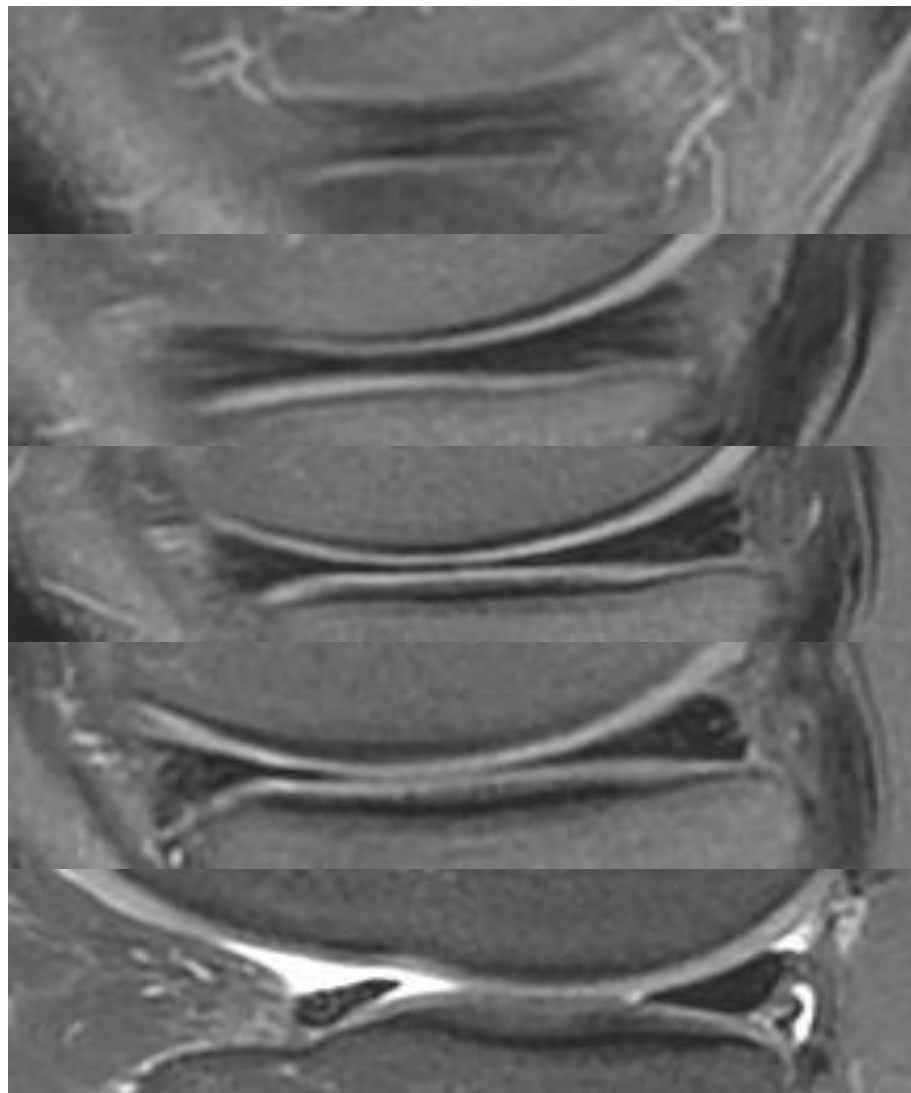
矢状位

外周层面

领结状

中心层面

菱形

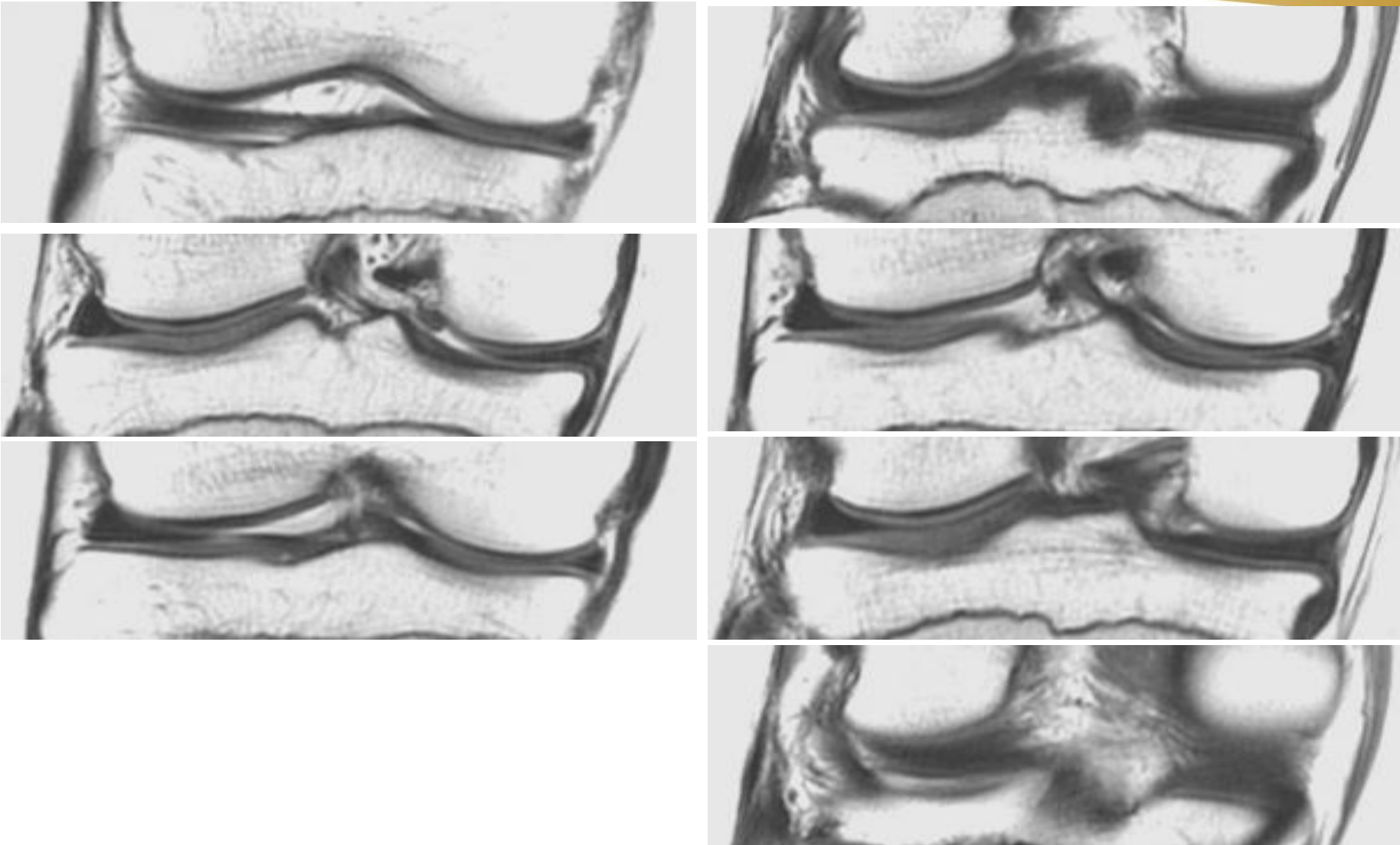


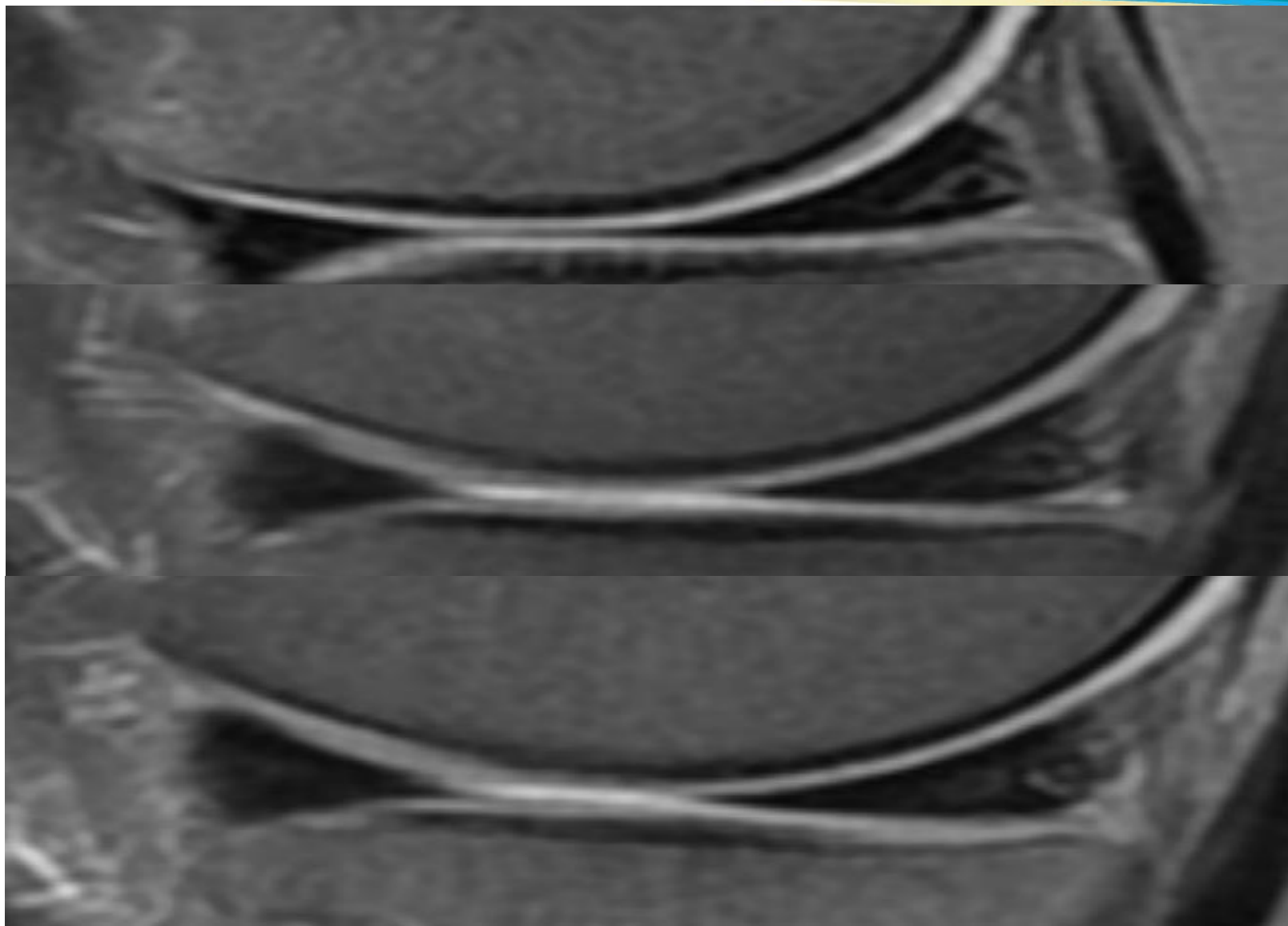
半月板信号：
均匀低信号

半月板形态：
冠状位

前后层面
板状

中心层面
三角形



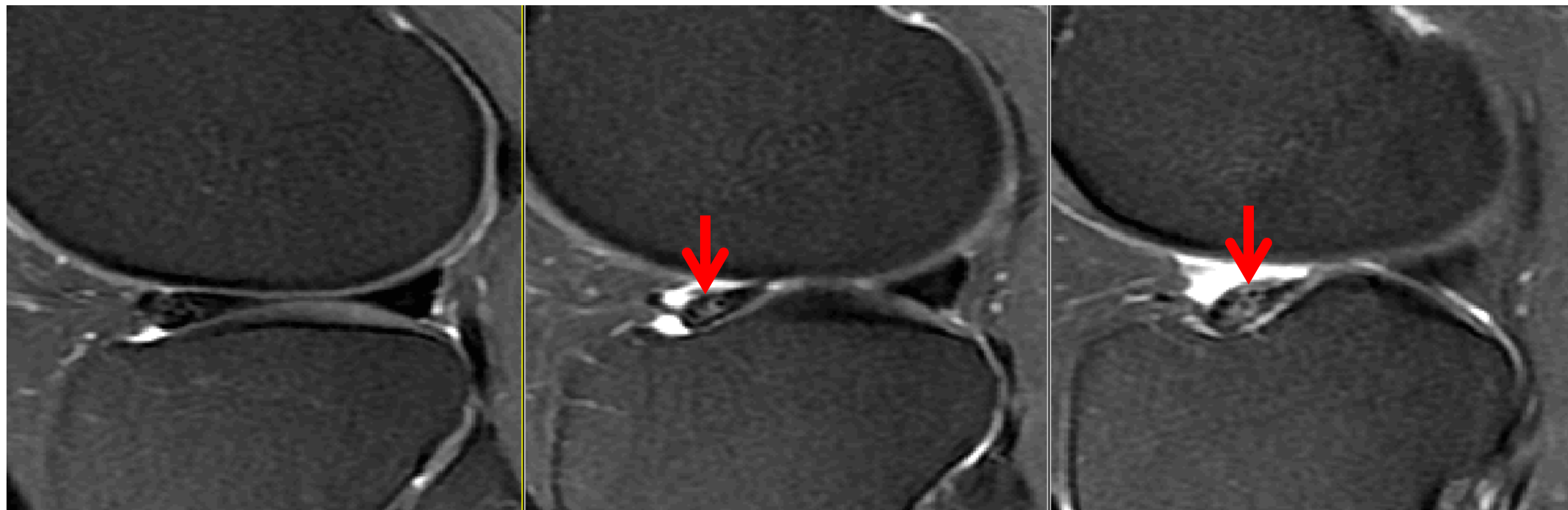


半月板正常变异 裙边样半月板(Meniscaal flounce)



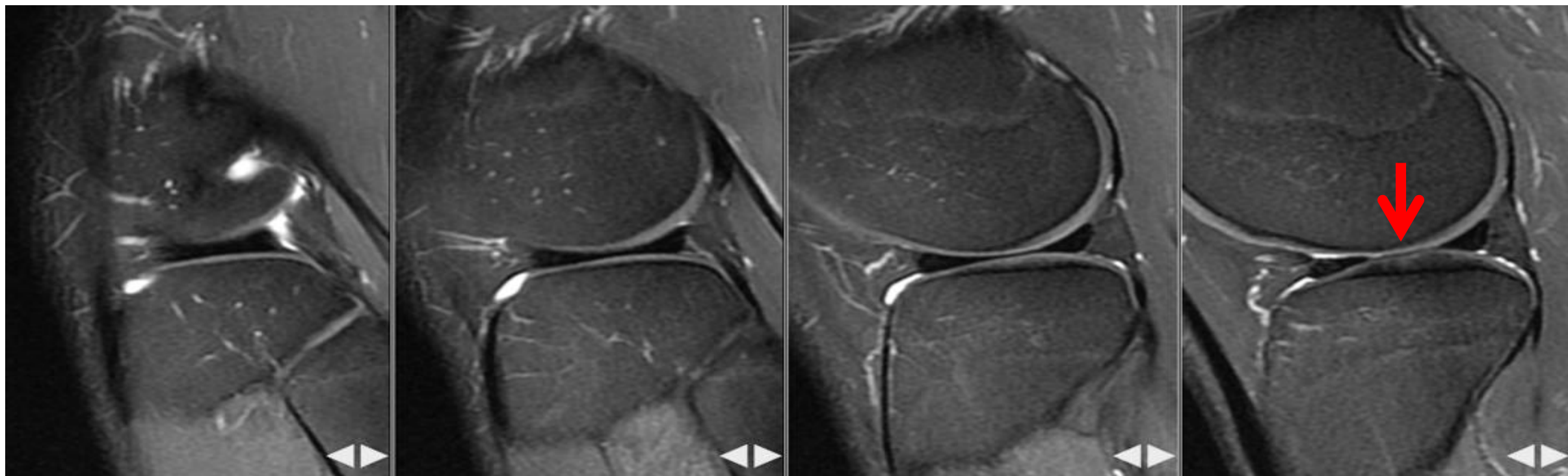
半月板正常变异 筛状前角 (Speckled anterior horn)

外侧半月板筛状前角较常见；是由ACL的纤维穿入半月板引起。通常在T1WI或PdWI显示斑点状高信号影。



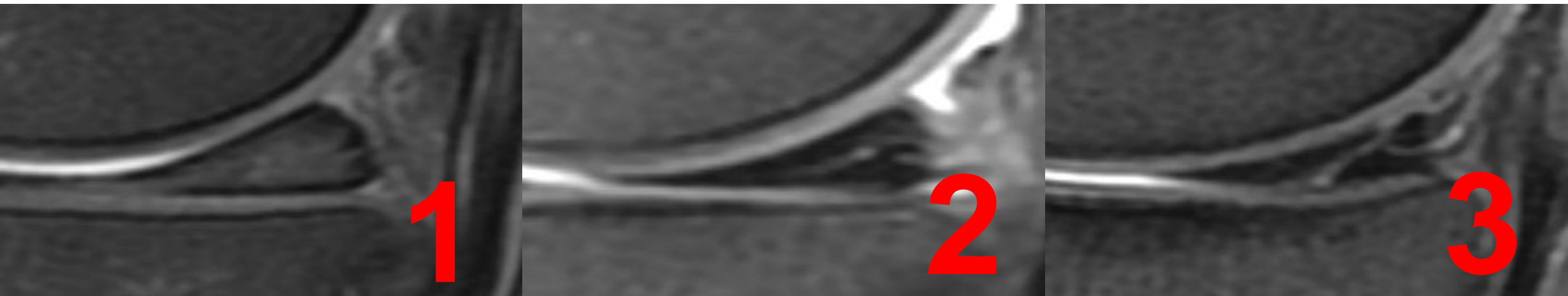
半月板正常变异 盘状半月板 (Discoid meniscus)

半月板中央部未穿透，全部或部分覆盖胫骨平台。宽度超过15mm。常见于外侧，发生率约正常人群的3%。



半月板撕裂

半月板MRI信号异常的分级：



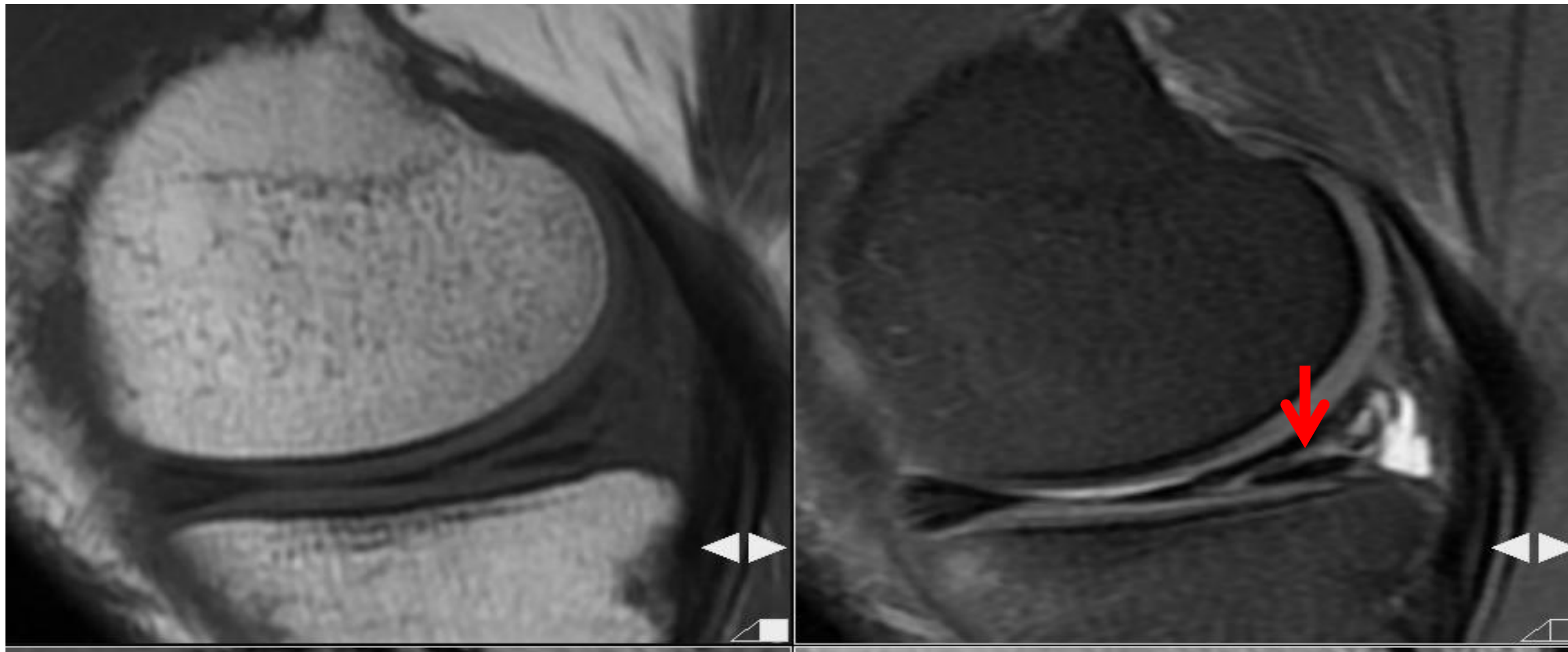
0级 均匀黑色的半月板

1级 半月板内球形信号，未延伸至关节面

2级 半月板内线形信号，未延伸至关节面

3级 半月板内异常信号累及关节面

半月板撕裂



半月板撕裂

半月板形态改变



纵向撕裂：

- 纵向垂直撕裂
- 纵向水平撕裂
- 纵向斜形撕裂
- 桶把样撕裂
- 半月板翻转
- 半月板层叠

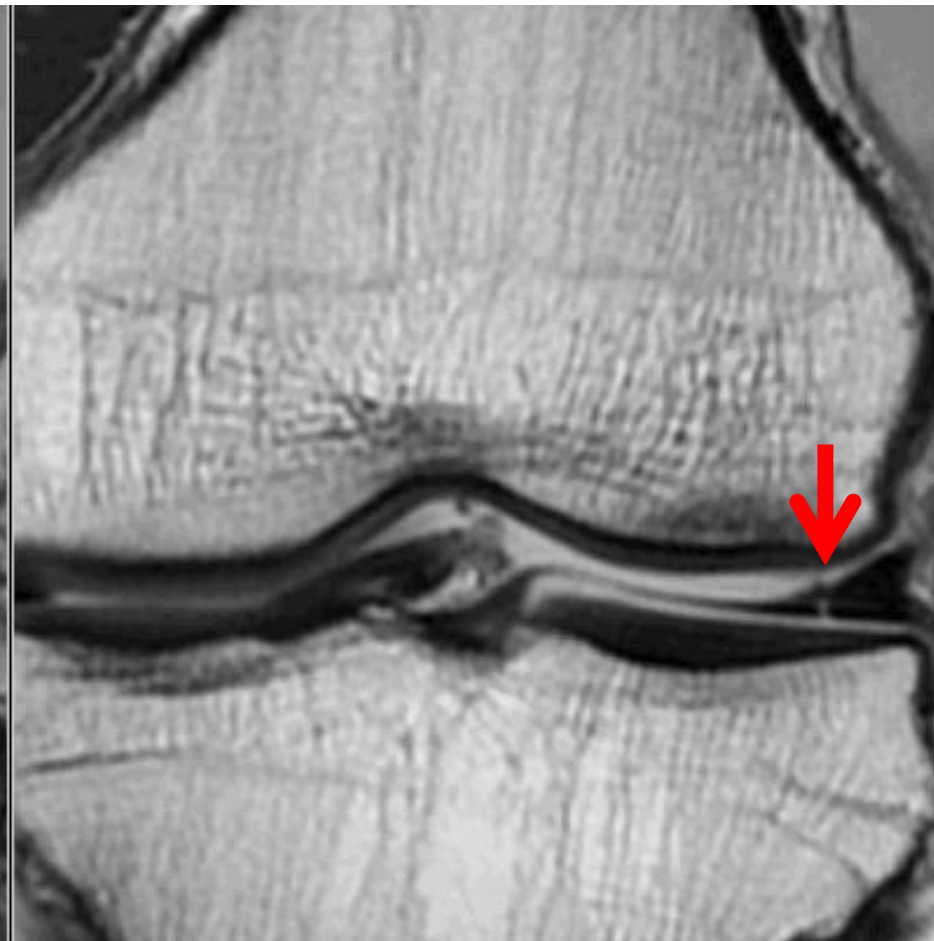
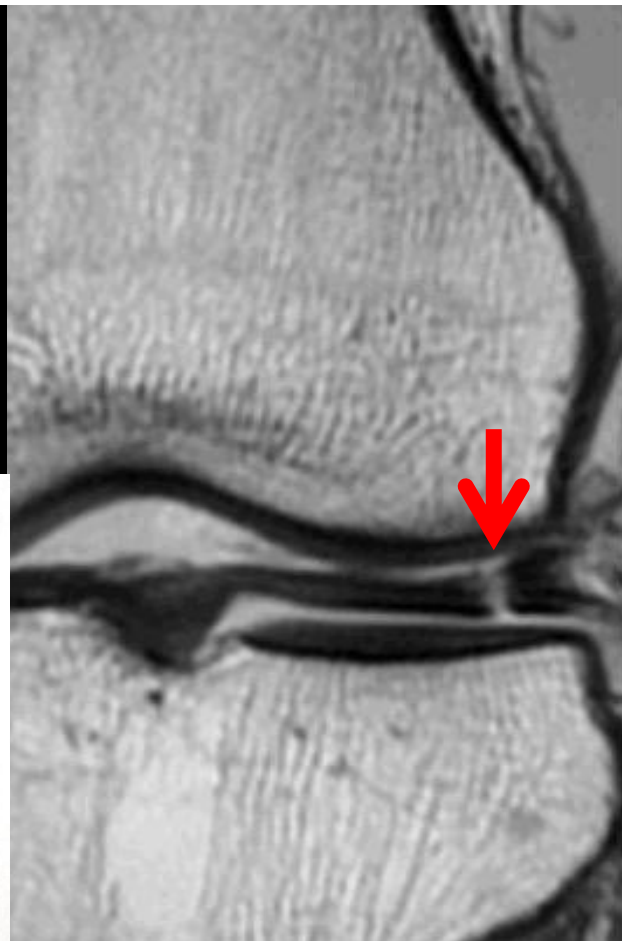
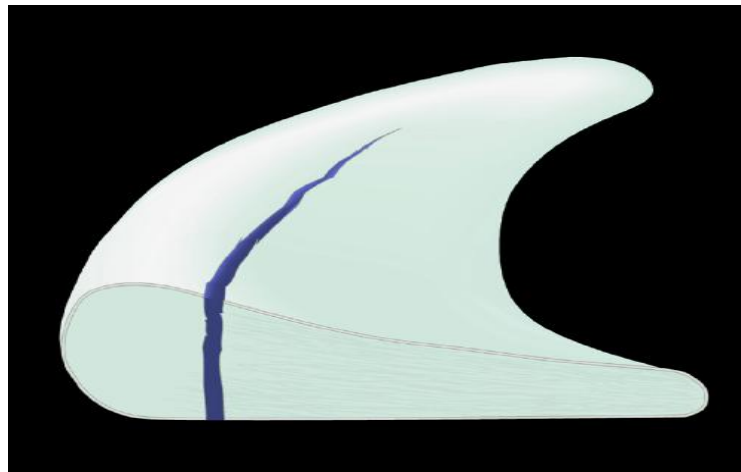
其他型：

- 截断撕裂
- 外围边缘撕裂
- 半月板 - 关节囊撕裂
- 复杂撕裂
- 半月板滑脱
- 半月板根部撕裂

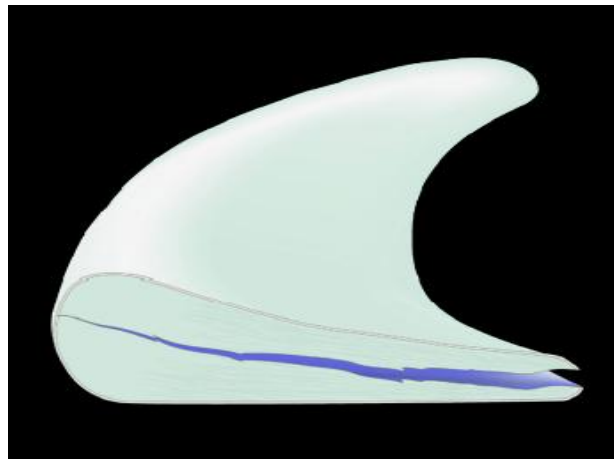
放射状撕裂：

- 鹦鹉嘴样撕裂

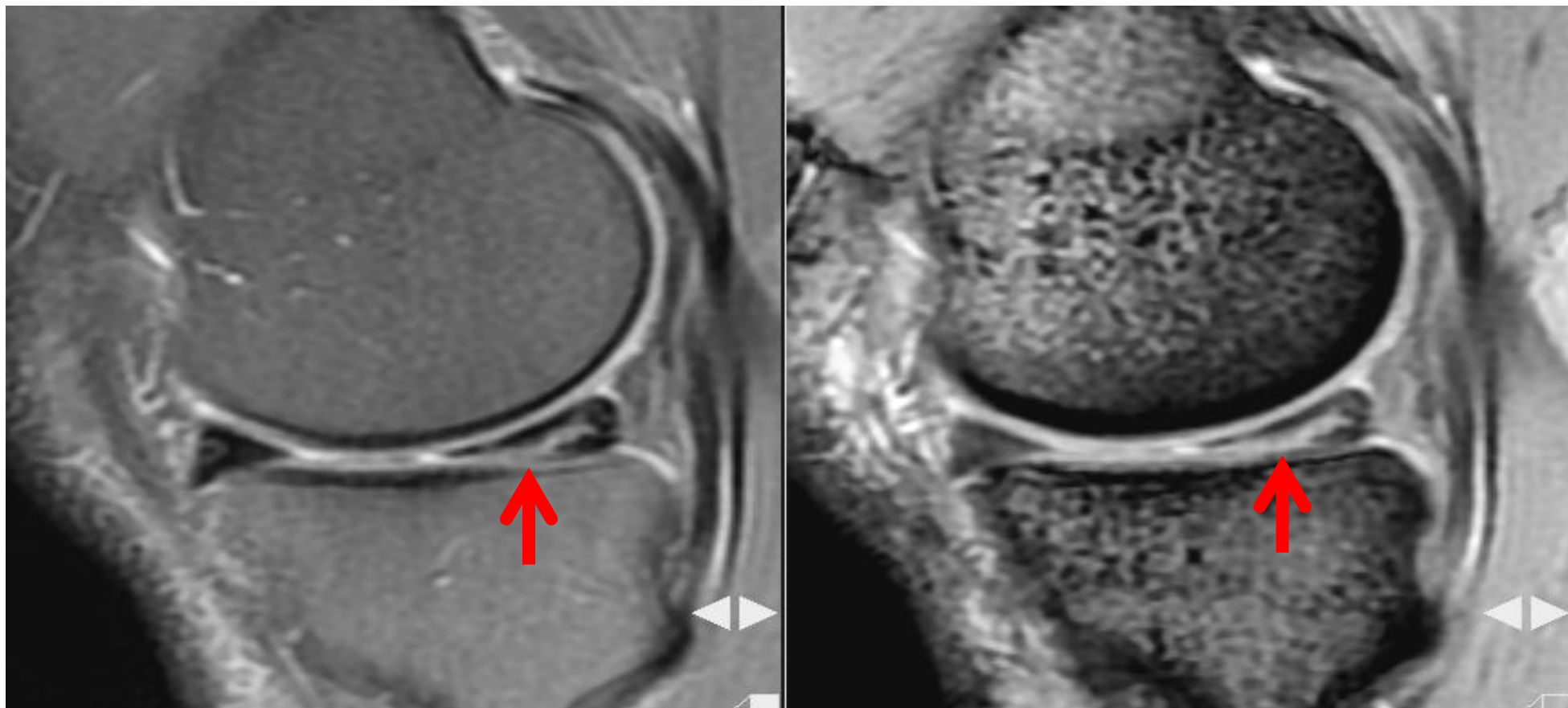
纵向垂直撕裂



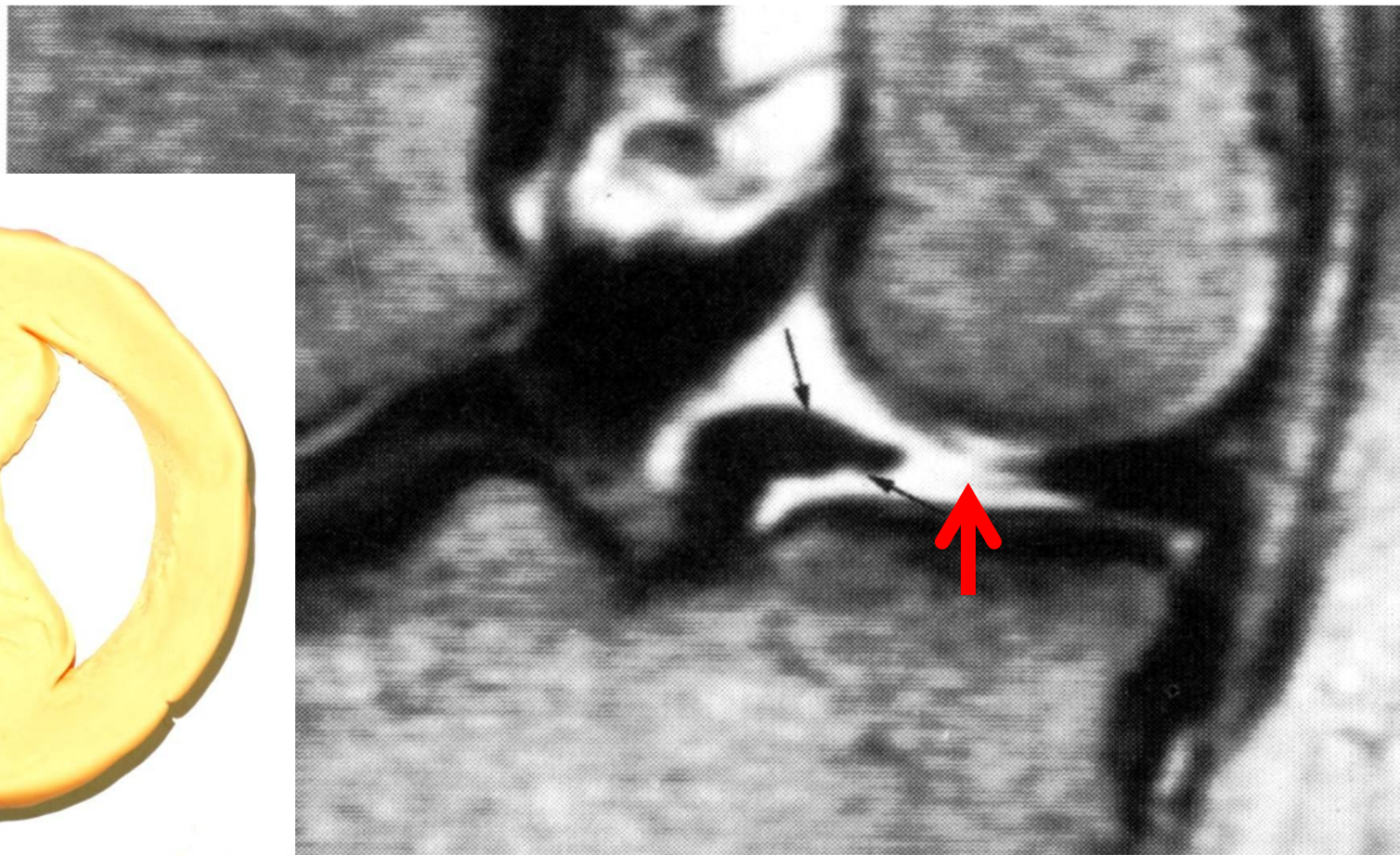
纵向水平撕裂



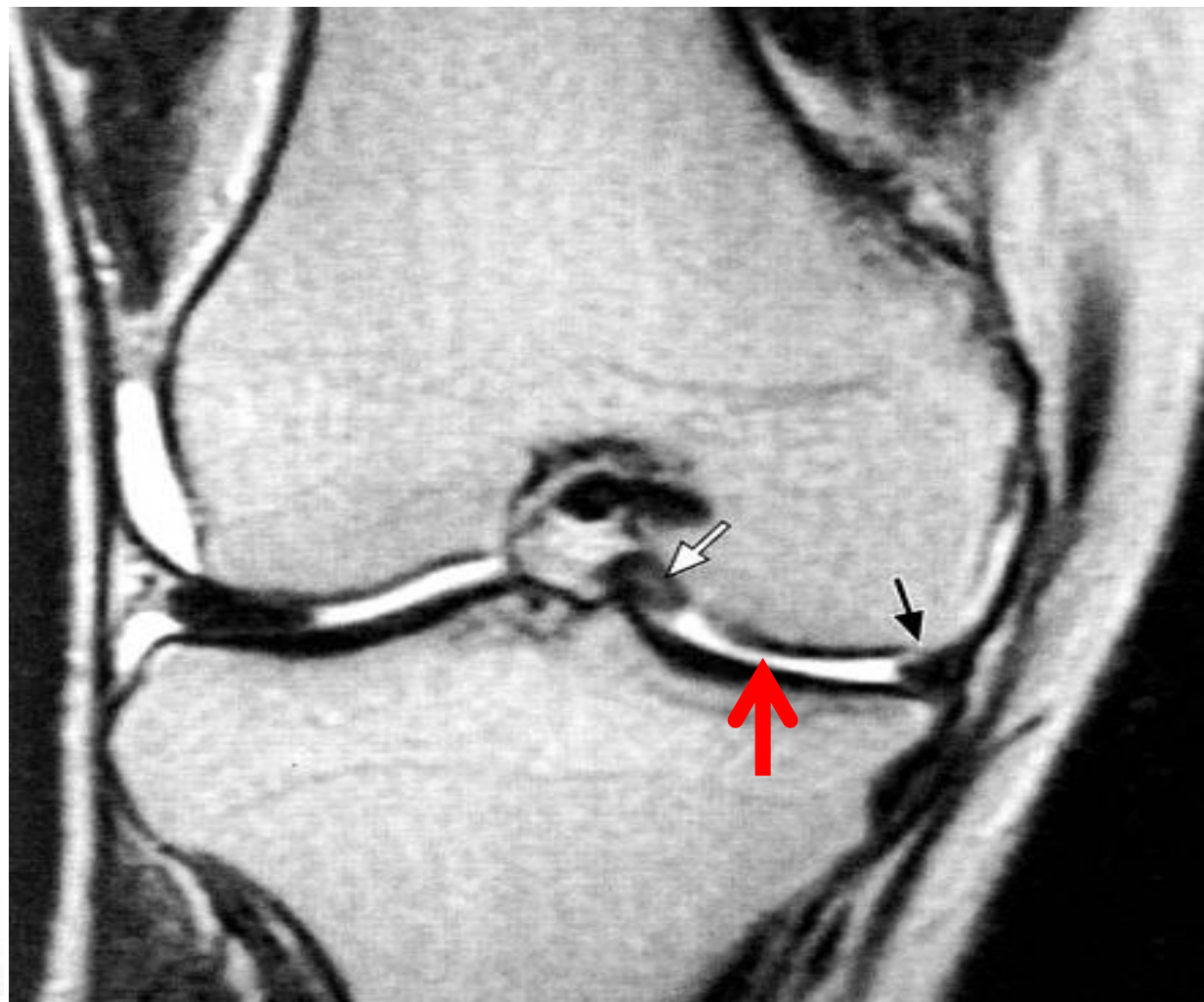
纵向斜形撕裂



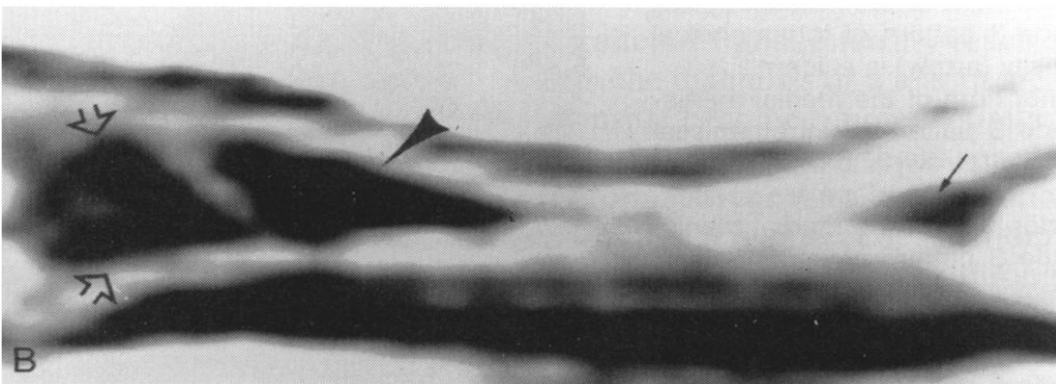
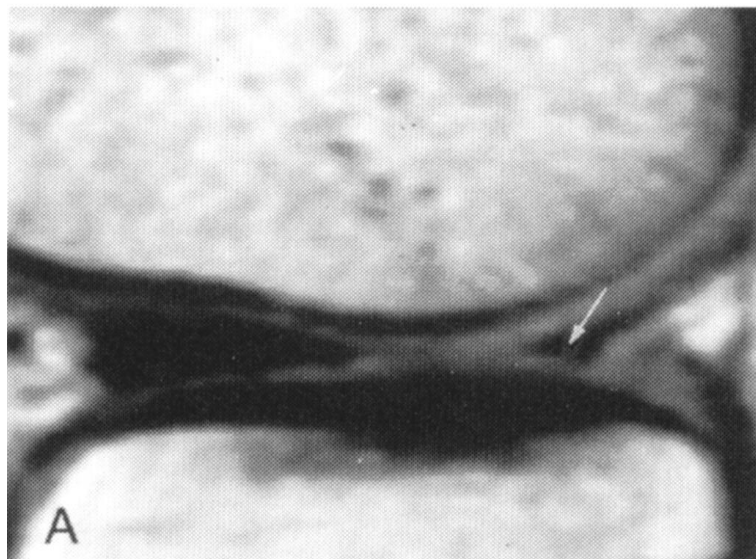
桶把样撕裂



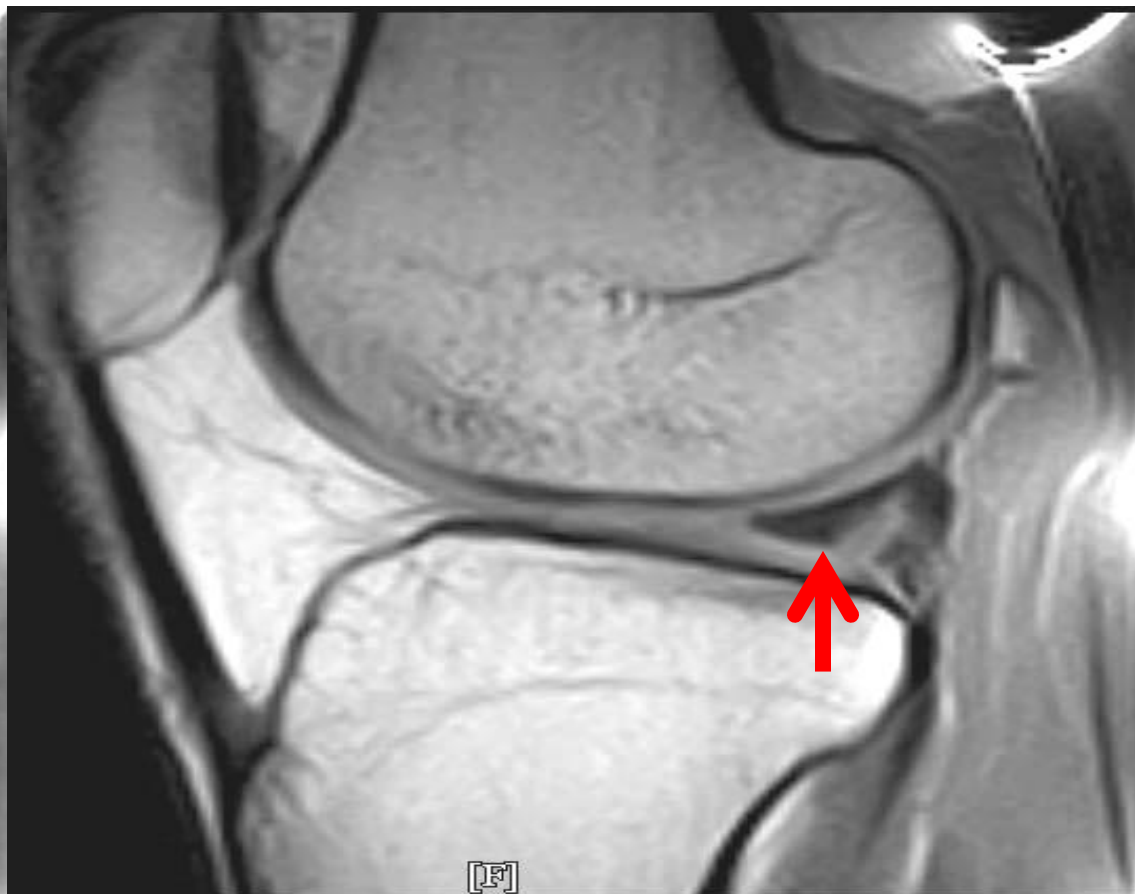
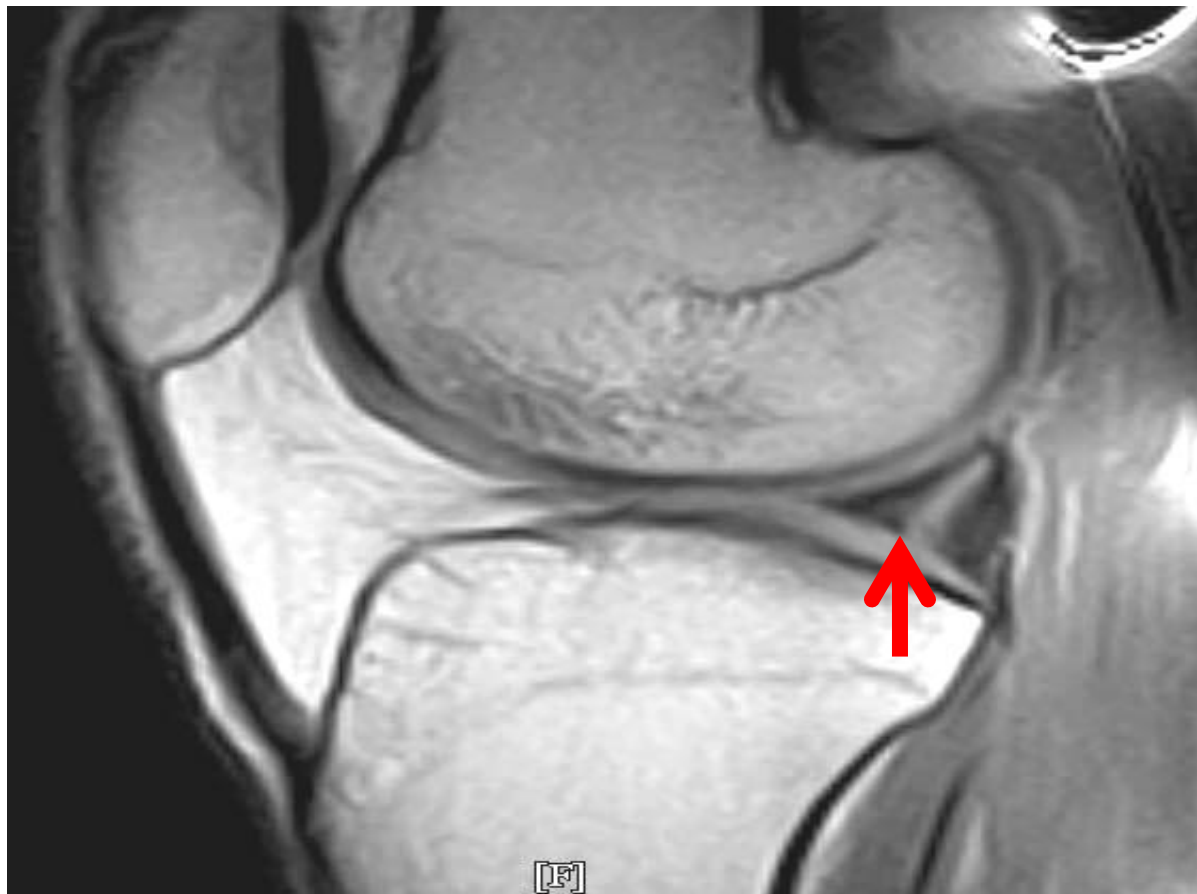
桶把样撕裂



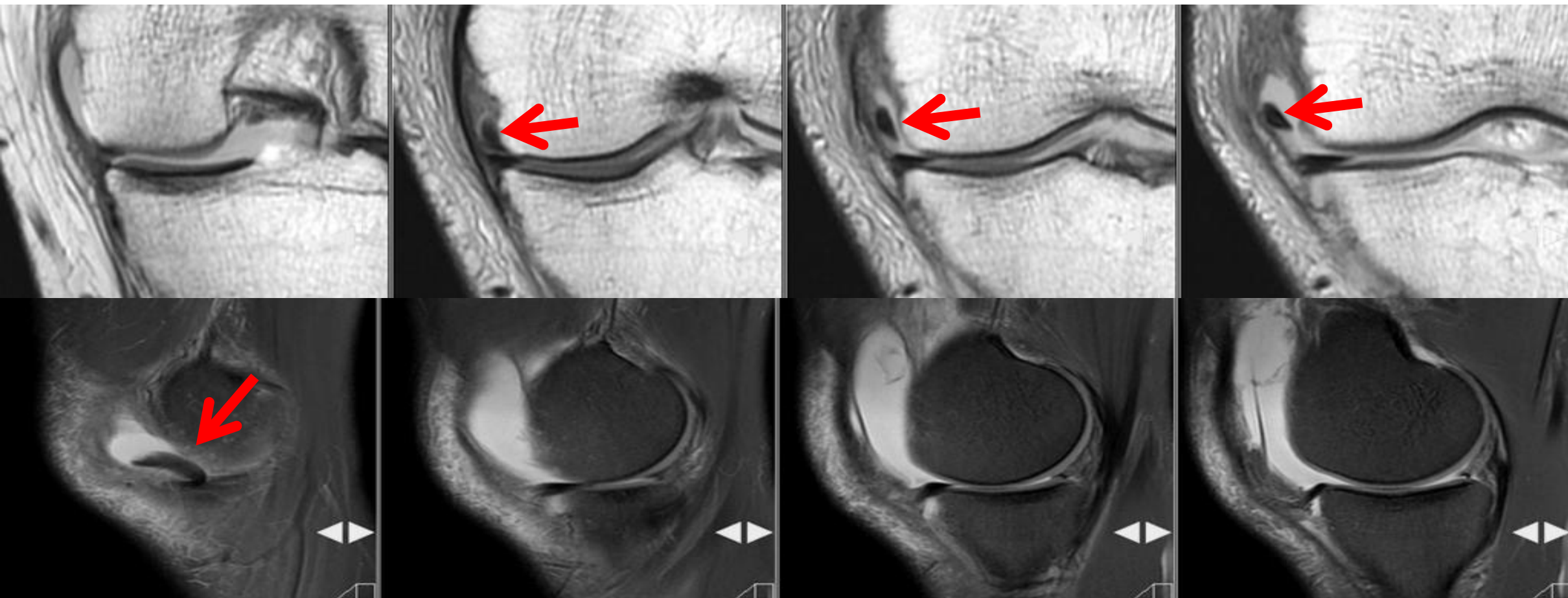
半月板翻转



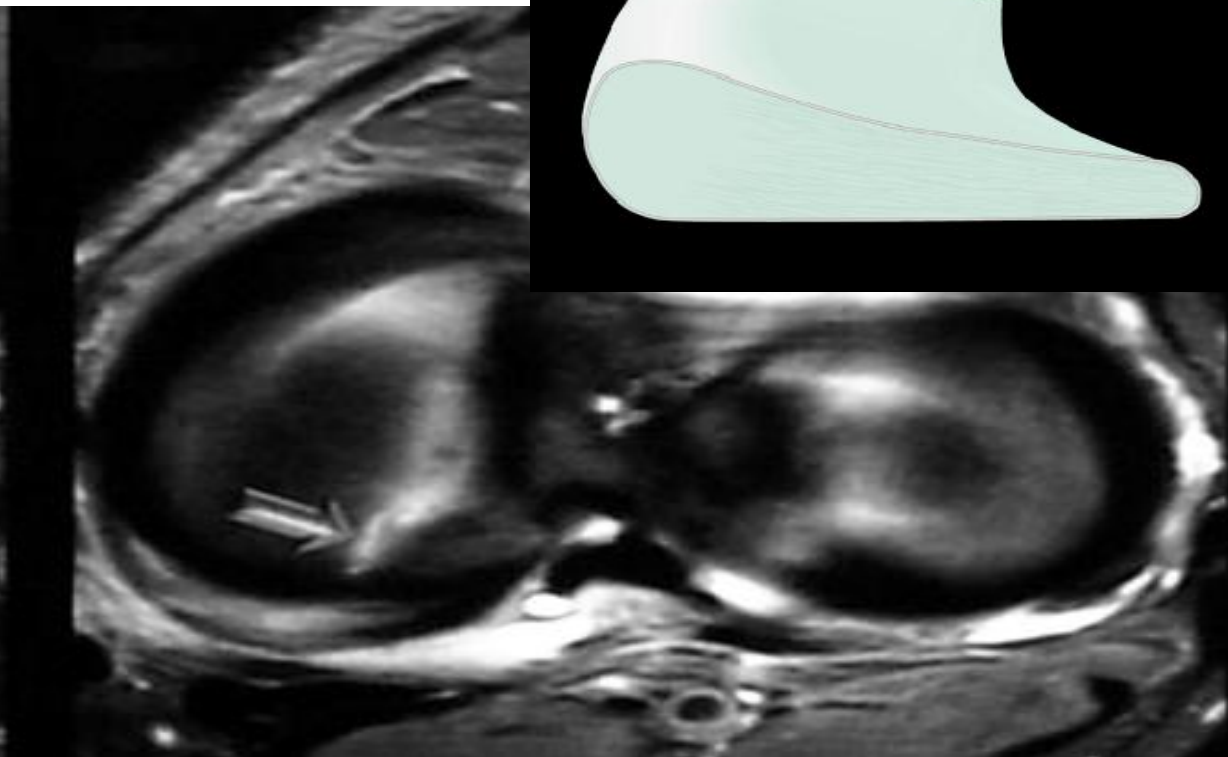
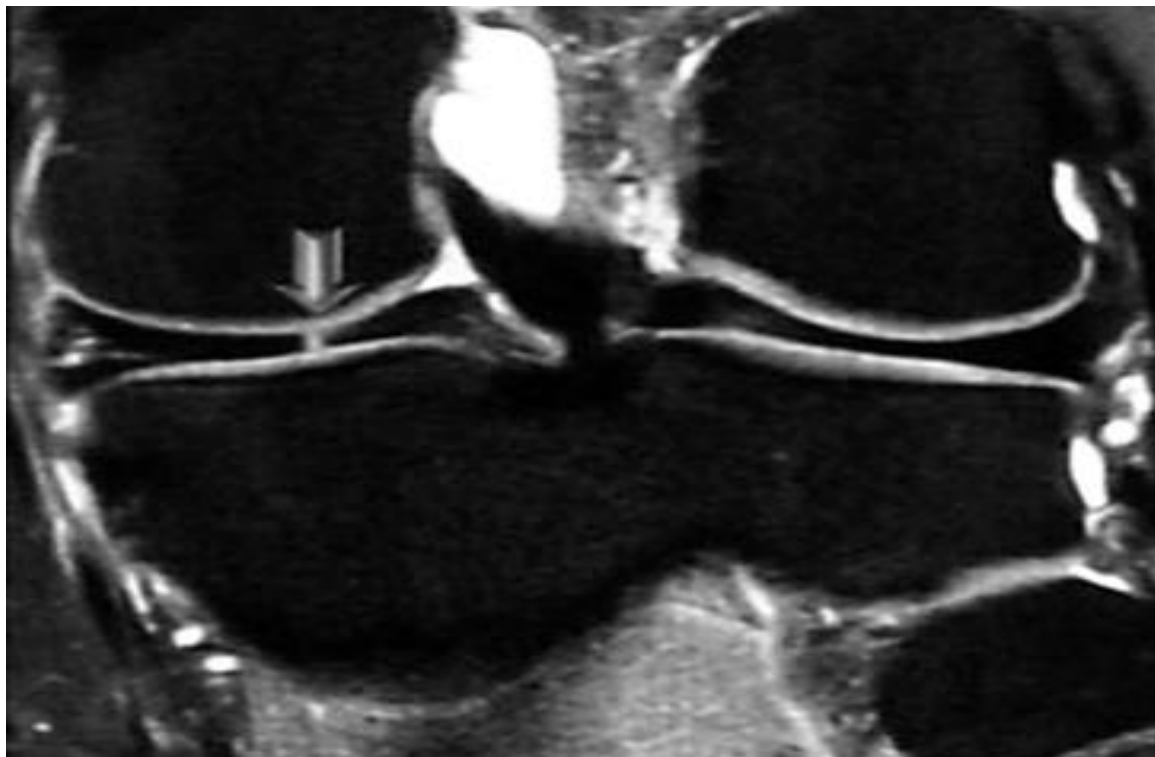
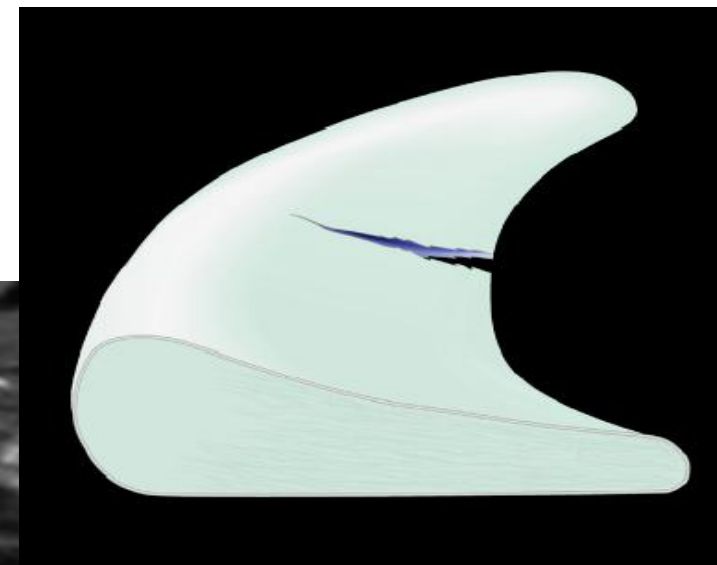
半月板翻转



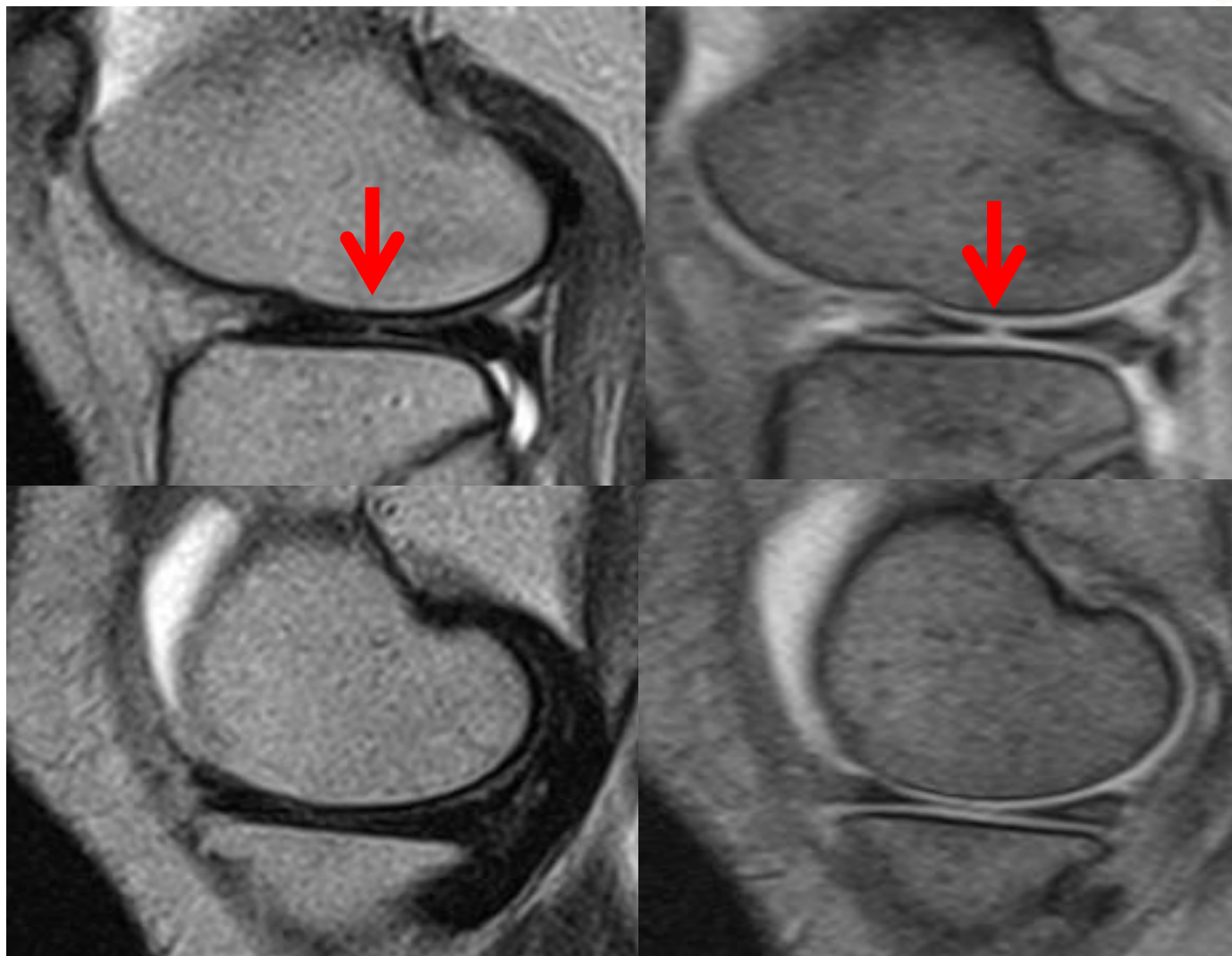
半月板翻转



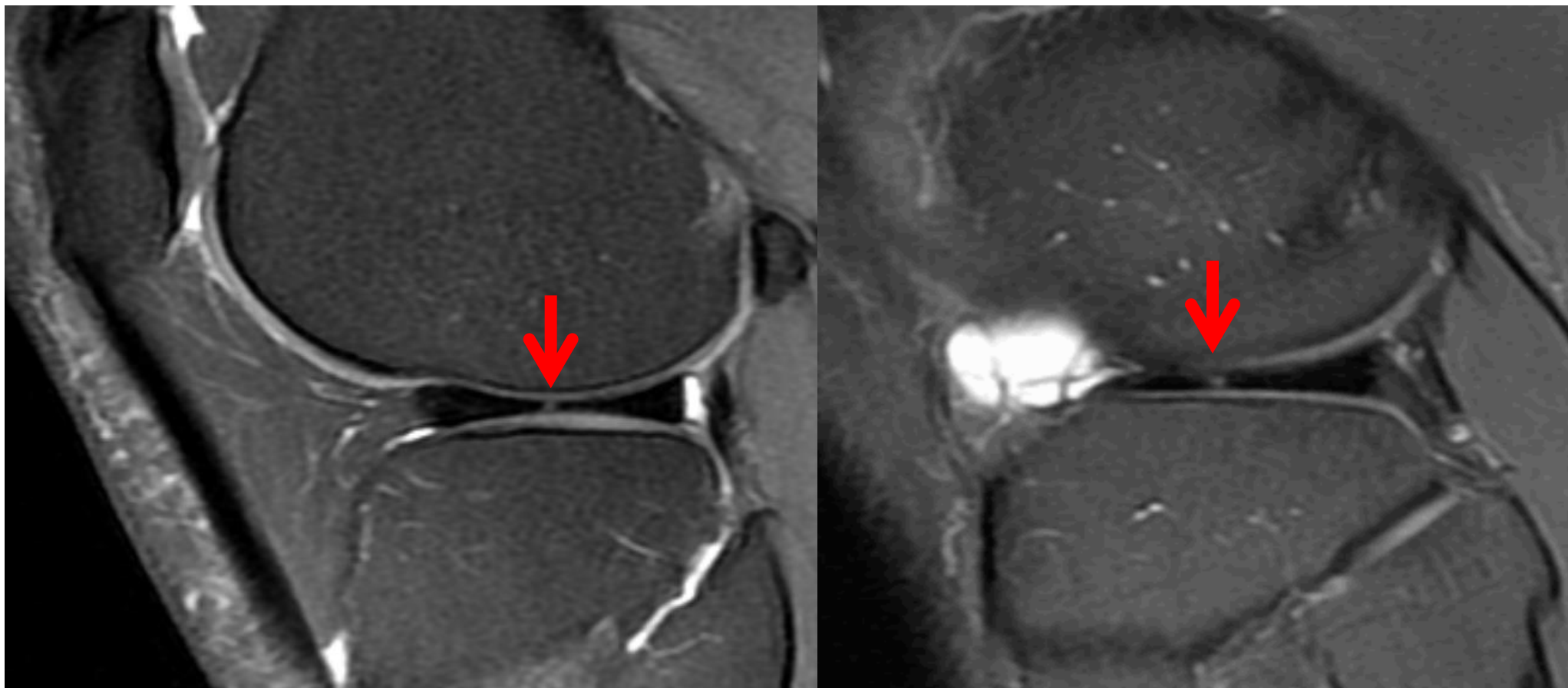
放射状撕裂



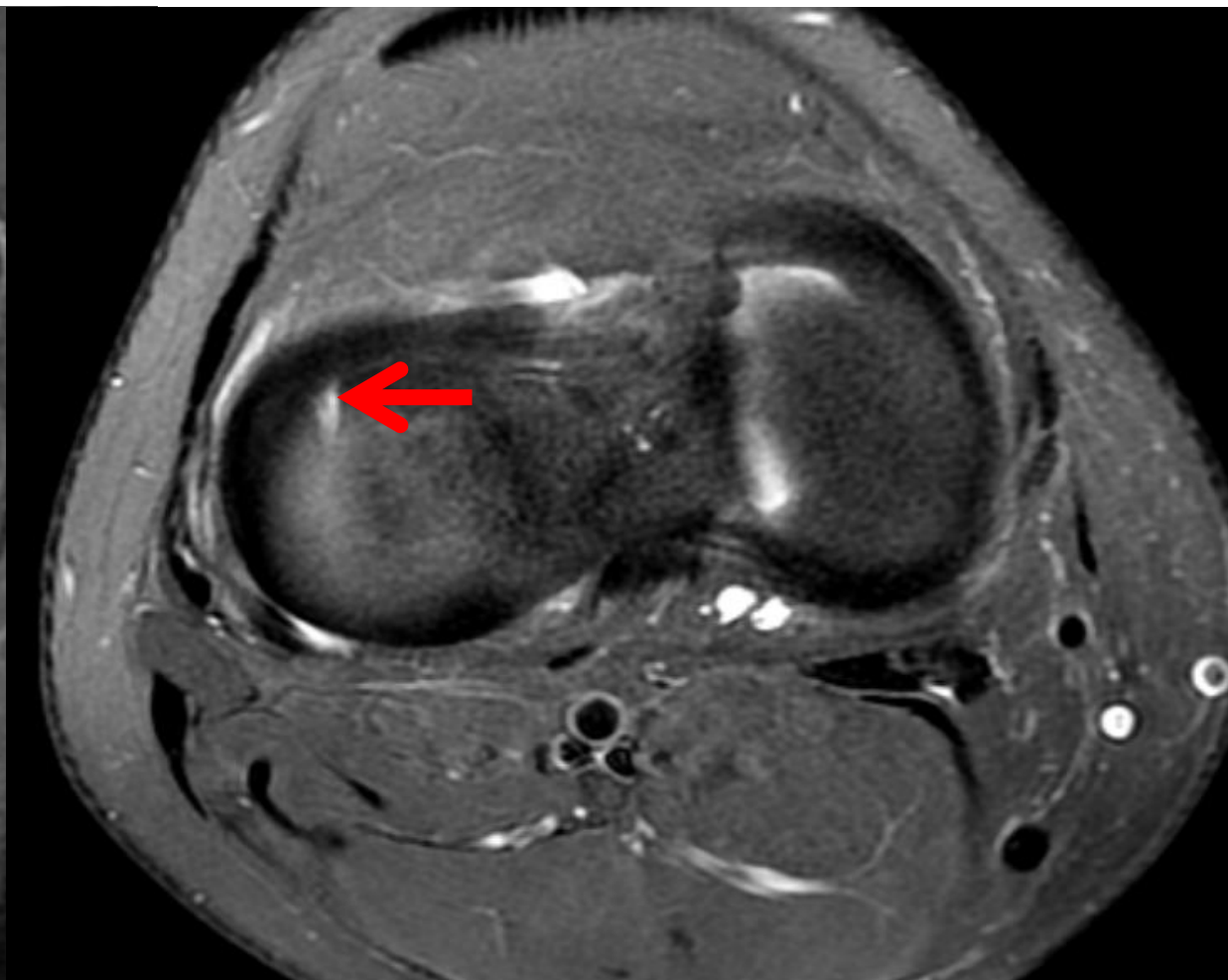
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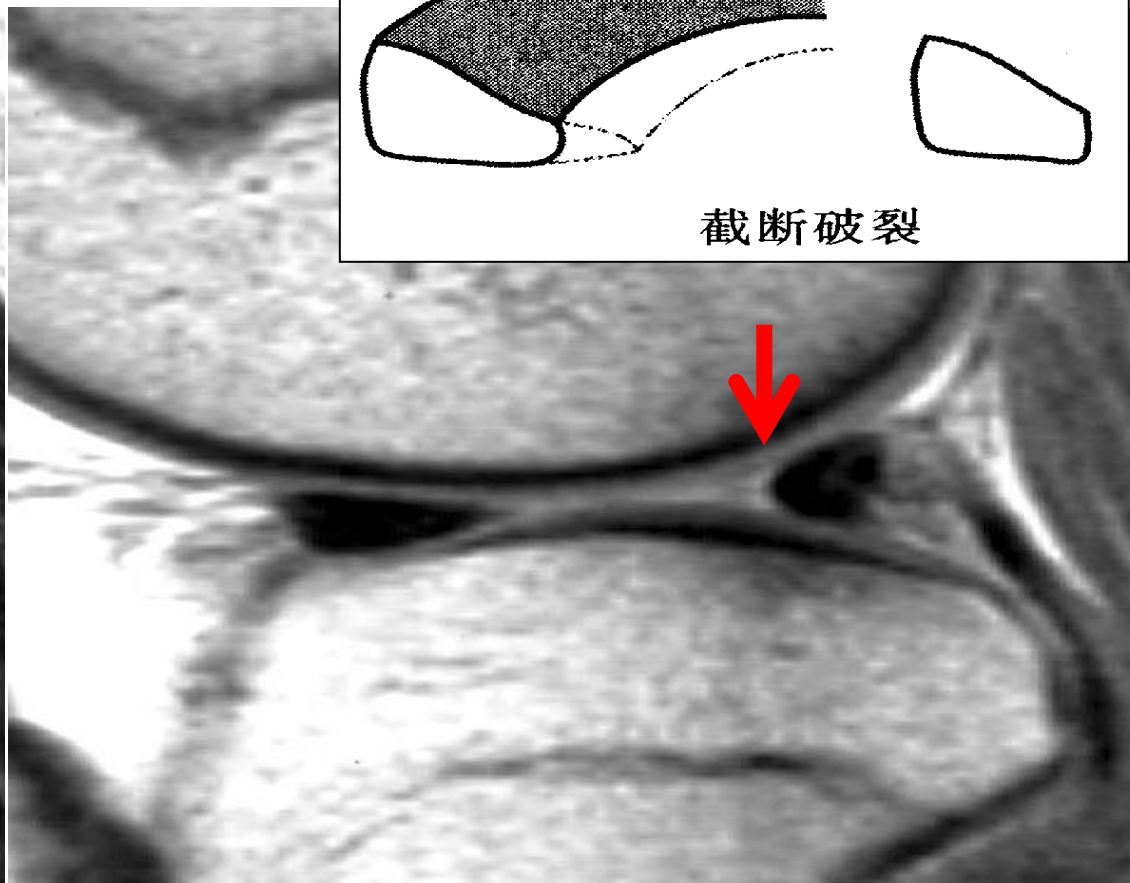
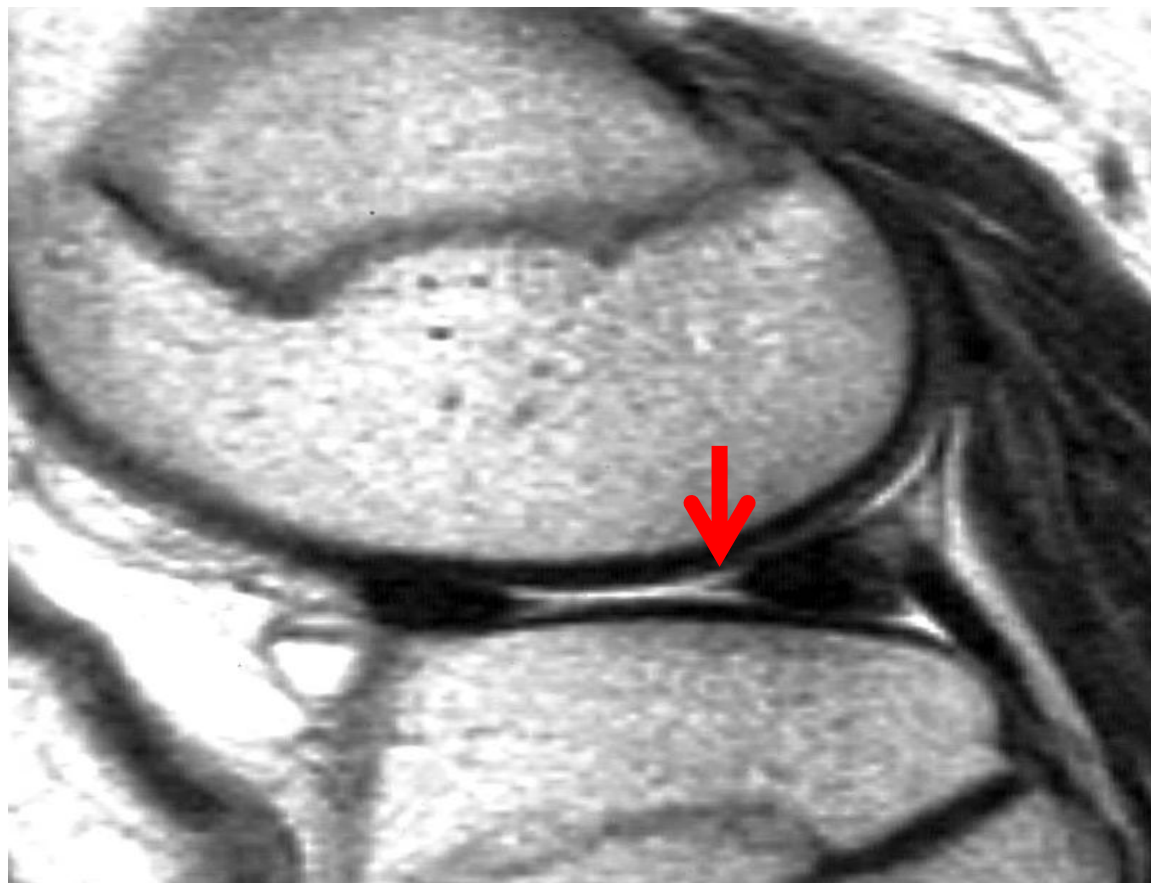
放射状撕裂



放射状撕裂



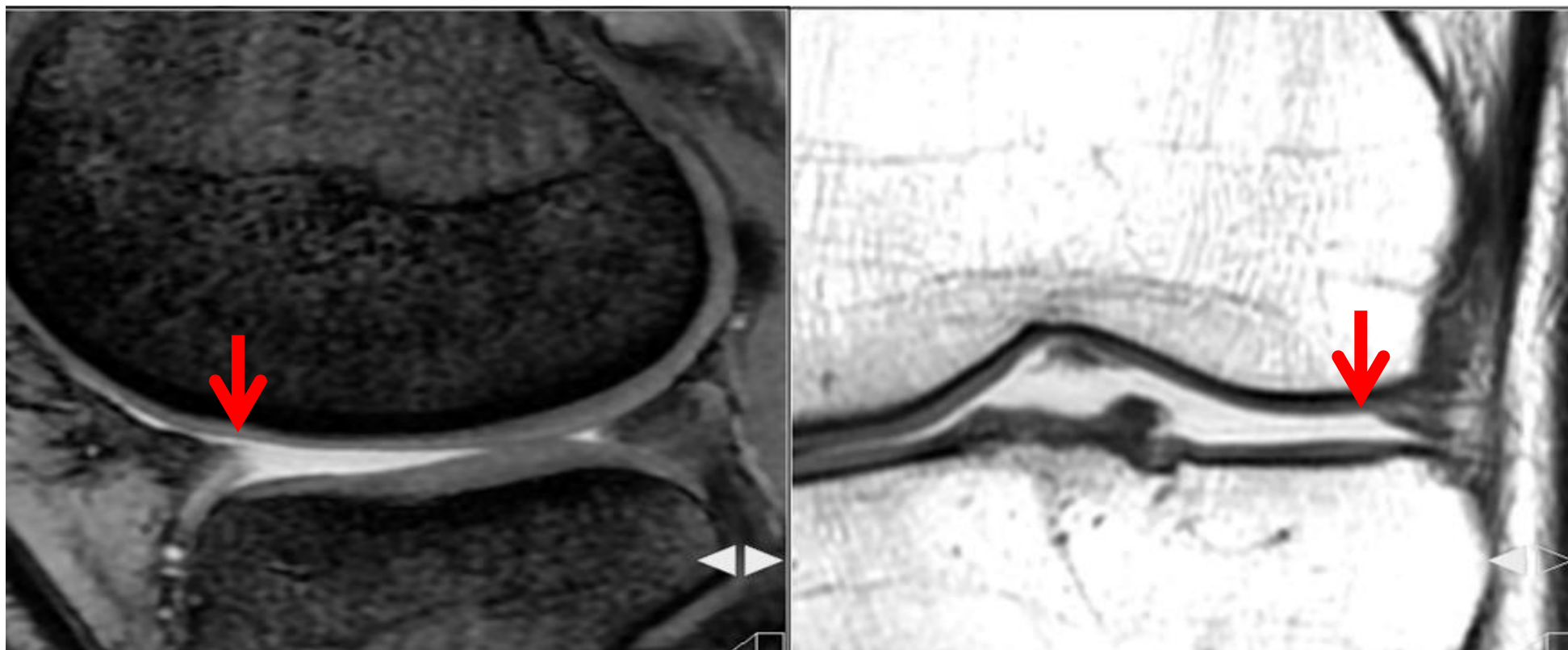
截断撕裂



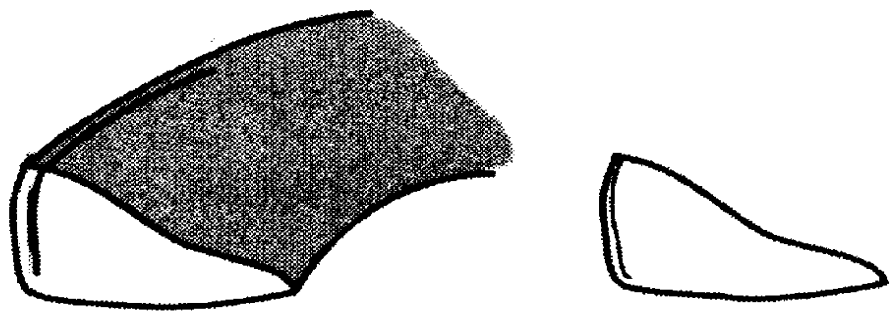
截断撕裂



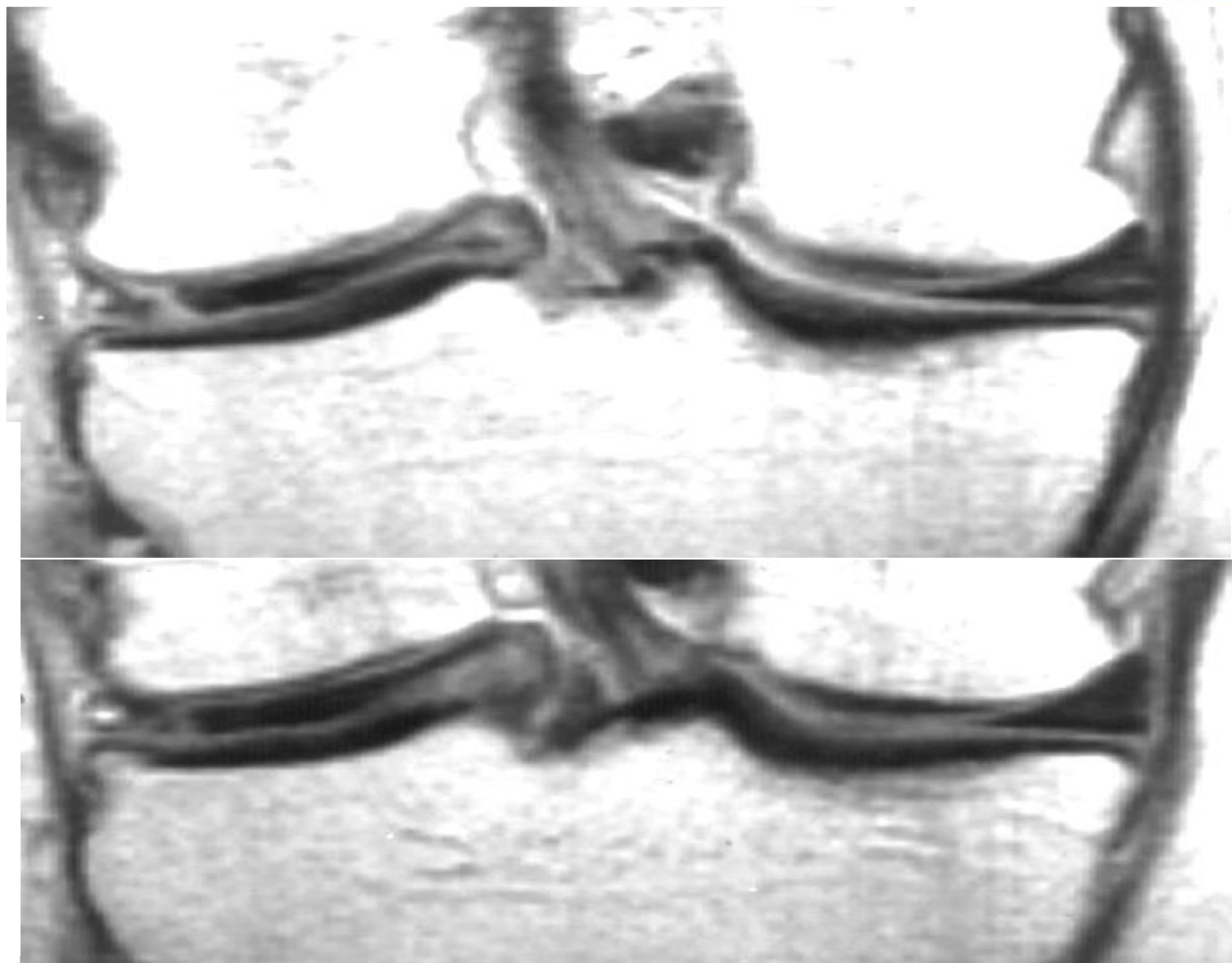
截断撕裂



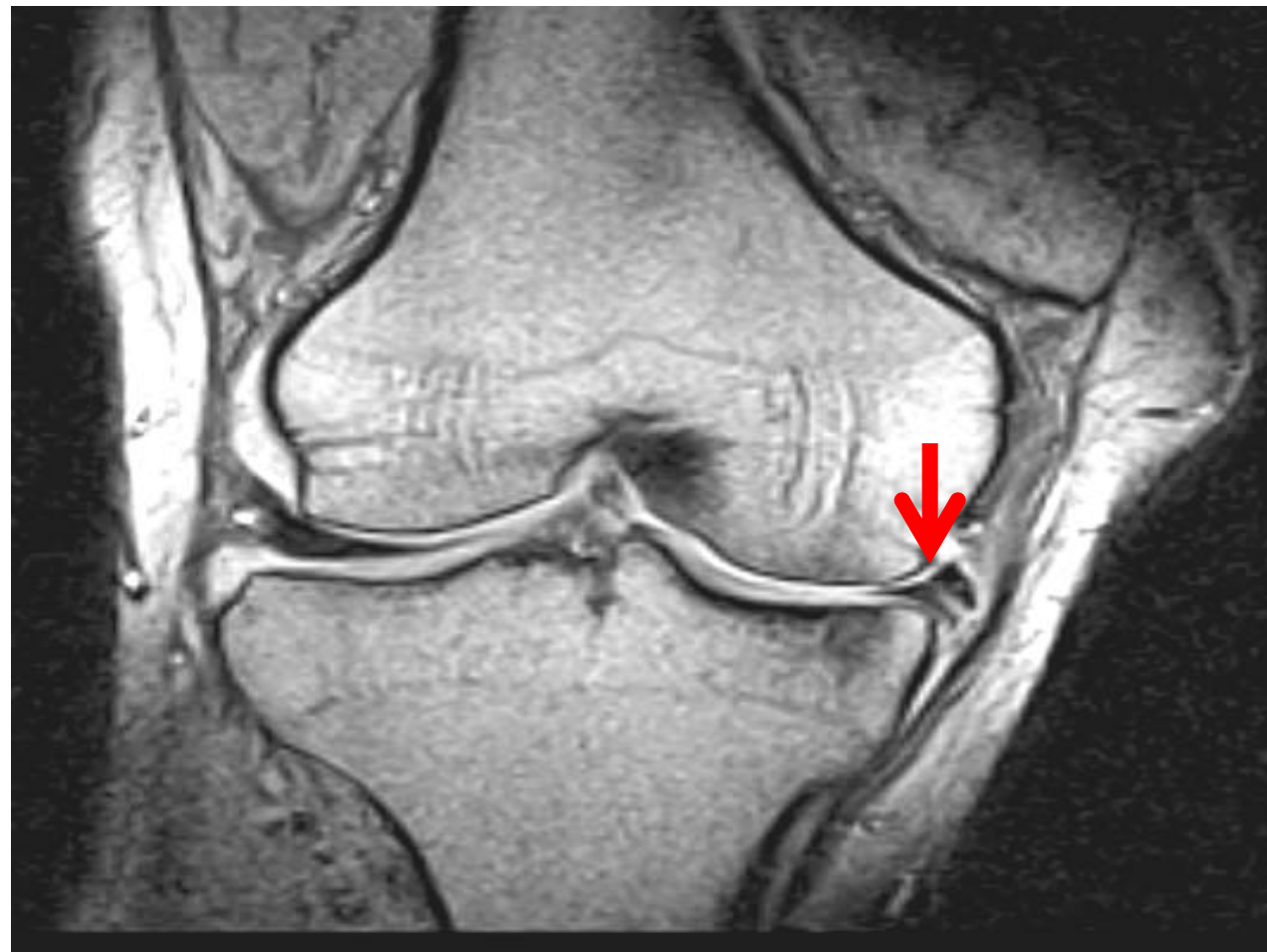
外围边缘撕裂



外围边缘破裂

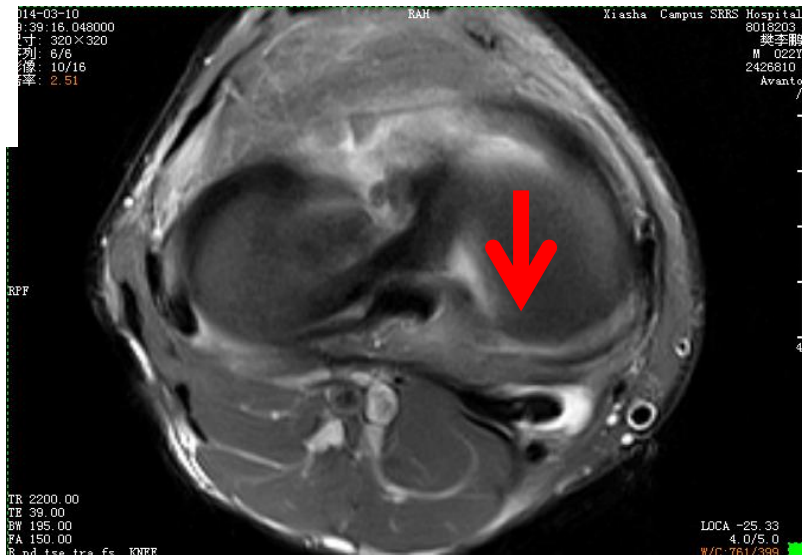


外围边缘撕裂



外围边缘撕裂

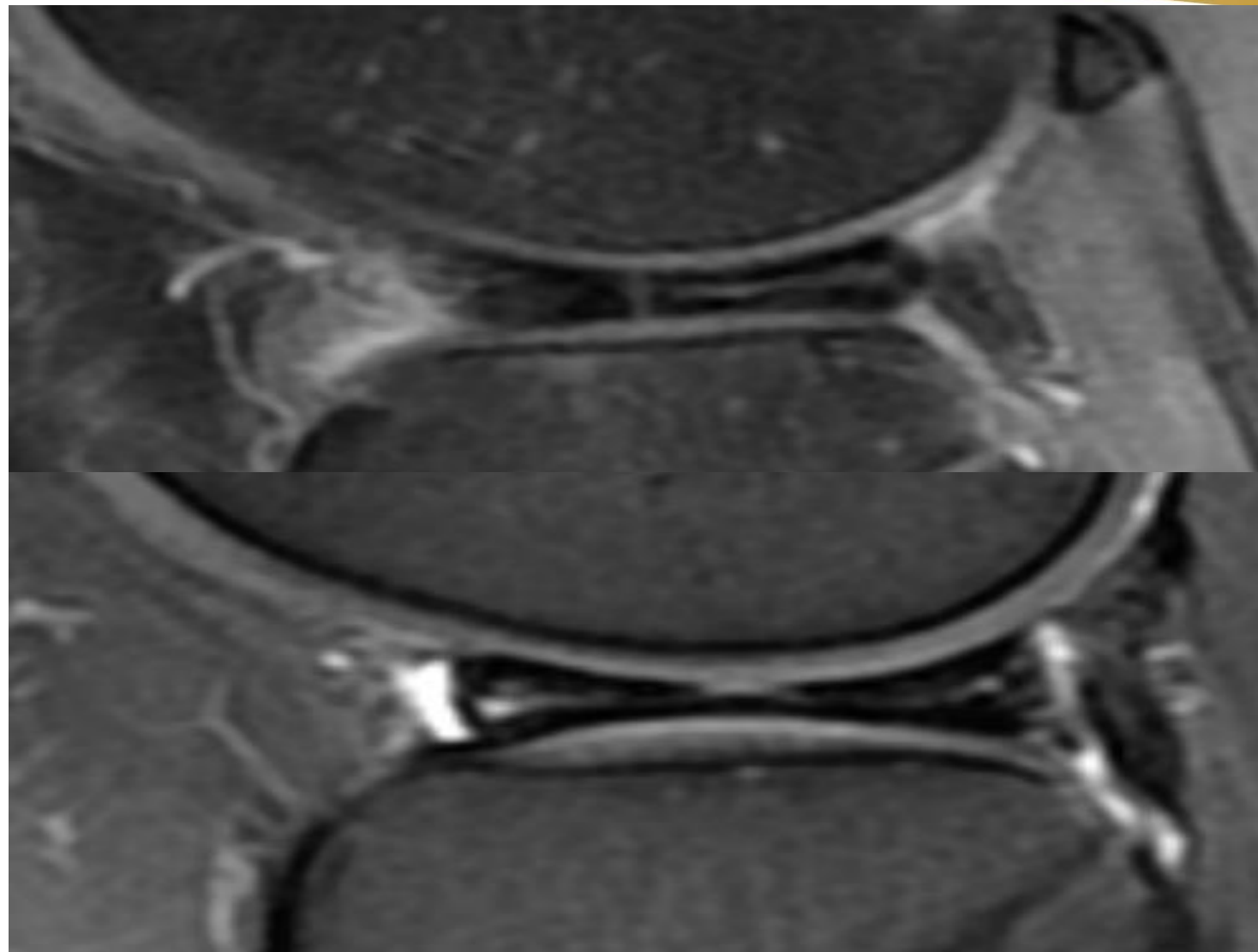
半月板股骨后韧带
(Wrisberg lig.)
附着点撕裂



半月板 - 关节囊撕裂

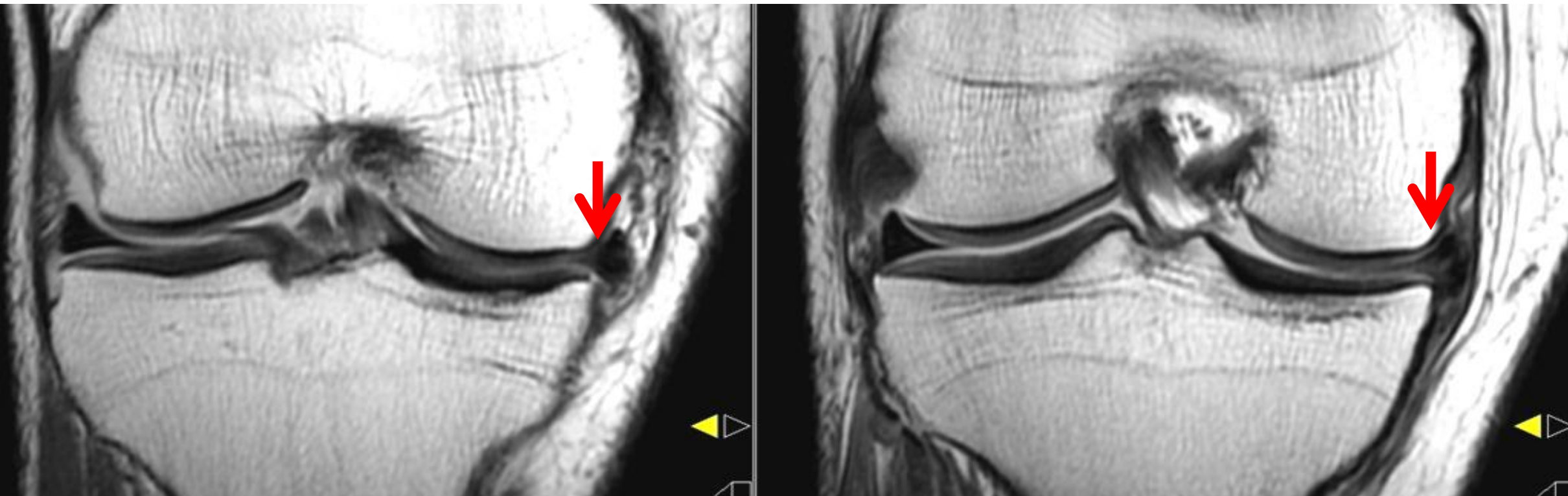


复杂撕裂



半月板滑脱

半月板滑脱通常见于骨关节炎患者，也见于部分类型的半月板撕裂（大、复杂、放射状撕裂或者根部撕裂）。半月板滑脱会加重骨关节炎。



Lin E. Magnetic resonance imaging of the knee: clinical significance of common findings. Curr Probl Diagn Radiol. 2010 Jul-Aug;39(4):152-9.



Factors Associated with Meniscal Extrusion in Knees with or at Risk for Osteoarthritis: The Multicenter Osteoarthritis Study

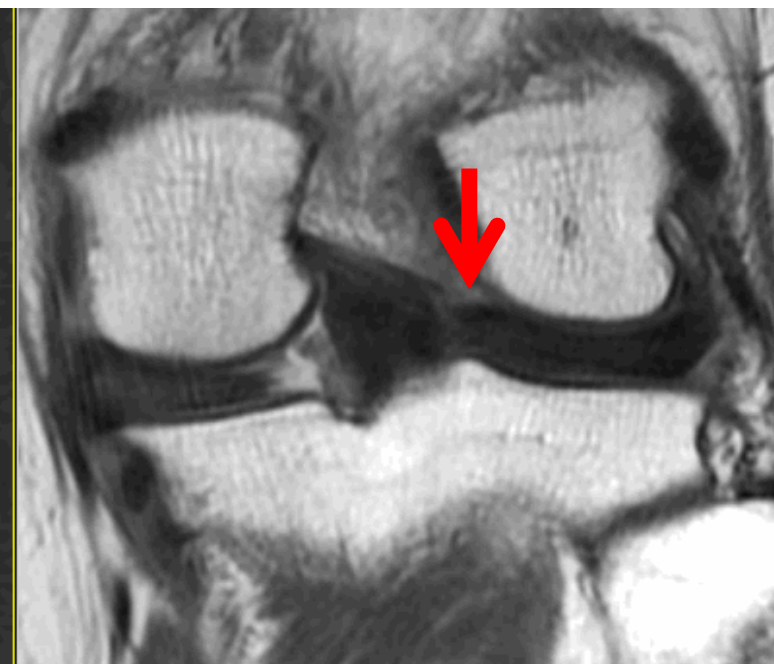
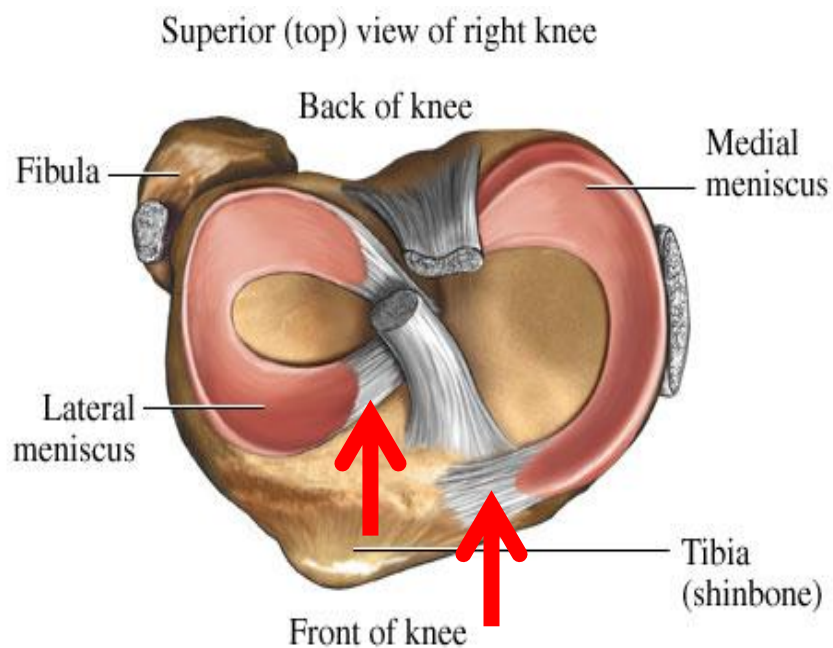
Radiology: 2012;264(2): 494-503

- (1) in persons who have or are at risk for knee OA, meniscal tears are not the only factors associated with meniscal extrusion;
- (2) other independent factors include tibiofemoral cartilage damage and knee malalignment.
- (3) the severity of meniscal damage and the presence of root tears are independently associated with meniscal extrusion.

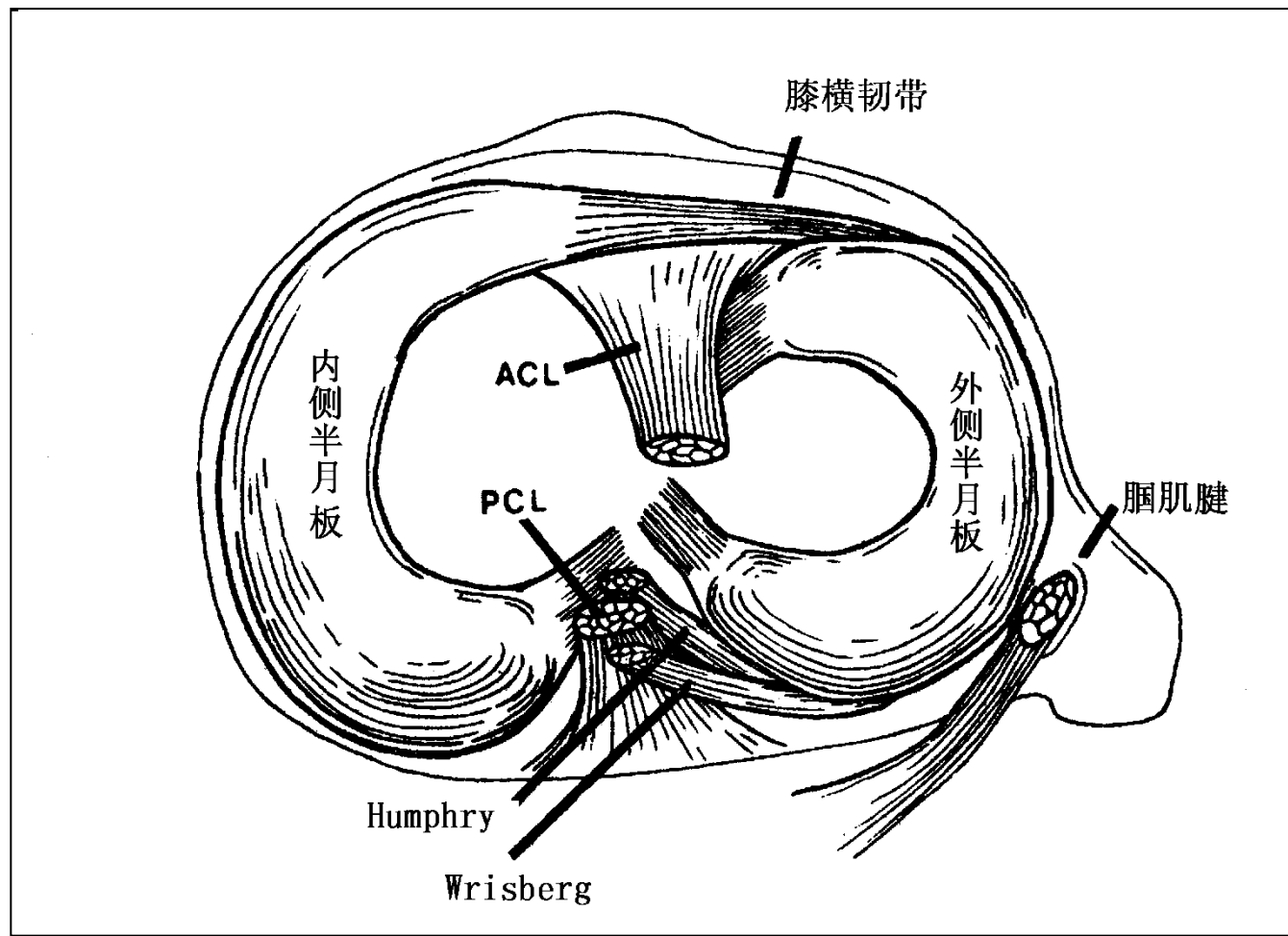
Meniscal extrusion seems to be a result of the complex interaction of the different joint tissues and biomechanical loading involved in the OA process.



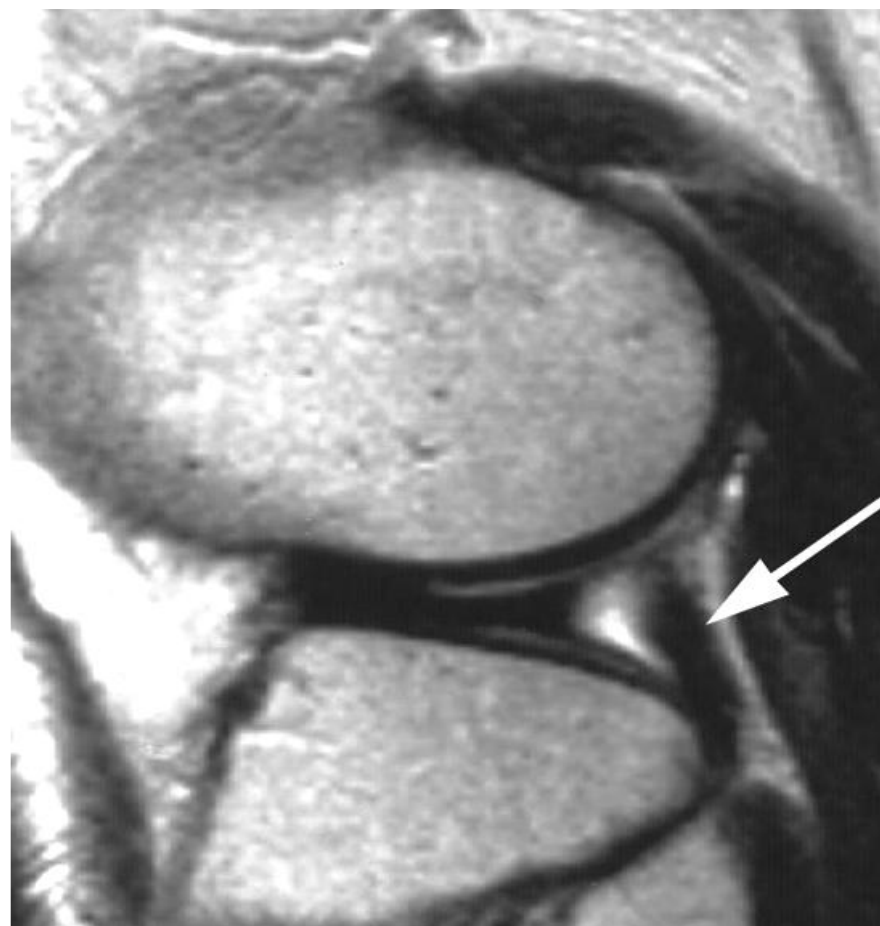
半月板根部撕裂



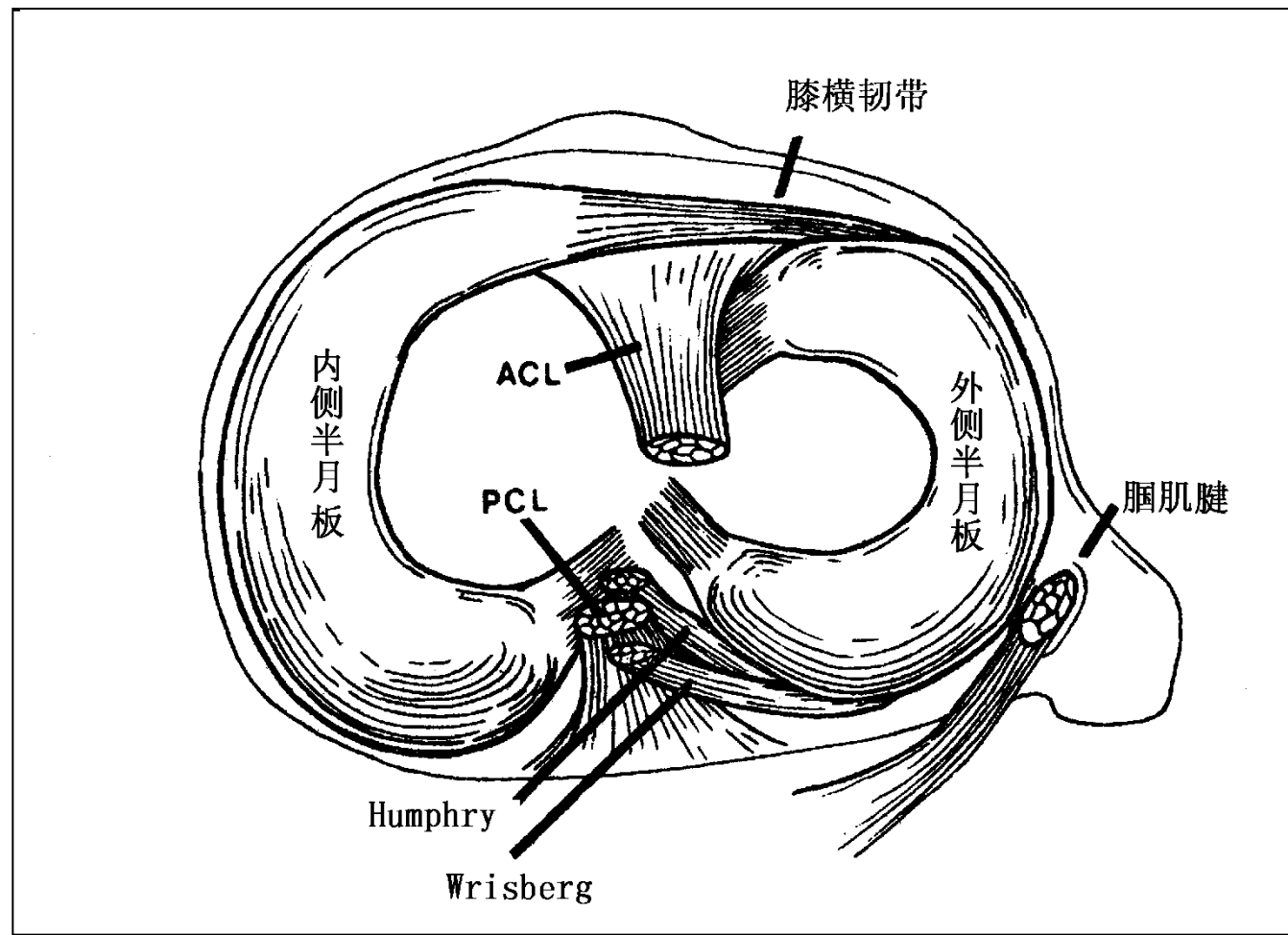
半月板撕裂 鉴别 腓肌腱



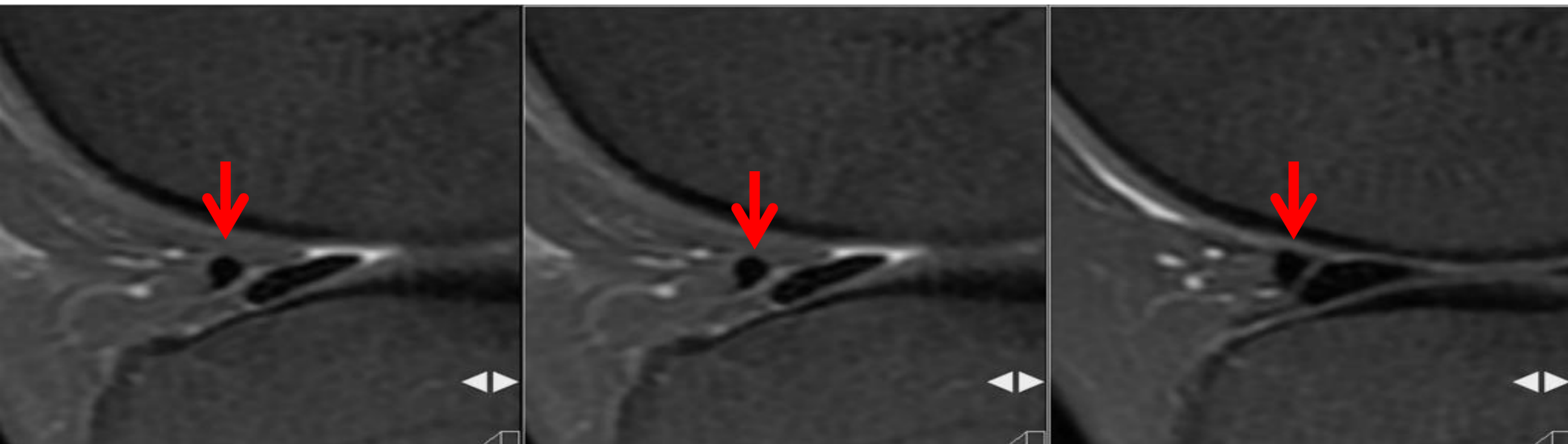
半月板撕裂 鉴别 腓肌腱



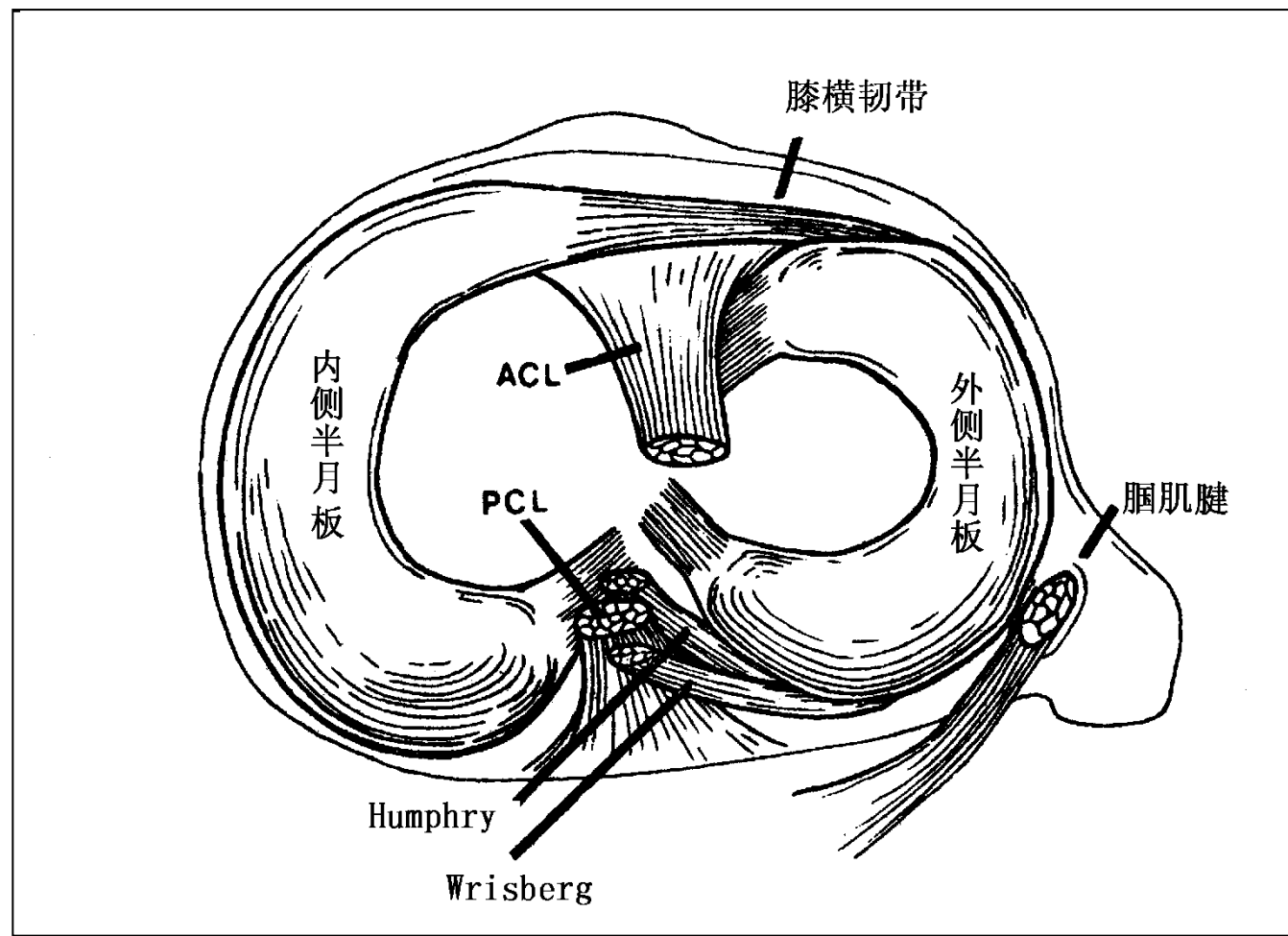
半月板撕裂 鉴别 膝横韧带



半月板撕裂 鉴别 膝横韧带



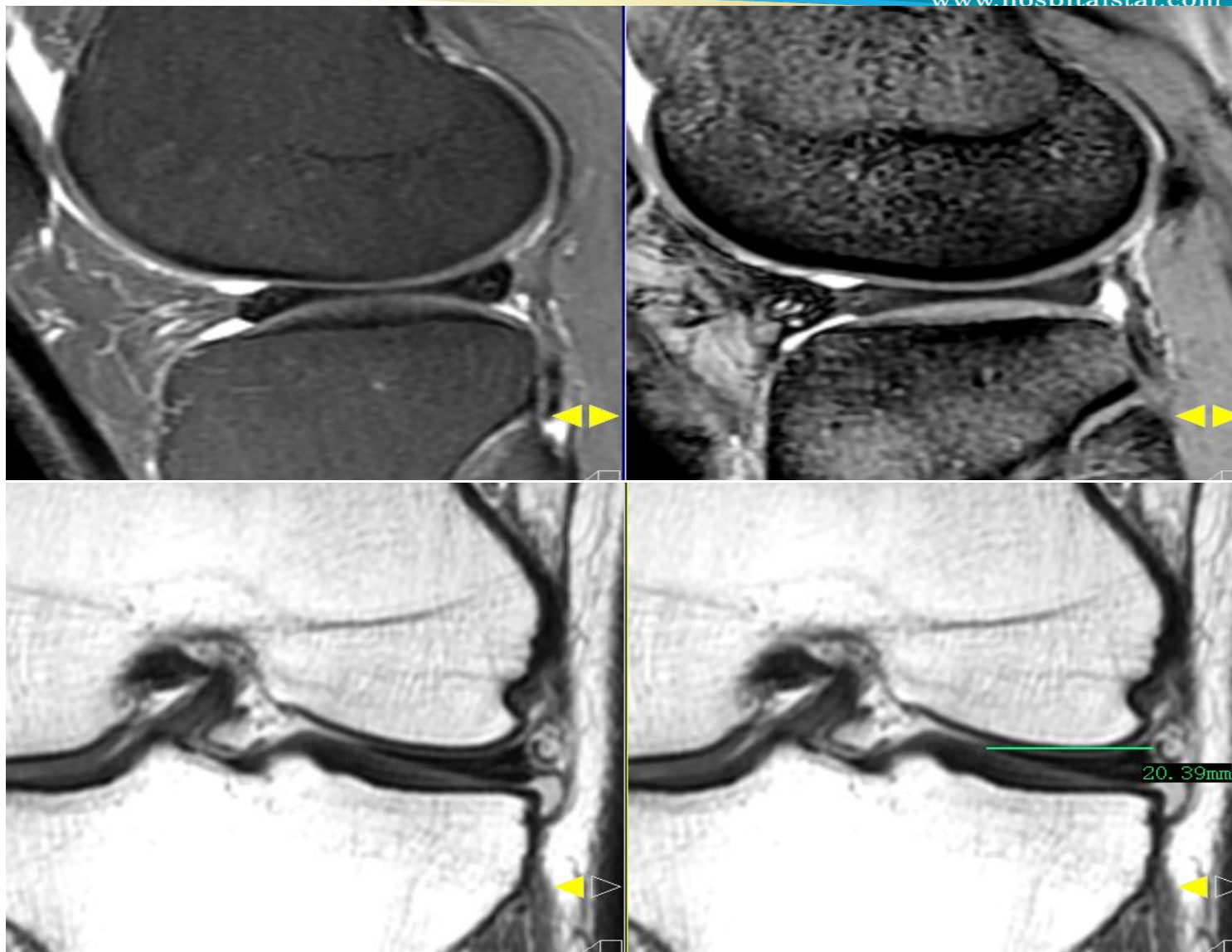
半月板撕裂 鉴别 半月板 - 股骨韧带韧带



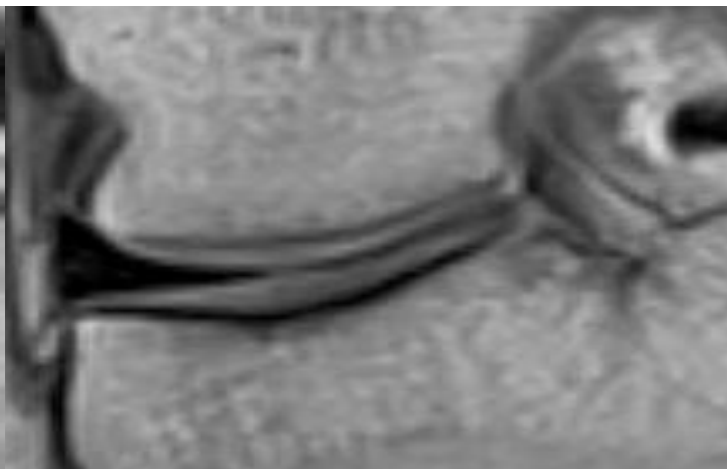
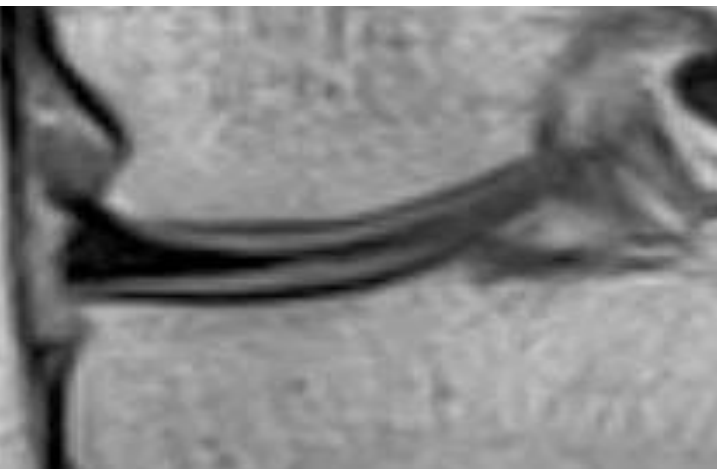
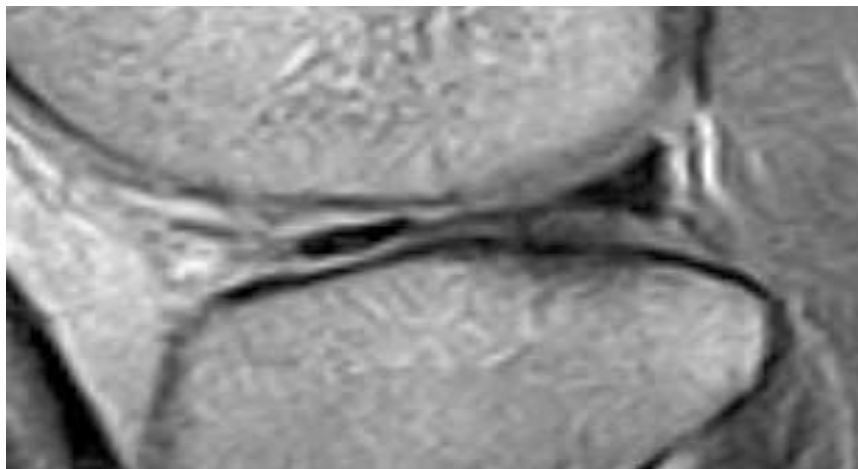
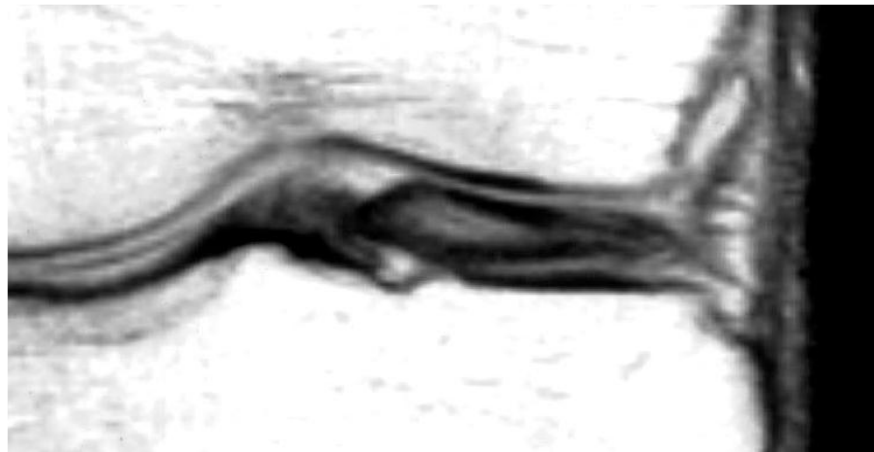
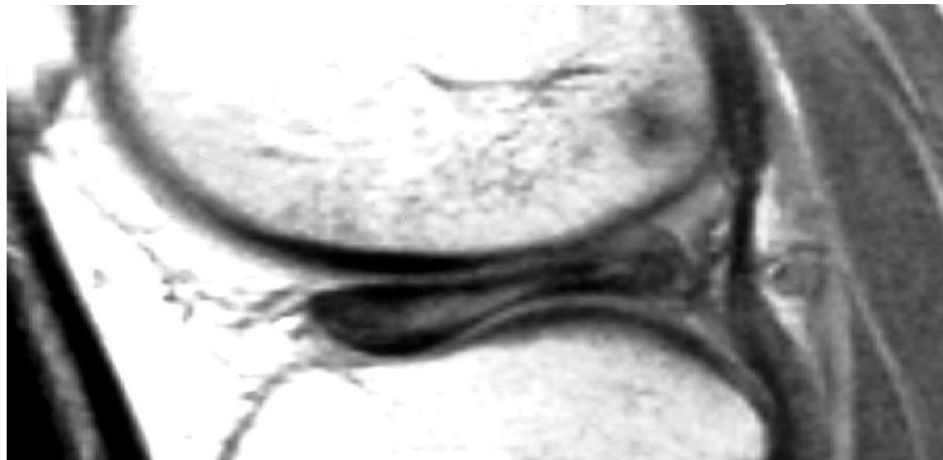


盘状半月板

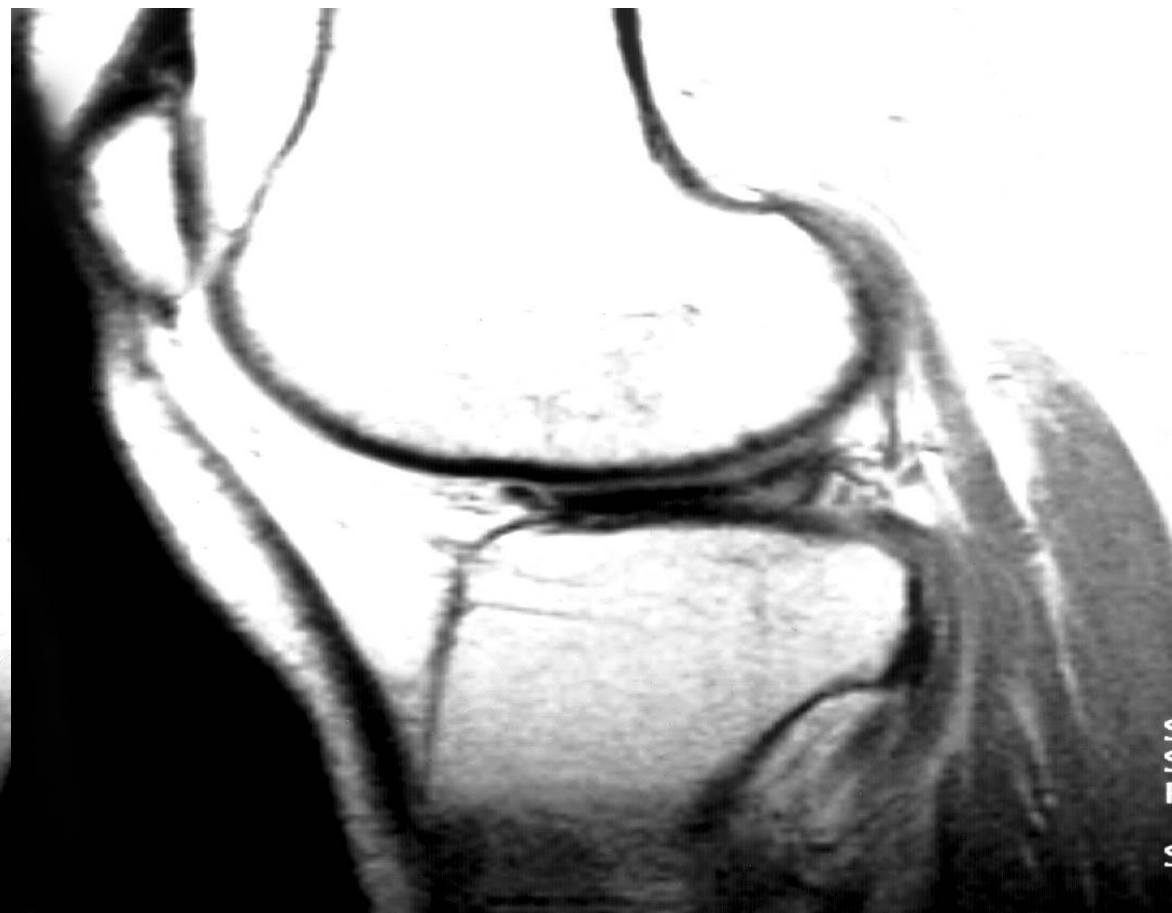
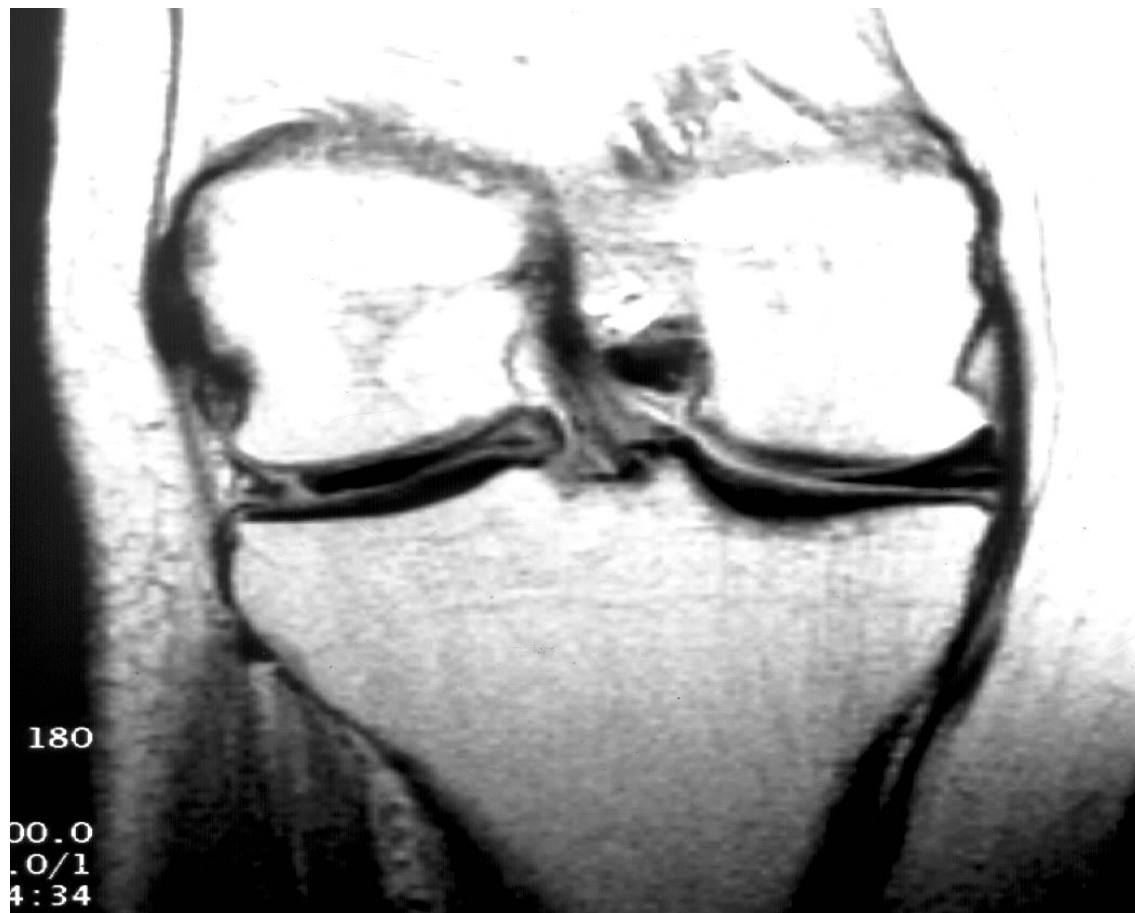
- 盘状半月板 在解剖上显示位半月板组织部分或全部地覆盖了胫骨平台的中心区域。
- 盘状半月板 MRI表现为连续3个层面见到半月板呈“双凹形”或半月板的宽径增加 ($>15\text{mm}$, 冠状位)。



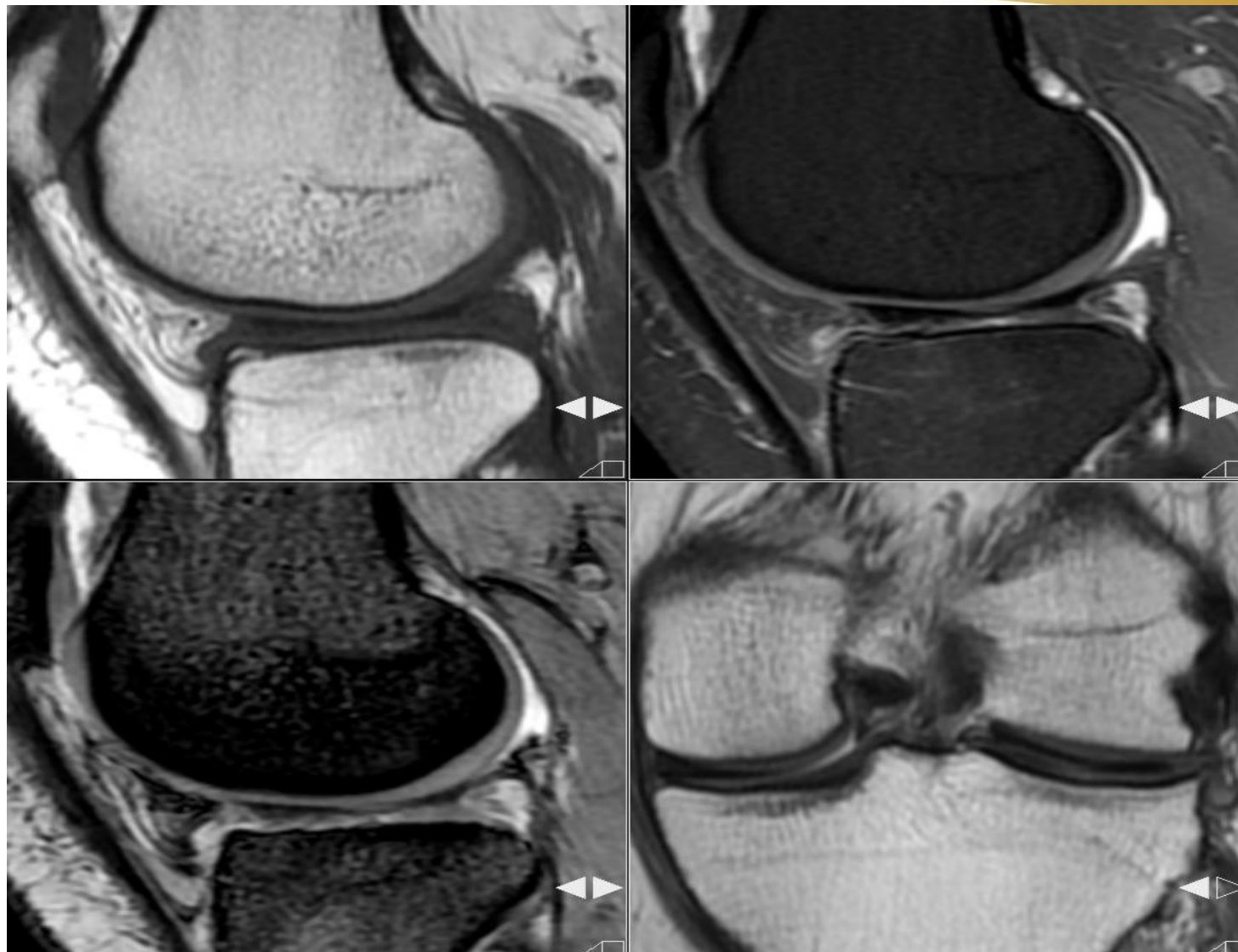
盘状半月板



盘状半月板 伴撕裂



盘状半月板 伴撕裂



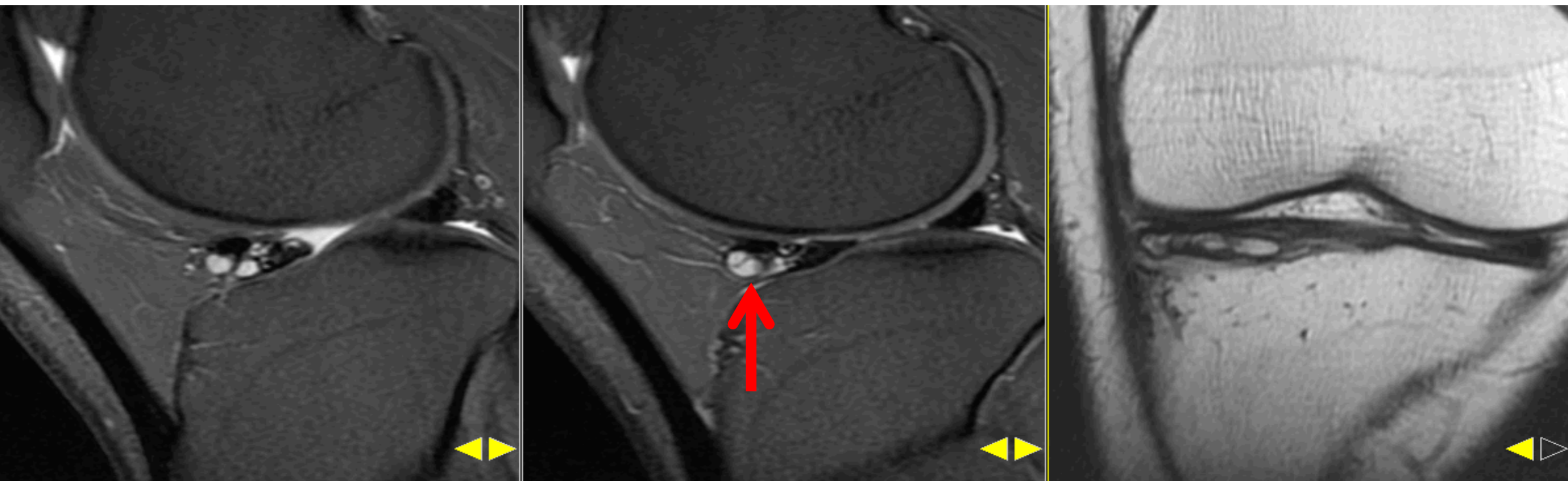
半月板囊肿

半月板囊肿分三型：半月板内、半月板旁和滑膜囊肿。

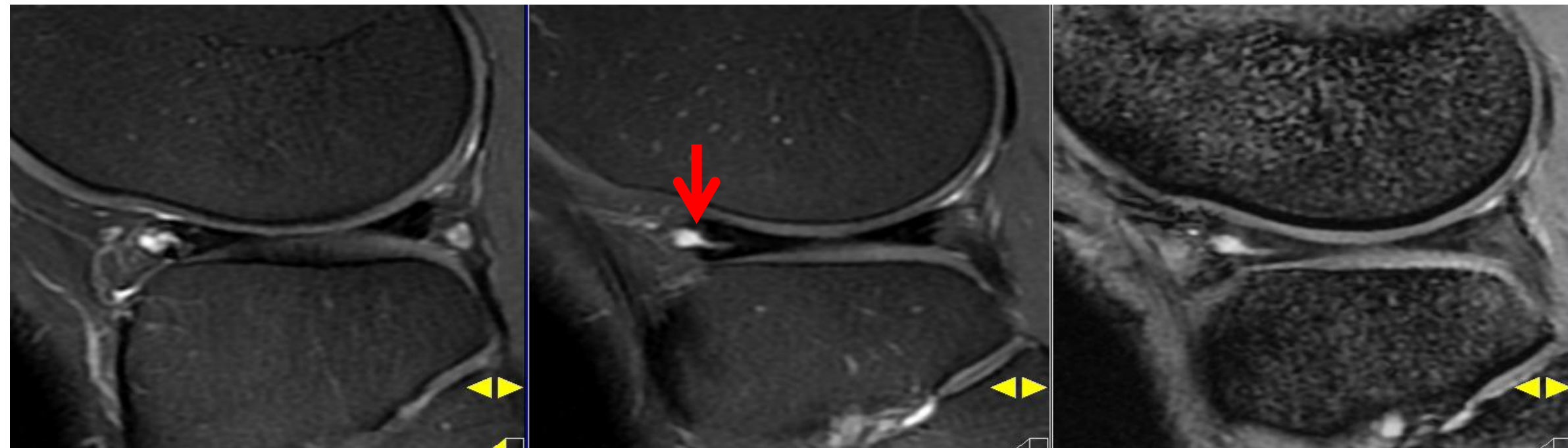
形成原因不清楚，但多数作者认为半月板粘液样变性和水平方向上贯通撕裂是主要原因，液体通过撕裂口进入囊内。

MRI表现为卵圆形的含液病灶，常伴半月板水平撕裂。

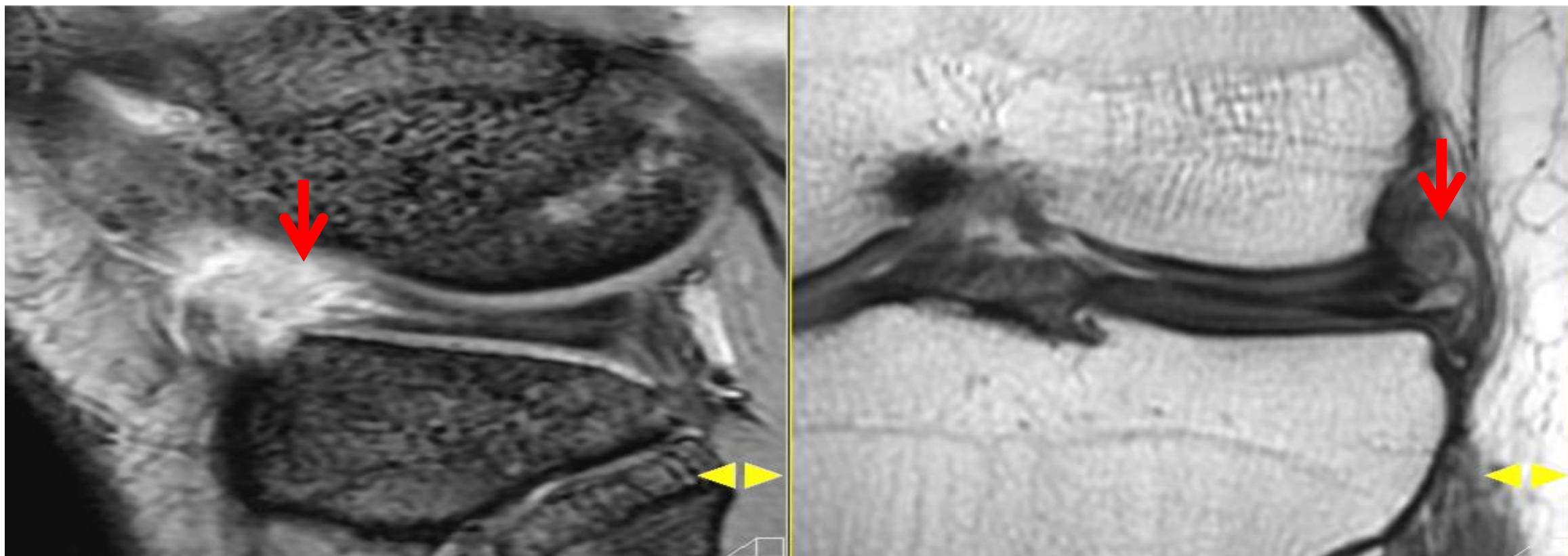
半月板囊肿（半月板内）



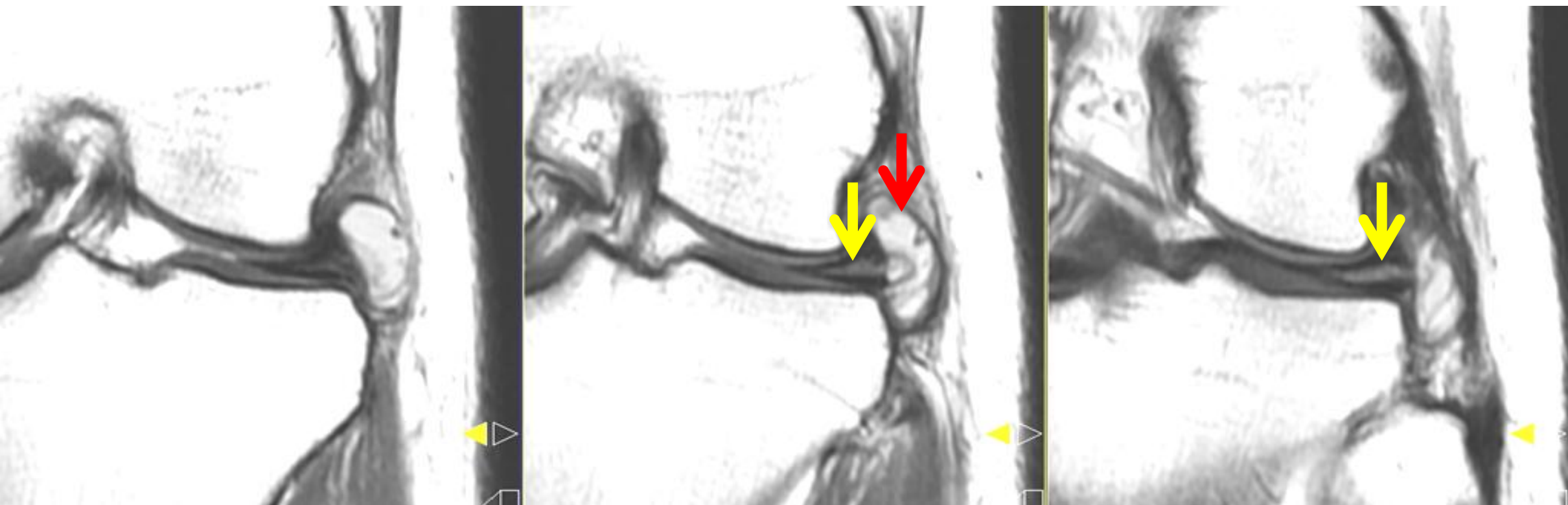
半月板囊肿（半月板内）



半月板囊肿（半月板旁）



半月板囊肿（半月板旁）



测试？





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THANKS!