髋关节撞击综合征(FAI)诊断与关节镜下治疗

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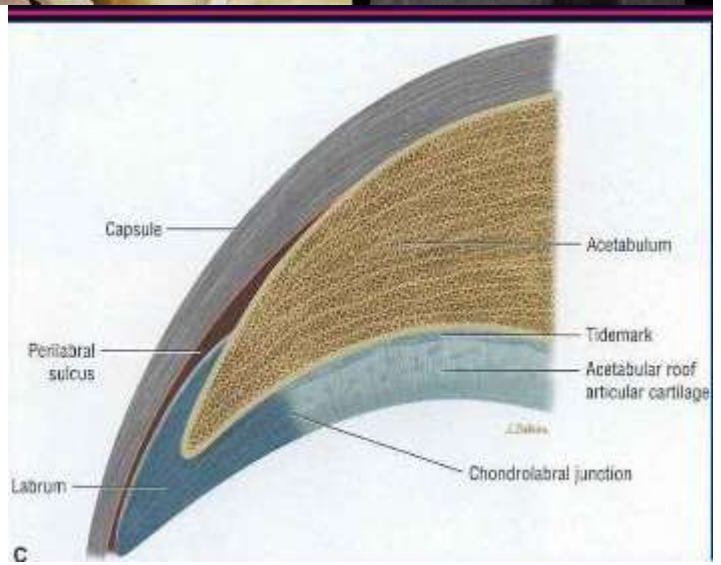
正常髋关节解剖图


关节囊
髋臼
股骨头


髋臼盂唇解剖
盂唇
旁沟


髋关节五位
骨坐

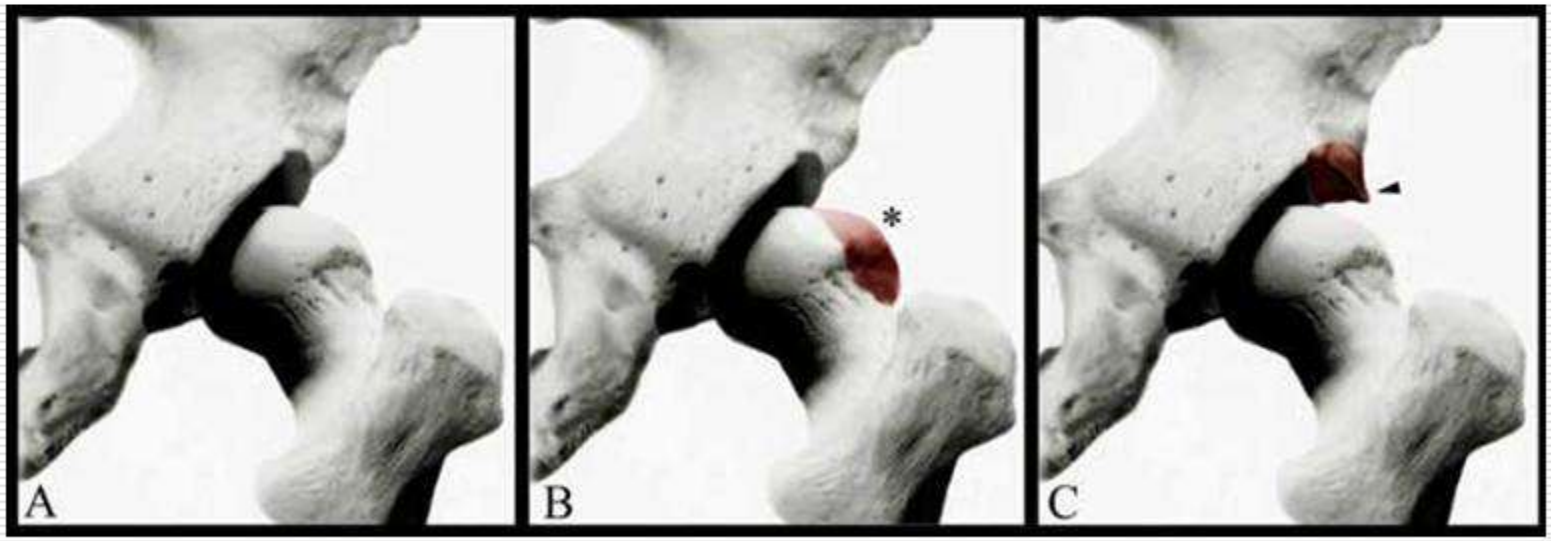

Capsule
Acetabulum
Tidemark
Perilabral sulcus
Acetabular roof articular cartilage
Chondrolabral junction
Labrum
C

概念

- 股骨髋臼撞击症是指由于股骨近端或/和髋臼形状异常导致股骨头颈结合部与髋臼边缘发生撞击，以致髋臼、盂唇及软骨损伤，从而引发髋关节疼痛症状，继而发展导致髋关节退行性病变，最终导致髋关节骨性关节炎形成。

概念

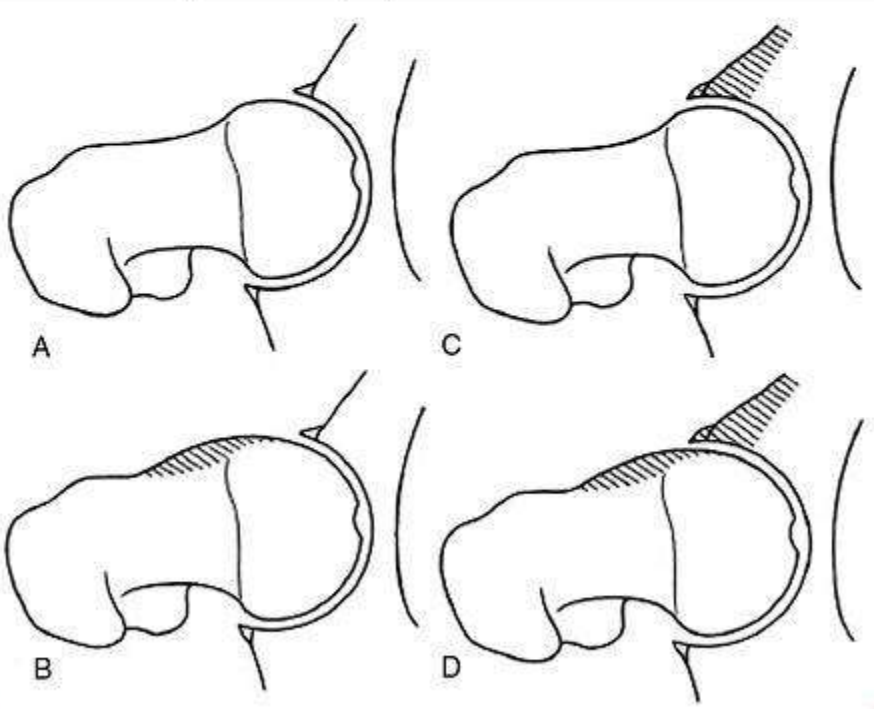
- **FAI的概念最早是由University of Berne.Switzerland Ganz等2003年正式提出，近十年来已逐渐受到临床医生的重视。**
  - Clin Orthop Relat Res. 2003 Dec;(417):112-20.



分型、发病机制

- **Impingement types.** ***Diagram showing a normal acetabular fossa along with the typical concavity of the anterolateral femoral head-neck junction (A), the aspherical femoral head/convex anterolateral headneck junction in the cam-type deformity (B), excessive acetabular coverage in the pincer-type (C), and mixed cam and pincer (D).***

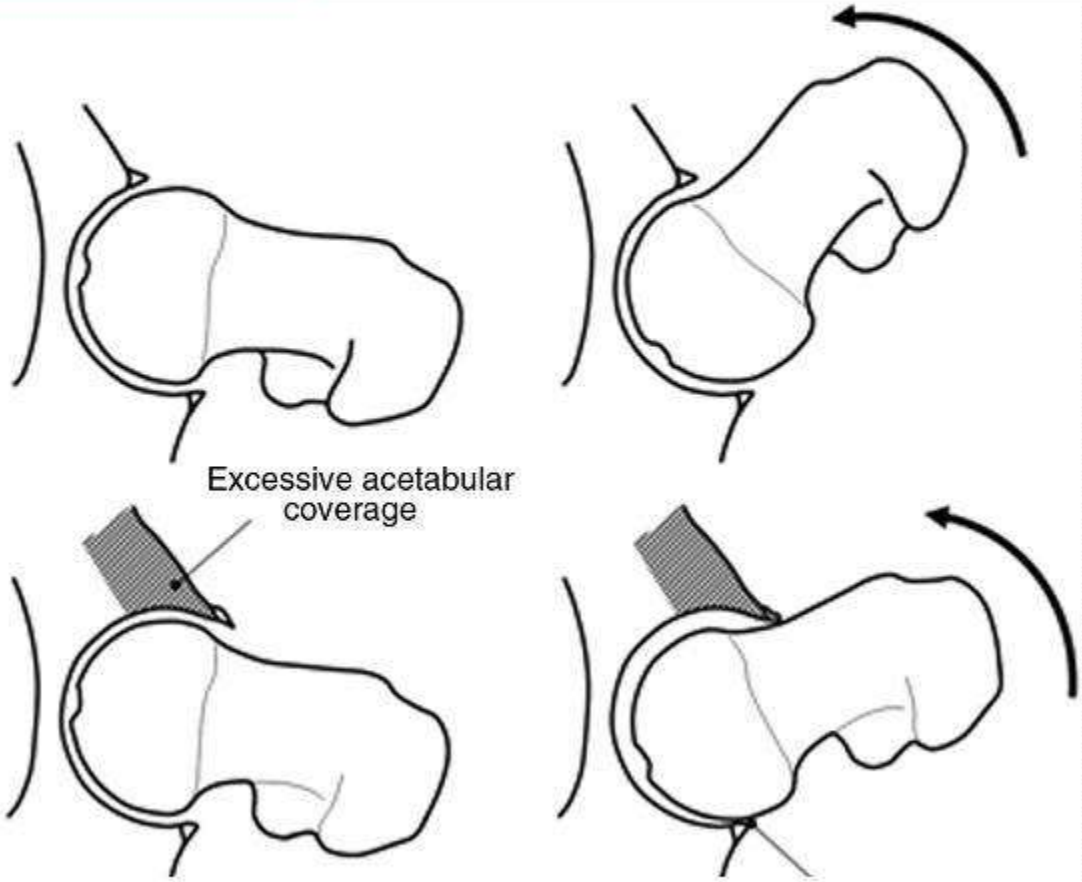
依据发生撞击的部位及髋臼、股骨近端的形态异常，**FAI**可分为凸轮型撞击型，钳夹型撞击型及混合型。



J. Parvizi, M. Beck, K.A. Siebenrock, R. Ganz, and M. Leunig, Anterior Femoroacetabular Impingement Part I. Techniques of Joint Preserving Surgery, *Clin Orthop*, 418, p. 62, © 2004 Lippincott Williams & Wilkins

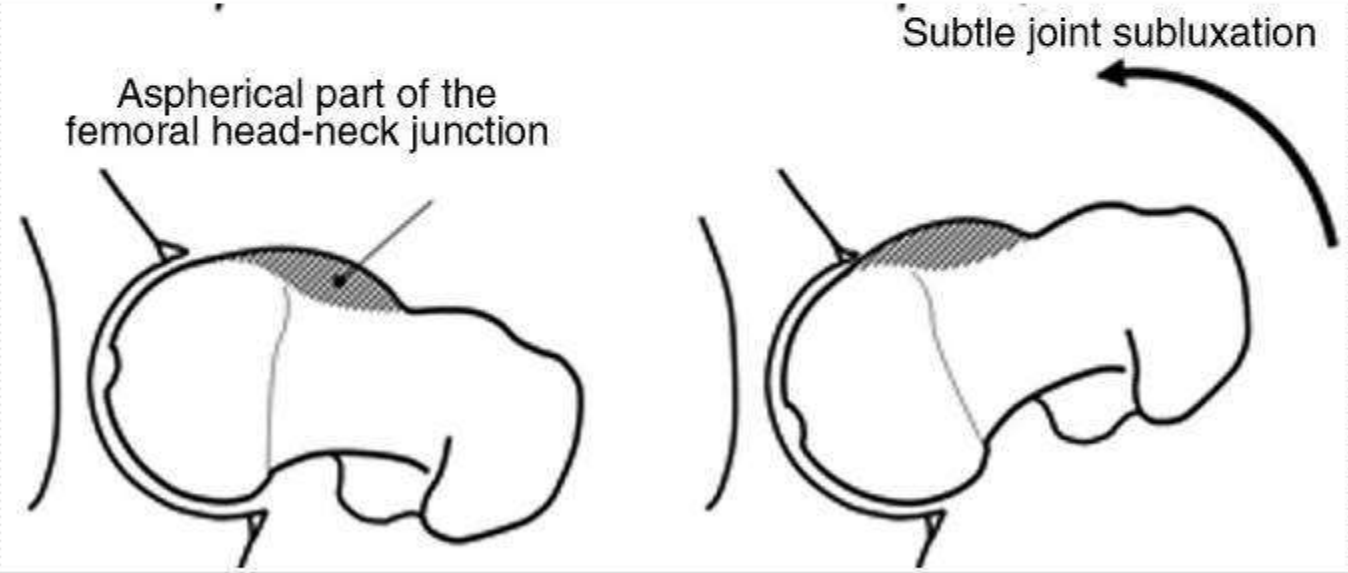
钳夹型撞击型

- 钳夹型撞击型的骨性异常来自于髋臼侧，多由髋臼的过度包容引起。髋关节屈曲以及各方向活动时，异常突起的髋臼缘与股骨头颈处发生碰撞，导致髋关节周围组织，特别是软骨，髋臼唇的损伤。



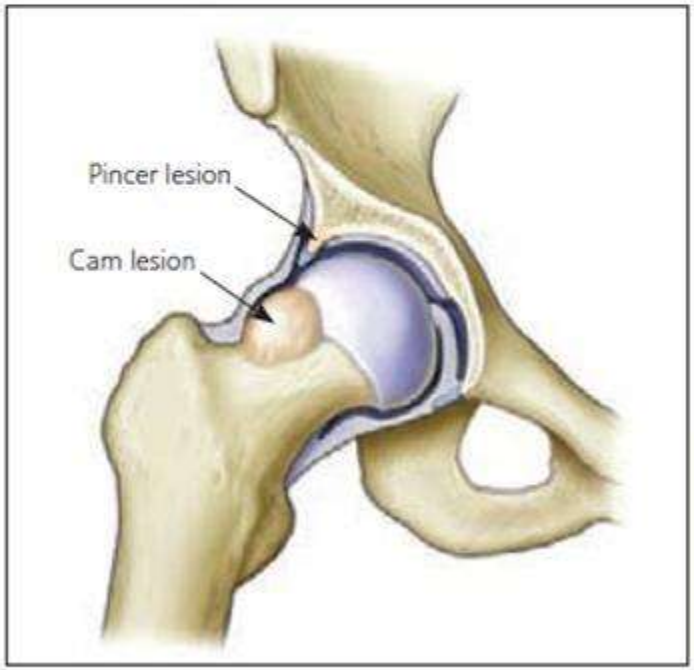
凸轮型撞击型

- 凸轮型撞击型指股骨头颈交界处前外侧的异常骨性增生突起(图1A)。在髋关节活动，特别是屈曲内旋活动时，骨性突起与髋臼外上缘反复碰撞，导致软骨出现由外向内的表面磨损和(或)分层，以及盂唇撕裂损伤。
- 在这种反复产生的碰撞压力和异常剪切应力作用下最终导致髋关节骨性关节炎的发生。



混合撞击型

- 混合型又称凸轮钳夹撞击型，是指上述2种骨性异常机制同时存在，导致FAI的发生。



- 虽然目前研究表明一些儿童疾病，如股骨头骨骺缺血坏死(Perthes病)，股骨头骨骺滑脱(slipped capital femoral epiphysis，SCFE)，髋臼后倾，先天型髋臼发育不良，股骨颈骨折畸形愈合与FAI的发生有密切关系，但是FAI还没有明确的病因，因此，对FAI的病因预防很难起效。

临床表现-症状

- FAI多发于年轻男性患者，特别是活动量大者。患者一般缺乏典型症状，早期多为腹股沟区疼痛，有时为髋关节处间歇性钝痛，随着疾病的进展会出现腰部、骶髂关节、臀部、大粗隆部疼痛，但疼痛平面一般在膝关节以上，久坐或剧烈活动后加重，并有患者出现髋关节“钩住”、“死腿”感觉。

Clinical manifestations-symp

- **Patients with FAI typically have anterolateral hip pain. They often cup the anterolateral hip with the thumb and forefinger in the shape of a "C," termed the C-sign. Pain is sharp when turning or pivoting, especially toward the affected side. It can worsen with prolonged sitting, rising from a seat, getting into or out of a car, or leaning forward. Pain is usually gradual and progressive.**
- Byrd JW. Physical examination. In: *Operative Hip Arthroscopy*. New York, NY: Springer; 2005:36-50.



临床表现-体征

- 髋关节活动受限，特别是在内收屈曲活动的终末明显受限是**FAI**的关键体征。

临床表现-体征

- 撞击试验的诊断阳性率高，统计阳性率达99%，是诊断FAI 的重要体征。撞击试验分为前方撞击试验和后方撞击试验。

- 前方撞击试验用于检查发生于髋臼前外侧的FAI，方法为患者取仰卧位，做髋关节被动屈曲活动，至90° 时，内收、内旋活动髋关节产生剧烈疼痛为阳性。

Knee Surg Sports Traumatol Arthrose，2007，15(8)：1041-1047.

临床表现-体征

- 后方撞击试验，又称激发试验，用于检查撞击部位在髋臼后下方的**FAI**，检查时患者仰卧，将患肢垂下床沿，做髋关节后伸、外旋动作，产生疼痛为阳性。

- Orthop Relat Res，2003，417(12)：112-120.

影像检查 ？

X线：标准骨盆正位片

髋关节穿桌侧位片（患侧）

Dunn位片：屈髋45度，髋外展20度

蛙式侧位片：髋外展45度并外旋，屈膝90度

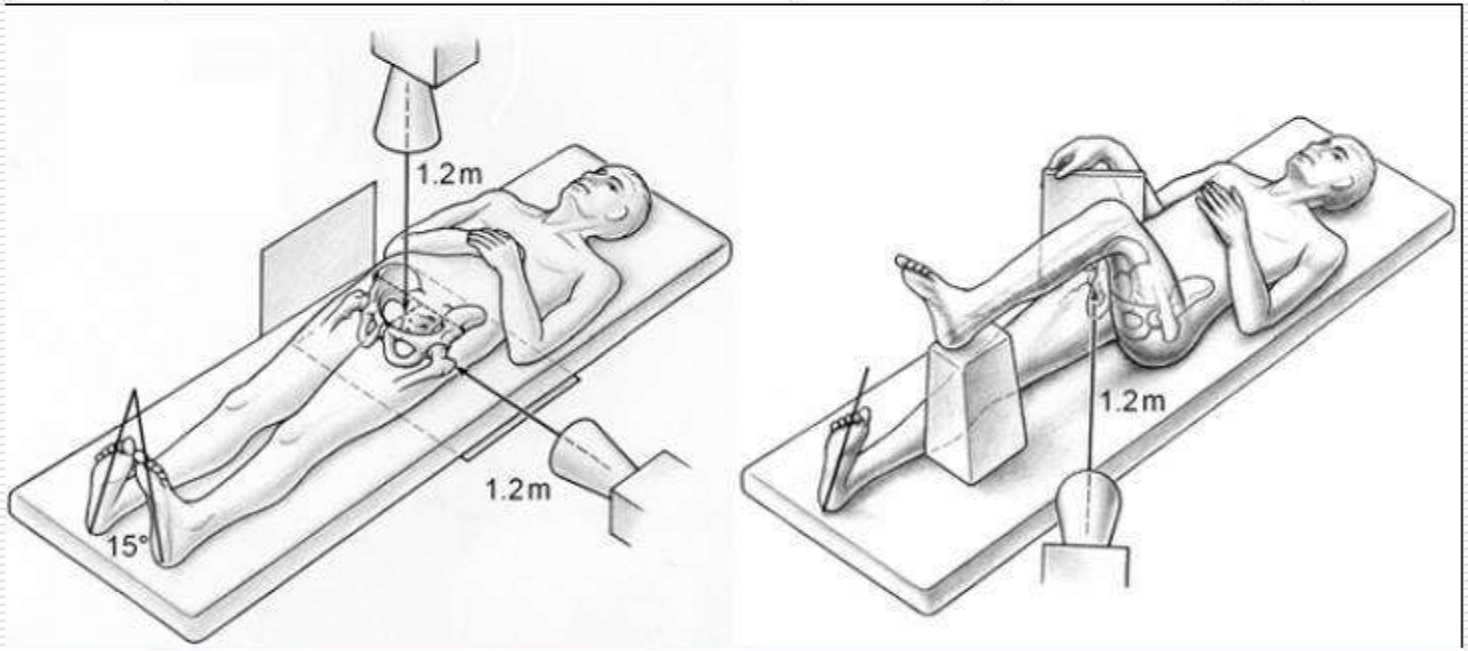
骨盆假斜位片

CT

MRI

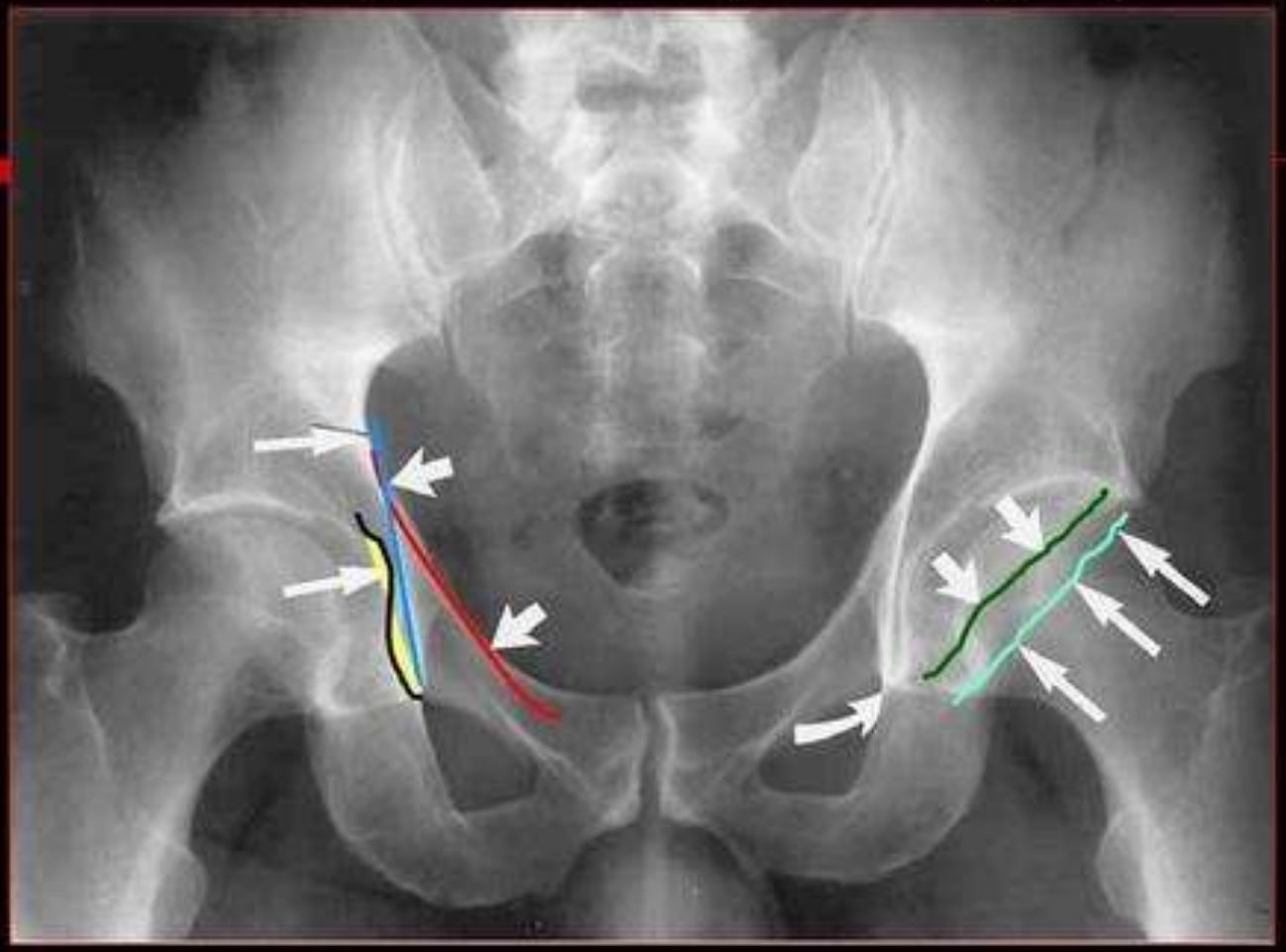
影像学表现-X线片

- **Radiographs: AP and Cross table lateral**
- Correct setting for anteroposterior (*left*) and Cross-table axial radiograph of hip (right) is needed to visualize anatomy of anterior femoral head–neck junction, which is not visible on anteroposterior pelvic radiograph.



Cross-table axial view allows for better analysis of the sphericity of the femoral head as well as the femoral head-neck offset

Normal Anatomy of AP Hip Radiograph



Ilioischial line: posterior column

Iliopubic line: anterior column.

Acetabular Fossa :
medial acetabular wall

Anterior Acetabular Wall

Posterior Acetabular Wall

Normal Anatomy of AP Hip Radiograph.

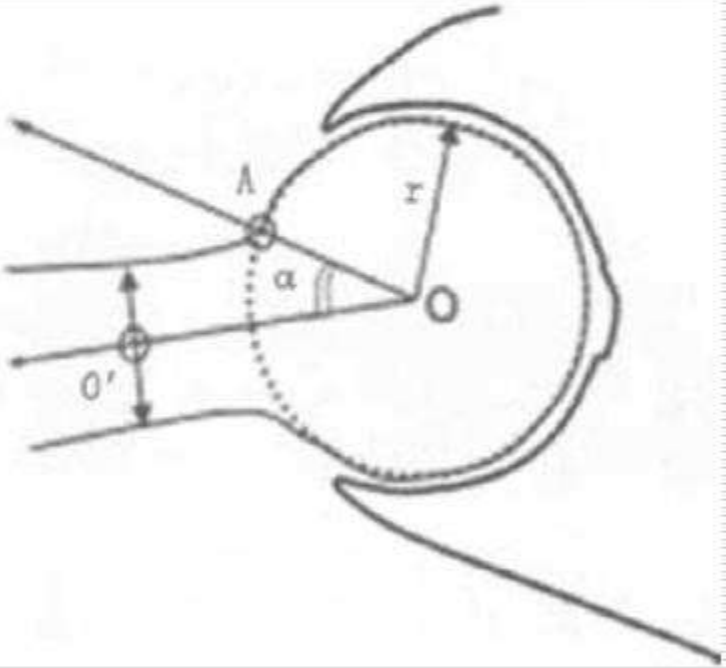
-Acetabular Fossa lying lateral to ilioischial line.

-Center edge angle （LCE）: angle formed from vertical line from the center of femoral head and line drawn to the lateral edge of the acetabulum. Normal: 25-39^0 (20-25=borderline dysplasia, >39 suggesting acetabular overcoverage).

-Extrusion Index: portion of uncovered femoral head divided by total covered + uncovered E/(A+E): Normal >.25, <.18=consistent with acetabular overcoverage.

影像学表现-X线片

- 股骨颈α角是反映股骨头颈交界处凹陷程度的指标。
- 在股骨头前方与股骨颈交界处确定一点，该点定义为与股骨头中心距离刚好超过股骨头半径r，设为A点，该点与股骨头中心的连线和股骨头中点与股骨颈中点连线的夹角即为α角。
- 股骨颈α角的大小与X线片的投照体位有关，用水平侧位(内旋15°)X线片及屈髋45°或90°(Dunn位Cross-table axial radiograph)X线片测值更准确的反映股骨头颈交界处的形态。根据Notzli等的研究，股骨颈α角的正常值应<50°。也有研究采用蛙式位（frog-leg radiograph）。



影像学表现-X线片

- 股骨头颈偏距(femoral head-neck offset OS)及偏距率(offset ratio)。
- 股骨头颈偏距是指股骨头半径与邻近股骨颈半径的差值。测量方法是在水平侧位x线片上，测量股骨头前缘和股骨颈前缘的距离，正常值为(11.6±0.7)mm，凸轮型FAI患者的股骨头颈偏距值为(7.24-0.7)mm。一般而言，股骨头颈偏距值<10 mm就应怀疑凸轮型FAI。
- 偏距率是指股骨头颈偏距与股骨头直径的比值，正常值为0.21 4-0.03。Cam型FAI患者偏距率可达0.13±0.05。

影像学表现-x线片

- 凸轮型撞击型典型x线改变为：股骨头的球形结构消失，头颈交界处出现异常骨性突起，出现“手枪柄样（pistol-grip）”畸形，股骨头颈偏心距减小，α角角增大。

影像学表现-X线片

- 钳夹型撞击型典型x线表现为：髋臼缘骨化，髋臼覆盖过深或髋臼后倾，髋臼前缘投影比后缘投影更靠外侧，呈“8字征”或“交叉征”；股骨头-颈交界出现“疝窝（herniation pits）”。
- 中心边缘角(LCE) >40°。髋臼后壁缘投影位于股骨头中心外侧，提示髋臼覆盖过深，考虑FAI的可能性大。当骨盆正位片中坐骨棘的投影位于骨盆内，高度提示髋臼后倾的存在。

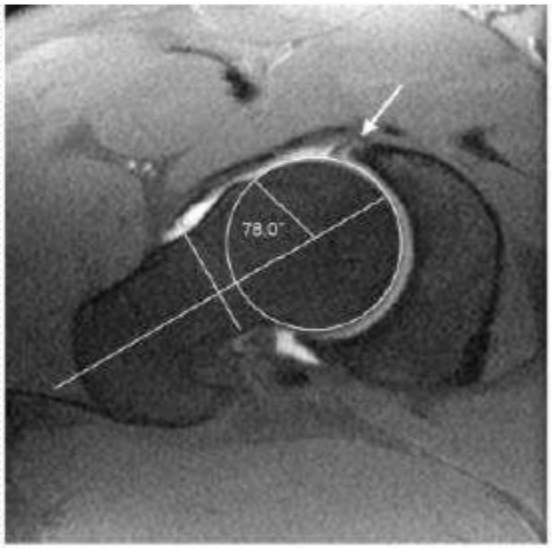
影像学表现-CT

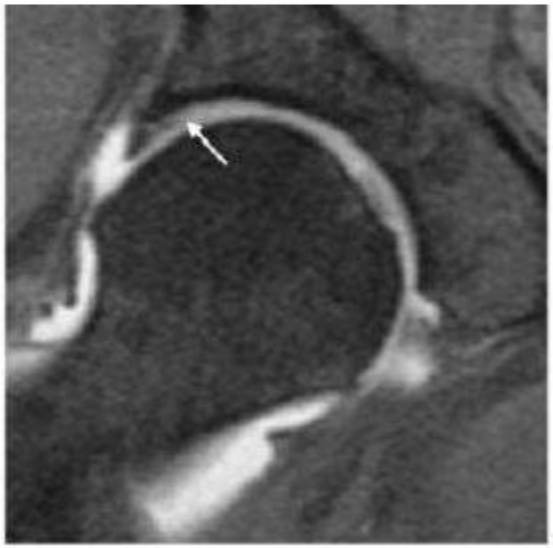
- CT扫描具有分辨率高，微细骨质显影清晰，可通过各个平面的扫描以及三维重建更有效地观察、测量上述提到的指征。通过测量横断面髋臼连线与水平线角度，可了解髋臼后倾的程度。

图 1-3 分别在横轴位、股骨颈斜轴位及冠状位显示股骨头颈连接处前外侧骨性隆起，股骨近端呈“枪柄样”改变；图 4 矢状位示髋臼后倾；图 5 横轴位示股骨头颈连接处囊性变；图 6 示股骨头颈及髋臼缘碰撞处软骨下囊变及髋臼缘骨质硬化；图 7 横轴位示髋臼后倾，髋臼前后缘连线与水平线交角呈锐角。

影像学表现-MRI

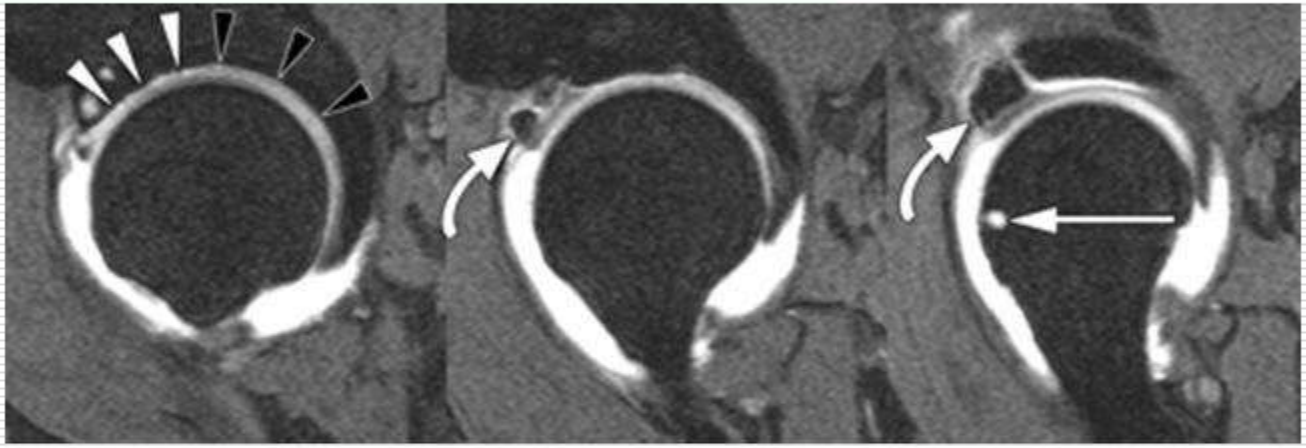
- MRI对于软组织显像效果好，除具有上述的征象和测量结果外，对于诊断软骨损伤和盂唇损伤有更好的敏感性和特异性。
- MRI显示头颈交界处骨囊性变，并周围骨髓显示水肿信号，考虑FAI的存在。MRI造影对于显示盂唇损伤的诊断更为敏感准确。在MRI造影上表现α角增大，前上方软骨损伤，盂唇损伤称为凸轮撞击型三联征。

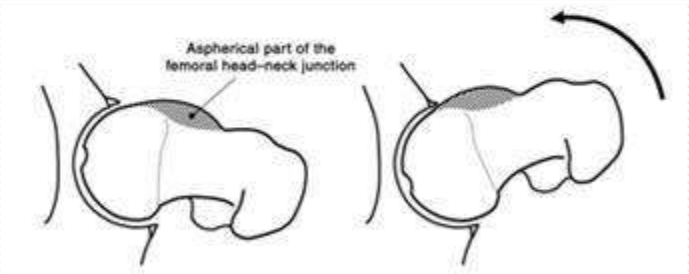





- Dysplastic Femoral Bump head/neck jxn resulting in abnormal alpha angle.
- Anteriosuperior Cartilage Abnormality
- Anteriosuperior Labral Tear.

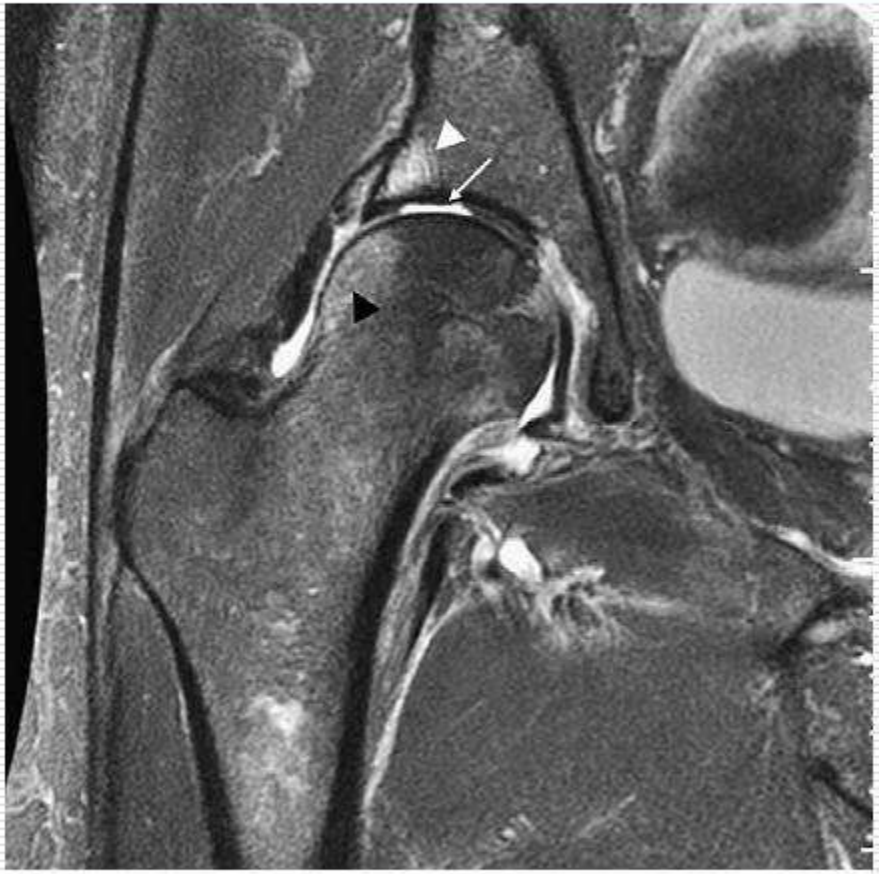
影像学表现-MRI凸轮撞击型

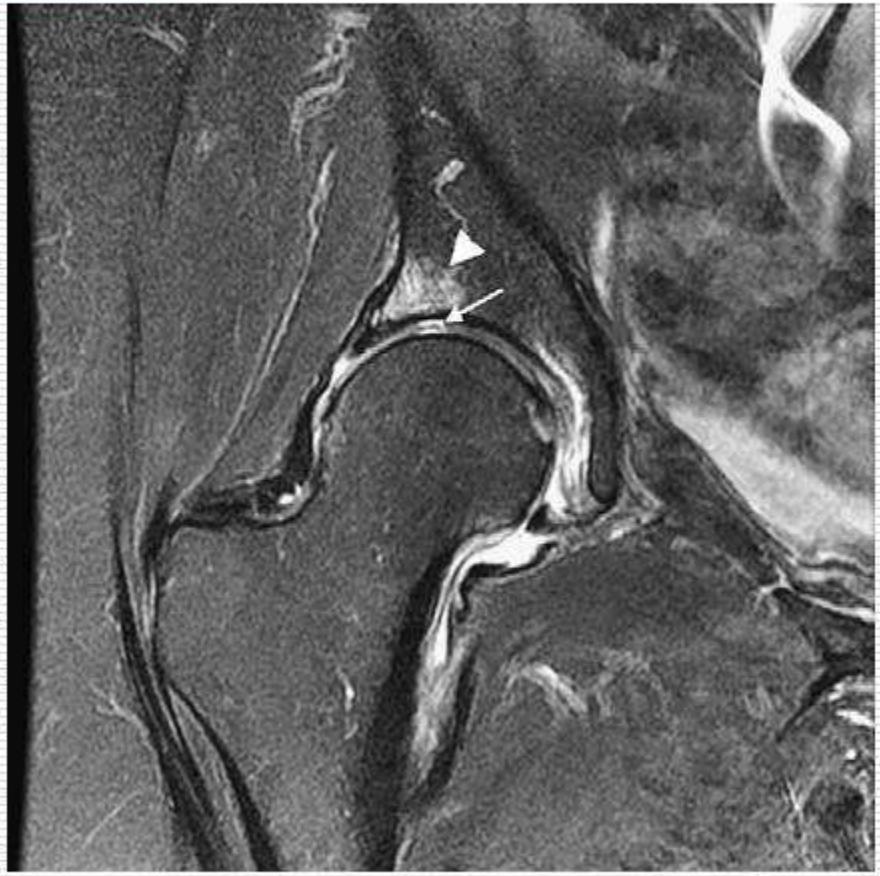




- Synovial Herniation Pit
- Edema anteriorlateral femoral head neck/dysplastic bump and anterosuperior acetabulum
- Os acetabuli

影像学表现-MRI凸轮撞击型





-edema superolateral acetabulum

-edema dysplastic femoral bump adjacent to physeal scar

-high grade chondral defect superior acetabulum

etabulum.

n lead to anterior superior labral tears and subchondral cyst.

ss in posteroinferior acetabulum seen
pingment.

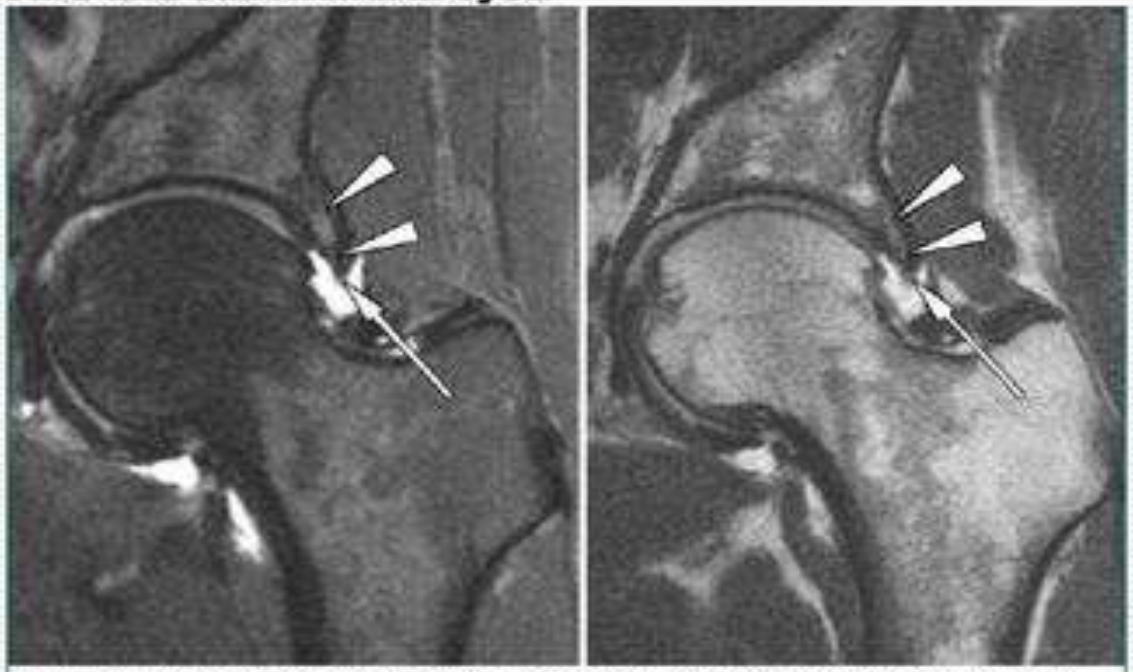
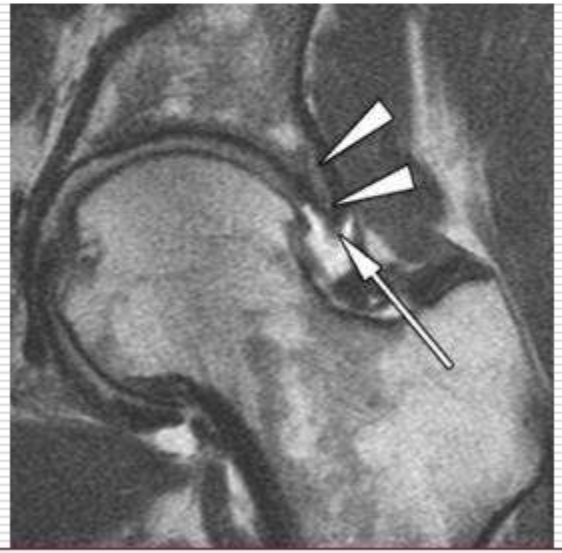


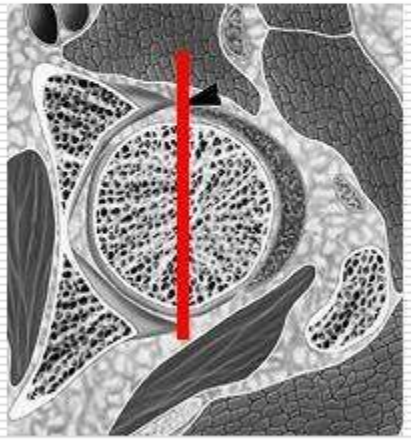
Figure 7: Coronal MR images obtained with an intermediate-weighted fast spin-echo sequence with fat saturation (2500/42) (left) and a T1-weighted spin-echo sequence (524/14) (right) show ossification of the acetabular labrum in a patient with pincer FAI. Bone marrow signal (arrowheads) extends into the substance of the acetabular labrum (arrow).

影像学表现-MRI钳夹撞击型

- Normal alpha angle
- Anterosuperior acetabular labral tearing
- Articular surface defects (typically smaller and more focal than those seen in cam impingement)
- Evidence of osseous impaction along the anterosuperior or superior femoral neck
- Spherical femoral head



Coronal spin-echo sequence T1-weighted MR image (524/14) showing ossification of the acetabular labrum in a patient with pincer FAI. Bone marrow signal (arrowheads) extends into the substance of the acetabular labrum (arrow).



Retroversion: anterior labrum even with or lateral to the posterior acetabulum in the sagital plane.

FAI技术性失误致误漏诊

- 误漏诊原因

- 摄影体位不标准： 髋关节正位投照时双侧股骨未内旋。骨盆片摆位不正，造成髋臼前后壁呈假性交叉征。

- 测量技术有误：评价髋臼深度及髋臼覆盖率时将髋关节退行性骨关节病形成的边缘骨赘误认为髋臼边缘；将股骨头颈增生骨赘股骨头坏死头塌陷后外上缘突起误为头颈部局部解剖异常；将退行性髋关节病和股骨头坏死塌陷后边缘突起误认为凸轮型髋关节撞击综合征。

- 髋关节CT检查未做冠状位及斜矢状位重建导致漏诊。

- 避免误漏诊对策

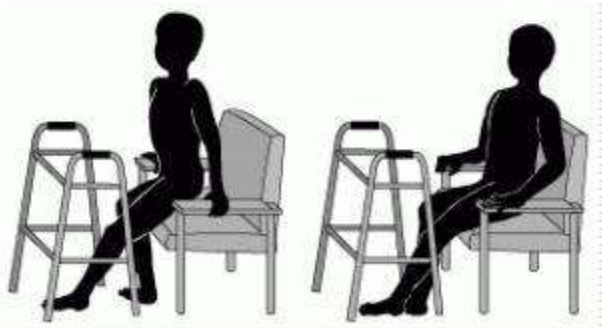
- 加强业务学习，加深对本病认识。

- 规范髋关节或骨盆片投照标准：摄片时患者仰卧，双下肢内旋15°以最大限度地显露前倾的股骨颈，标准的骨盆前后位片应当是尾骨尖端指向耻骨联合， 且二者之间的距离是1-2 cm。

- 规范CT 与MRI 检查方法：CT 检查除常规横轴位扫描外，必须行冠状位及斜矢状位多平面重建（MPR），以避免漏诊。MRI 检查除常规扫描外，观察盂唇软骨及关节软骨是否有损伤者， 必要时加质子密度加权像（PDWI）及三维扰相梯度回波序列。

治疗-保守治疗

- 对于初期**FAI**的患者，可以采用保守治疗的方法，包括休息，限制关节活动，理疗或按摩，服用非甾体类抗炎药物，类固醇类药物封闭治疗。保守治疗可在短时期内缓解疼痛症状，但可导致髋关节屈肌紧张，加重髋关节碰撞。由于骨性异常结构未解除，当患者恢复活动时症状又会复发。
- *All patients with symptomatic FAI should undergo a trial of nonoperative treatment prior to consideration of surgical treatment.* ***Unfortunately****, conservative measures are often* ***unsuccessful or unrealistic*** *with many patients as theyare frequently younger, active patients. Frequently, patients with FAI wish to return to their previous activity levels and therefore may be indicated for surgical treatment.*



治疗-手术治疗

- 手术治疗的目的在于去除股骨和髋臼的异常骨性结构，解除两者的碰撞，增加髋关节的活动范围。对于合并出现的盂唇损伤，也需要进行修补。
- ***Open surgical dislocation***
- ***Mini-open approach***
- ***Arthroscopic surgery***

手术治疗-开放性手术

- **Ganz**等首先提出了开放手术。患者侧卧位，由髋关节外侧入路显露关节囊，切开关节囊，行**大转子截骨术**，保护外旋肌群，以便保护股骨头的供血动脉，以免股骨头缺血性坏死的发生，将股骨头前脱位，以便提供全放位的观察视角。

- 对于凸轮型撞击型，行股骨头成形术，去除股骨头部骨性突起，恢复正常股骨头颈偏心距；
- 对于钳夹型撞击型，行髋臼成形术，去除髋臼缘处异常骨性突起；
- 对于软组织条件好的盂唇损伤需要进行缝合；
- 对于软骨损伤需要进行钻孔，行微骨折术。

- 开放性手术创伤大，恢复时间长，并且对术者的操作要求较高，有截骨处骨不连、股骨头缺血性坏死的可能。

手术治疗-开放性手术

Figure 1 Straight lateral approach is shown for Ganz surgical dislocation. It is extremely important to well visualize the posterior border of the greater trochanter prior to proceeding for the trochanteric flip osteotomy

Figure 2 Trochanteric flip osteotomy begins at the posterior border of the greater trochanter and is carried anterior exiting superficial to the piriformis fossa and distal to the vastus ridge.

Figure 3 Impingement at the femoral head neck junction is corrected using a curved osteotome to shave slivers of the area of concern.

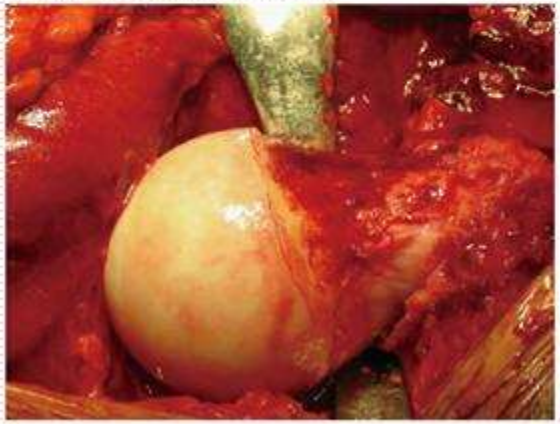
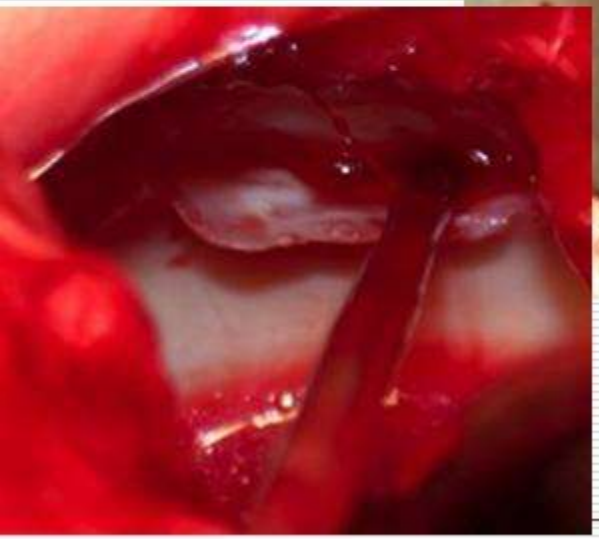


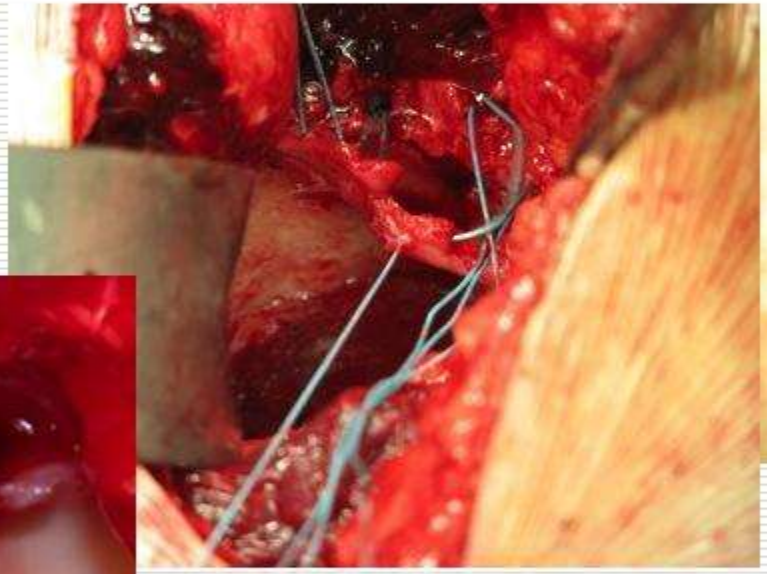
Figure 4 Osteochondroplasty is continued until the femoral head neck junction has been restored to the appropriate anatomical shape to relieve the impingement.

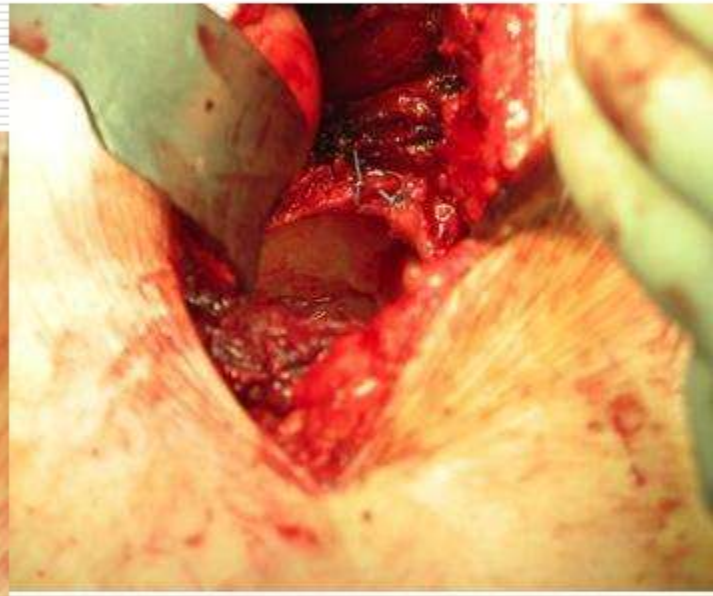
Figure 5 After adequate osteochondroplasty of the femoral head and neck junction and the acetabulum, the labrum is reattached using suture anchors, the femoral head is re-located. The hip should once again be taken through a full range of motion paying special attention to those positions that were noted to cause impingement prior to dislocation. If adequate resection of

手术治疗-小切口手术（ *Mini-open approach* ）

- 盂唇修复缝合







手术治疗-小切口手术（ *Mini-open approach* ）

Figure 7 Using "Heuter Approach", also called the "Short Smith-Pete", the superficial internervous plane between the femoral nerve (Sartorius) and the superior gluteal nerve (tensor fascia lata) is developed.

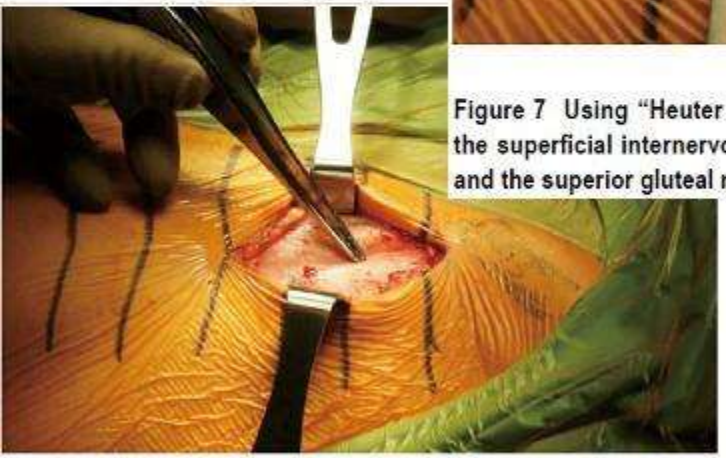
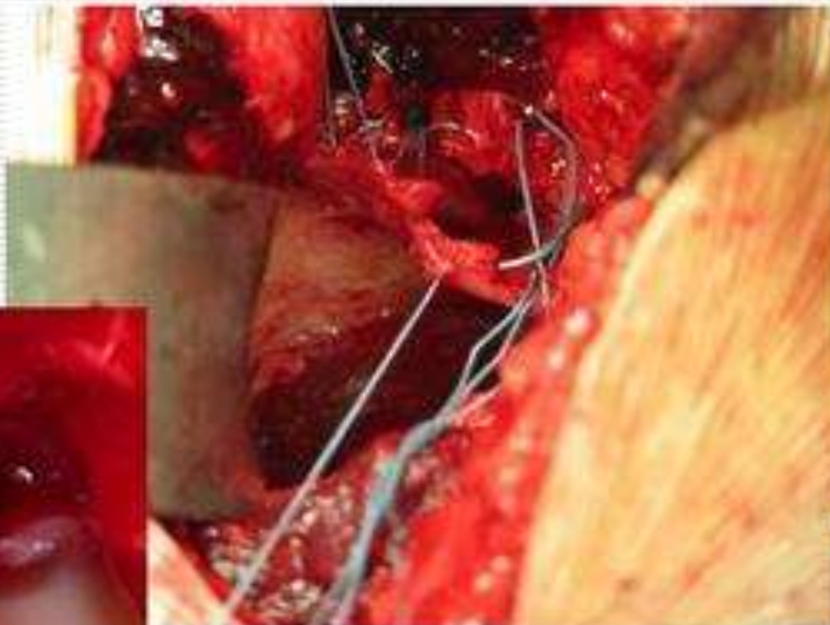


Figure 6 Mini-open technique using "Heuter Approach", also called the "Short Smith-Pete" because it follows the interval of the Smith-Petersen distal to the anterior superior iliac spine, is used for access to the capsule and femoral neck. The forceps point to the internervous plane between the femoral nerve (Sartorius) and the superior gluteal nerve (tensor fascia lata).

Figure 8 Anterior capsulotomy is performed. Labrum and femoral head and neck junction is adequately exposed. The distinct inflammatory appearance with red color of the cartilage is visualized.

盂唇修复缝合



手术治疗-关节镜手术

Figure 9 For arthroscopic debridement of femoroacetabular impingement, the patient is placed in a lateral position. The operative leg is placed in a traction device and fluoroscopy is used to identify the areas of impingement and placement of instruments.

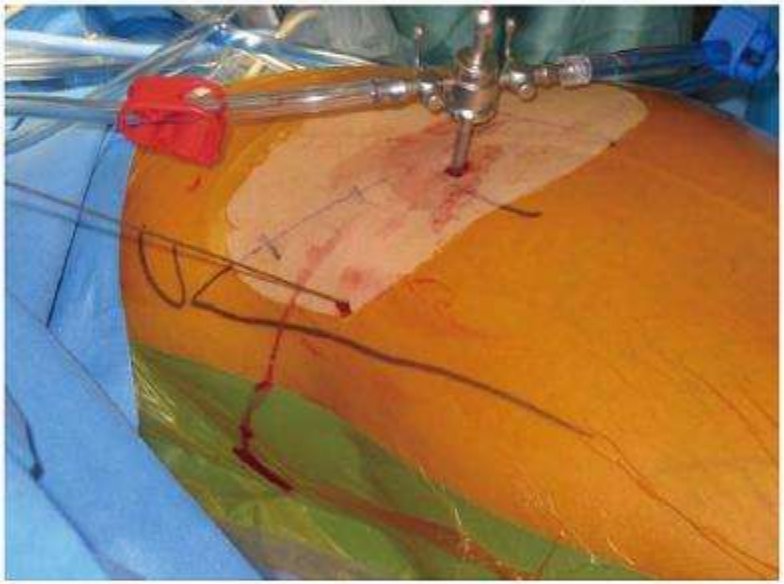


Figure 10 Arthroscopic portal placement: the anterolateral portal is placed about 1 cm proximal and 1 cm anterior to the tip of the greater trochanter. The anterior portal is placed directly distal to the anterosuperior iliac spine and medial to the anterolateral portal.

手术治疗-关节镜手术

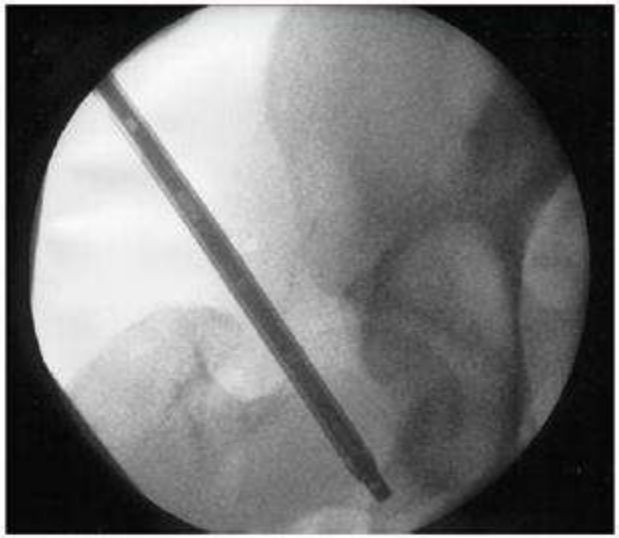


Fig. 1

Flouroscopic image showing the arthroscope in the peripheral compartment at the inferior aspect of the femoral neck.

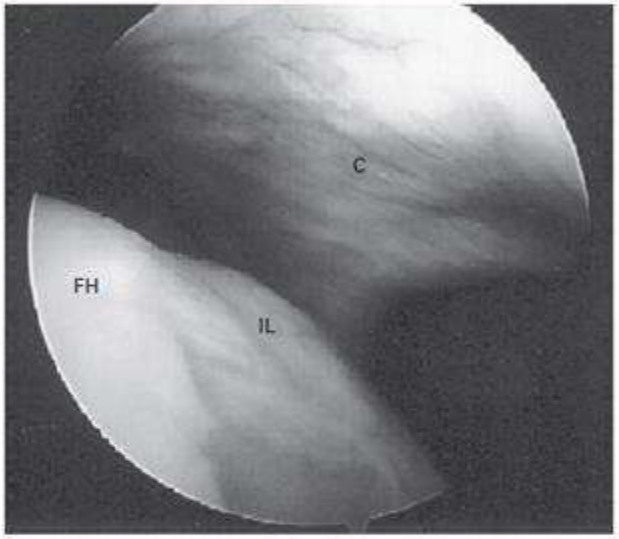


Fig. 2

Operative photograph showing an impingement lesion at the anterosuperior aspect of the femoral neck (FH, femoral head; IL, impingement lesion; C, capsule).

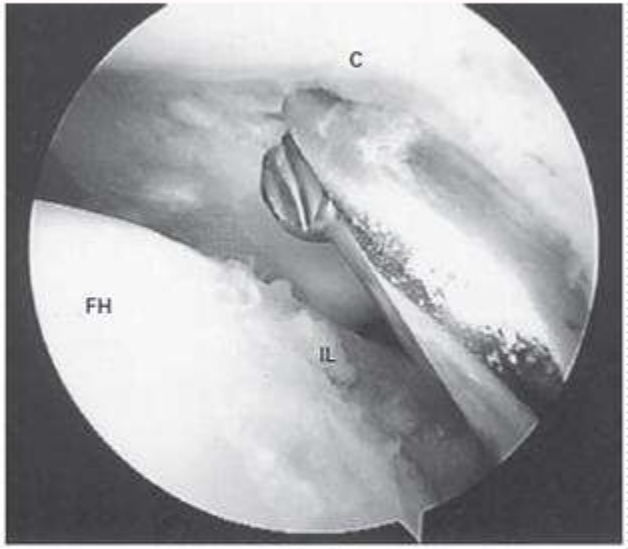
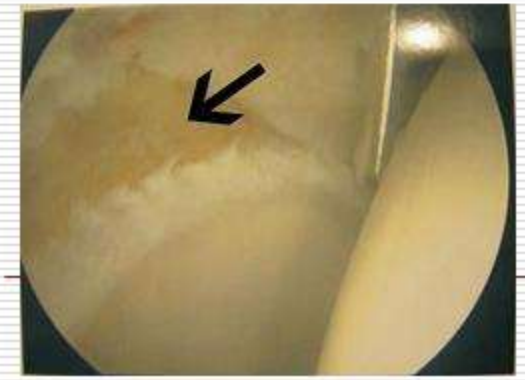


Fig. 3

Operative photograph showing resection of the impingement lesion using a burr (FH, femoral head; IL, impingement lesion; C, capsule).



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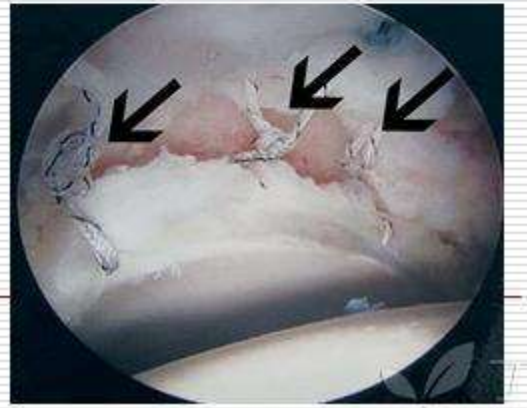
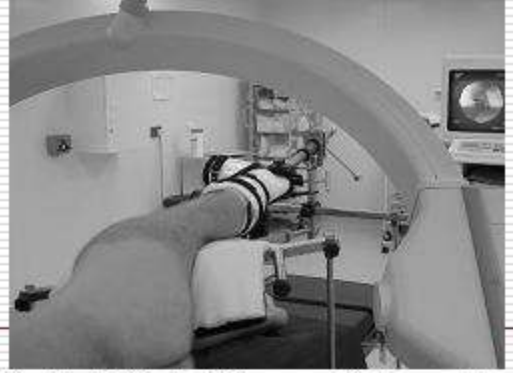


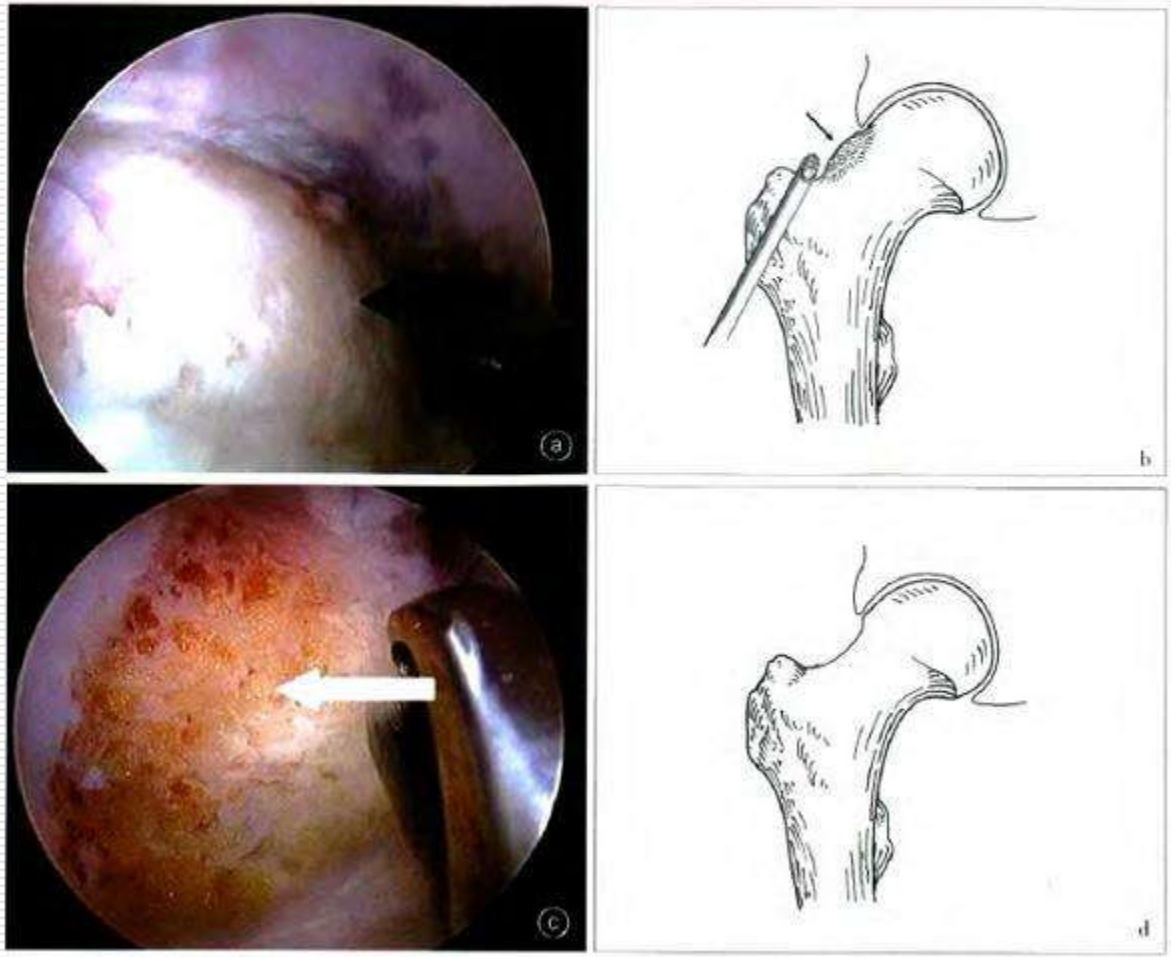
手术治疗-关节镜手术



- **2003**年**Sampson**等首次报道对于没有髋关节骨性关节炎的年轻**FAI**患者，使用髋关节镜的治疗。

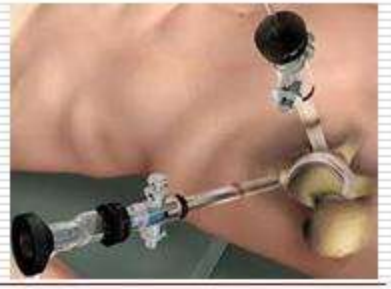
- 髋关节镜治疗髋关节内疾病需要牵引床和**C**形臂**x**线的辅助。患者取平卧或侧卧位。
- 无论哪种体位，都需要放松牵引后，髋关节在术中屈曲达**40°**，可以外展髋关节使前关节囊松弛，可以外旋髋关节使术者操作关节镜进入髋关节前方间隙，拍出髋关节前外侧的**x**线片。
- 通过牵引、**x**线定位，用特殊髋关节镜套管进入髋关节。
- 在外周间室可直接观察到头颈交界处或臼缘的异常骨性突起，使用高速磨钻行成形术，去除多余骨性结构；
- 可以直视下处理外侧臼唇损伤及使用刨削器械清理骨赘。
- 在中央间室可以观察到前方臼唇的撕裂及前方髋臼软骨的损伤，通过关节镜下缝合、钻孔微骨折技术对上述的病变进行处理。

手术治疗-关节镜手术



- 关节镜下股骨头颈成形术治疗**Cam**型股骨髋臼撞击症。**a** 关节镜下见股骨头颈结合部前外侧**Cam**形成(黑色箭头)，**b** **Cam**形成示意图，箭头示**Cam**形成，**C** 股骨头颈成形术后**cam**被完全切除，**d** **Cam**切除后示意图。

手术治疗-关节镜手术

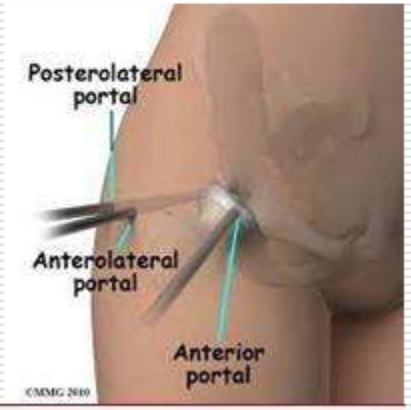


- **Controversy about Open vs Arthroscopic surgery**
- *Some surgeons assert that FAI cannot be adequately treated using arthroscopy due to the limited view of the femoral neck and acetabulum. They also feel that lesions cannot be adequately accessed with the femoral head remaining located within the acetabulum.*
- *However,advocates of hip arthroscopy claim that due to the consistent location of most FAI lesions a 360° degree view of the femoral head, neck, and acetabulum is not necessary.Techniques believed to be useful for treatment of FAI using arthroscopy have been described in the literature.*

- 目前，更多学者认为，髋关节镜治疗**FAI**是一种更安全有效，创伤更小，恢复期更短的微创手术方法。

总结（conclusions）

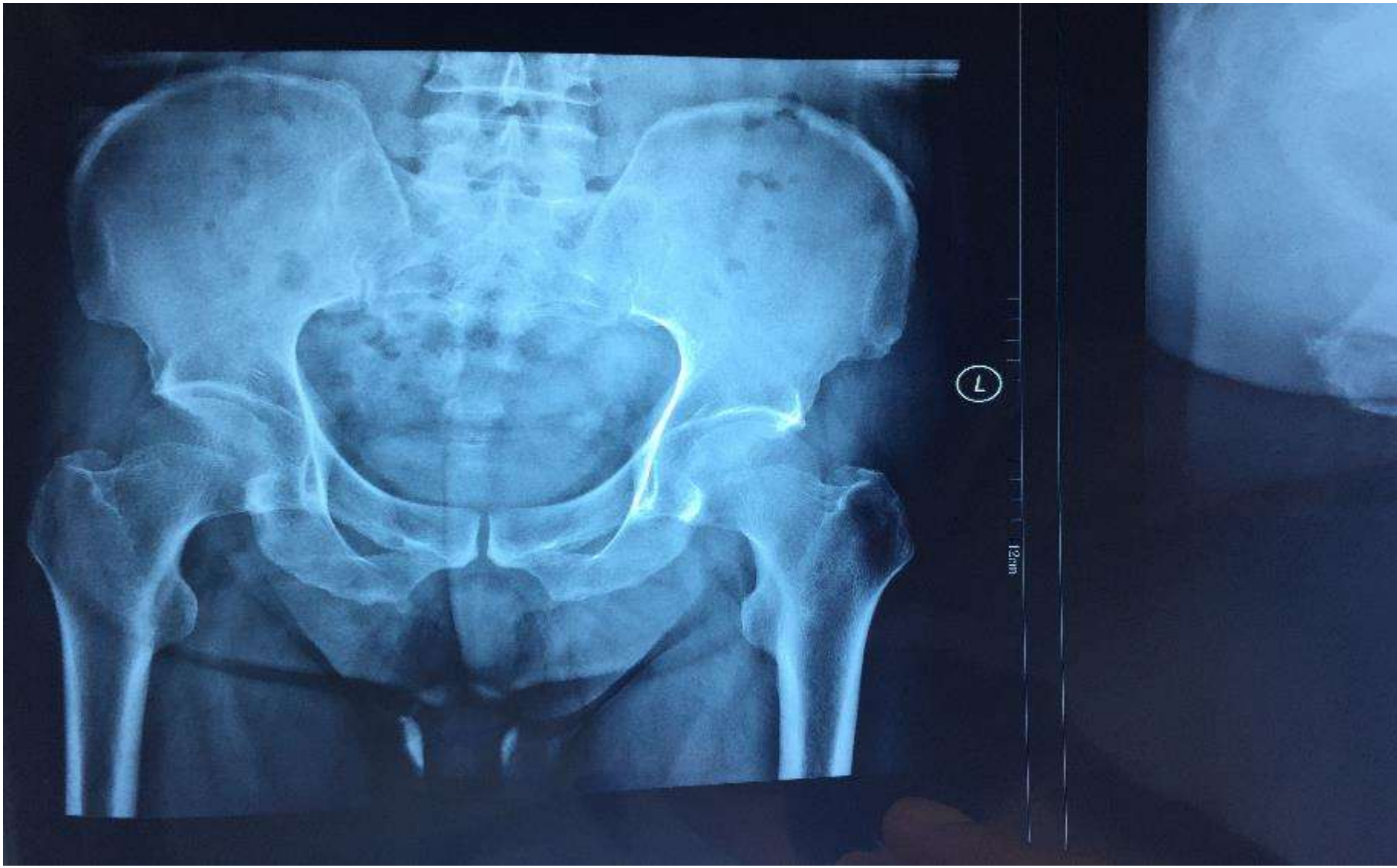
- **FAI**是解剖结构异常导致的慢性关节疾病，是造成髋关节骨性关节炎的重要病因。
- 通过**FAI**的临床表现，影像学改变可进行诊断。
- 保守治疗只能在短时期内缓解症状，手术可彻底去除解剖结构的异常。
- 相信随着关节镜技术和器械的不断进步，髋关节镜手术会成为治疗**FAI**的标准。



Case1：FAI并盂唇损伤

- 基本信息：男性患者，66岁，退休干部。
- 症状：运动后出现左髋关节疼痛、活动受限2个月来诊，特点是屈髋及起坐时疼痛加重，休息后缓解。
- 查体：左髋外观无明显肿胀，“C”字征明显，腹股沟区压痛，大转子区叩击痛，髋关节活动受限，以髋屈、内旋为明显，下肢血运、感觉、肌力、肌张力正常，神经系统检查正常。

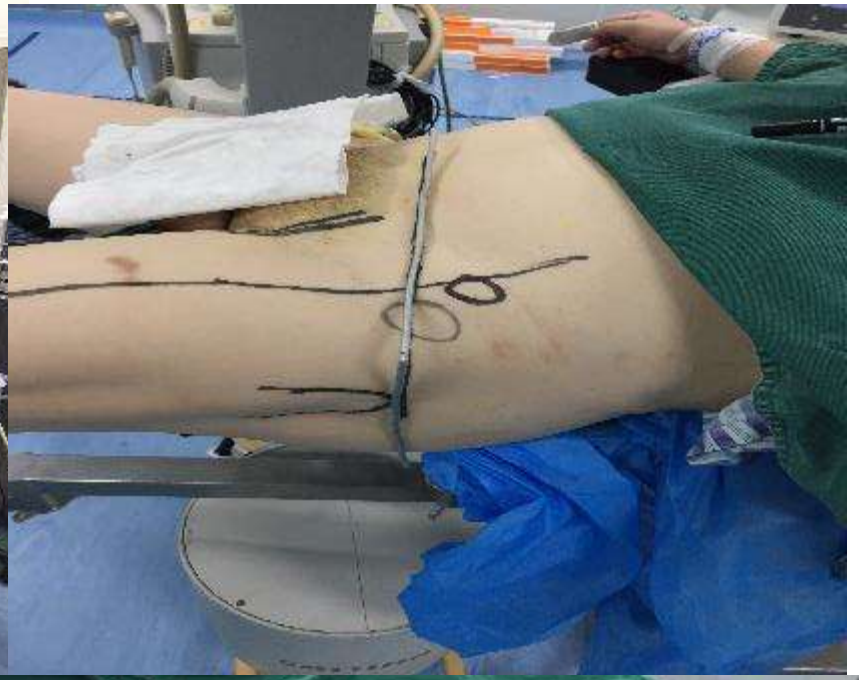
影像检查： X线



影像：MRI


WANG QING DE
HPL
MR190418021
*2/2/1953, M, 66Y
20190418000609
STUDY head
4/18/2019
11:12:06 AM
2 IMA 13 / 15
RP
MF 1.08
TI 230.0
TR 4000.0
TE 48.0
TA 02:00
BW 252.0
p2 M/NORM/DIS2D/FS/FIL
A1/IR
T:BO1,2;SP4-6
*tir2d1_5 / 130
Verio
MR B19
HFS
+LPH
10cm
TP H27
SP P30.4
SL 3.0/0.9
FoV 314*380
370*640s I
Cor>Sag(-2.1)>Tra(0.0)
W 555
C 221
SP P34.3
W 551
C 223

手术步骤：



手术步骤：

手术步骤

术后效果