

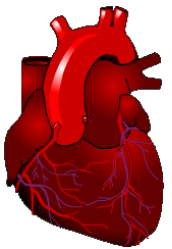
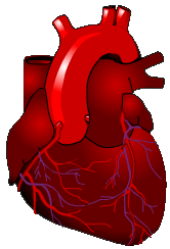


Systematic Anatomy

Locomotor system - Part 4

Lower limb bones & their articulations

下肢骨及其连结

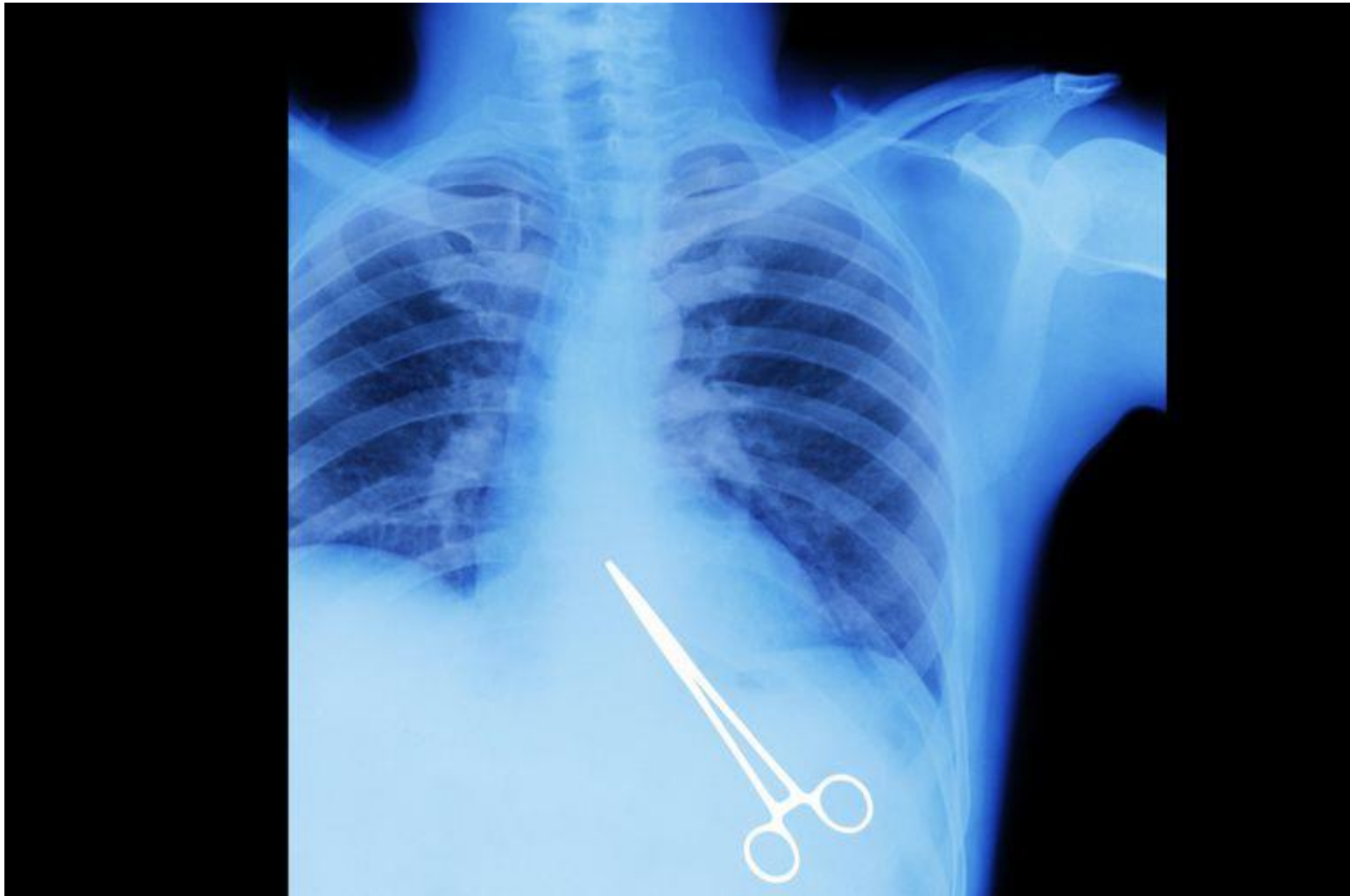


Prof.& Ph.D 张红旗

复旦大学基础医学院解剖与组织胚胎学系

复旦大学枫林校区

被遗忘在腹腔内的手术器械-血管钳



English words quiz

English into Chinese

1. Olecranon
2. Sphenoid
3. Acromion
4. Medial epicondyle
5. Capitulum of humerus

Chinese into English

1. 掌骨
2. 翼点
3. 肱骨滑车
4. 桡尺关节
5. 前臂骨间膜

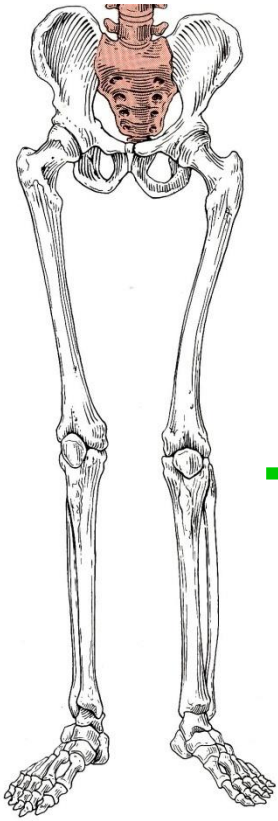
English words quiz

English into Chinese

- 1.Olecranon 鹰嘴
- 2.Sphenoid 蝶骨
- 3.Acromion 肩峰
- 4.Medial epicondyle 内上髁
- 5.Capitulum of humerus 肱骨小头

Chinese into English

- 1.掌骨 metacarpal bone
- 2.翼点 pterion
- 3.肱骨滑车 trochlea of humerus
- 4.肱尺关节 humeroulnar joint
- 5.前臂骨间膜 interosseous membrane of forearm

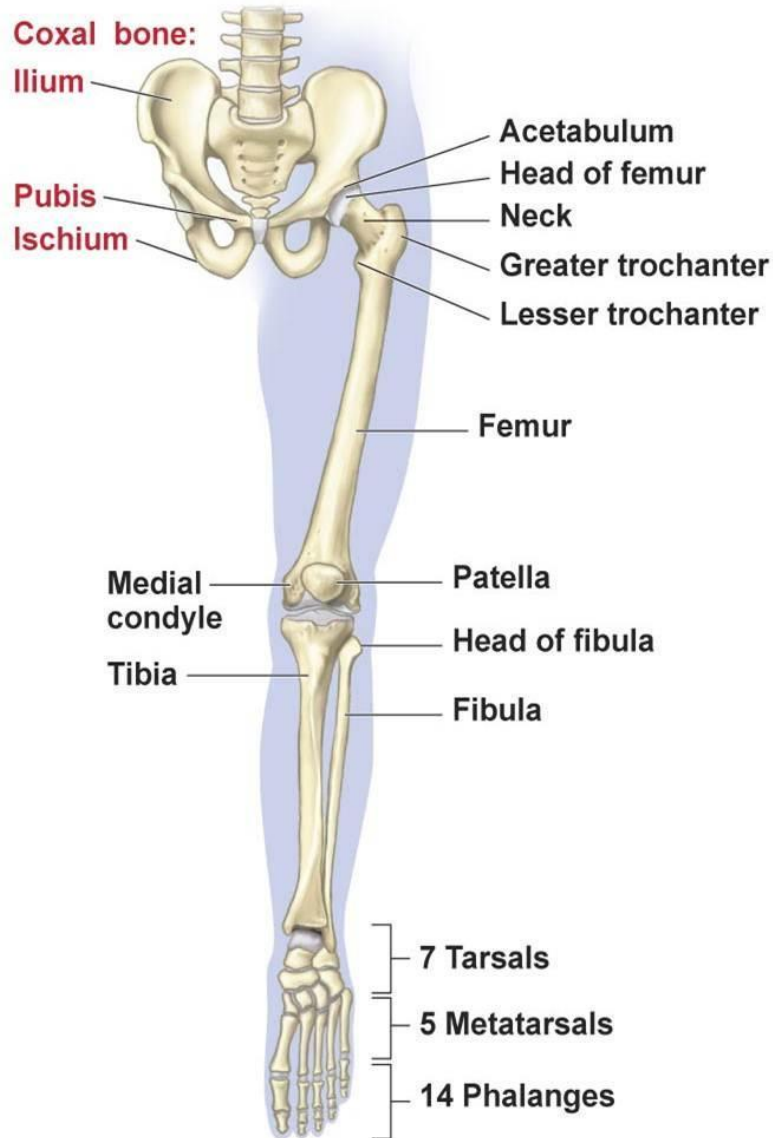


The lower limb bones and their articulations



The lower limb is specialized for locomotion. **Bearing weight & maintaining equilibrium.** so for same reason. The bones of lower limb are more **massive** than those of the upper limb.

Bones of lower limb - 62



Pelvic girdle:

Hip bone 髋骨 1

Free lower limb bones

Femur 股骨 1

Patella 髌骨 1

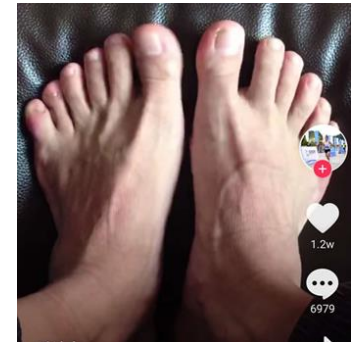
Tibia 胫骨 1

Fibula 腓骨 1

Tarsal bone 跗骨 7

Metatarsal bone 跖骨 5

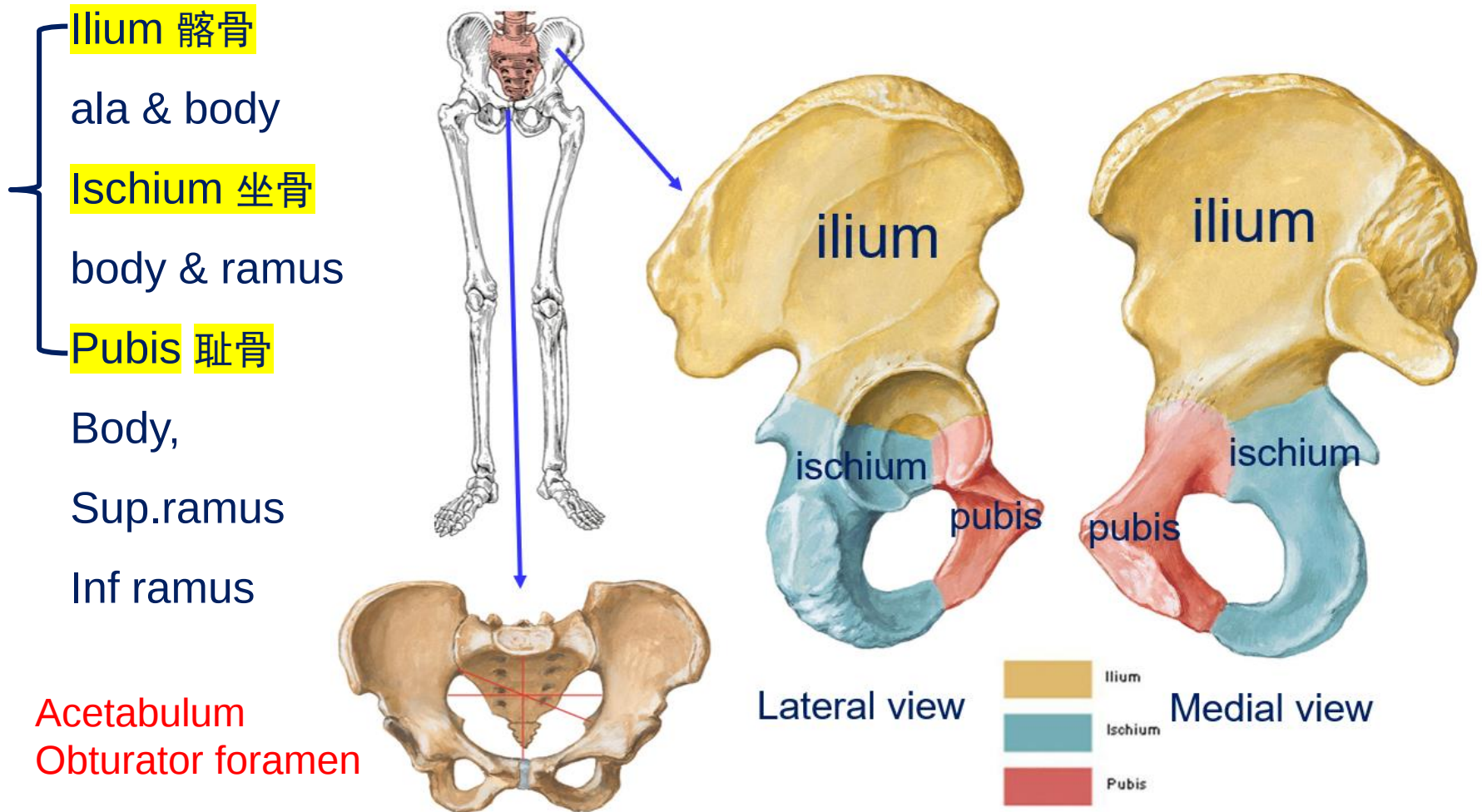
Phalanges of toes 趾骨 14

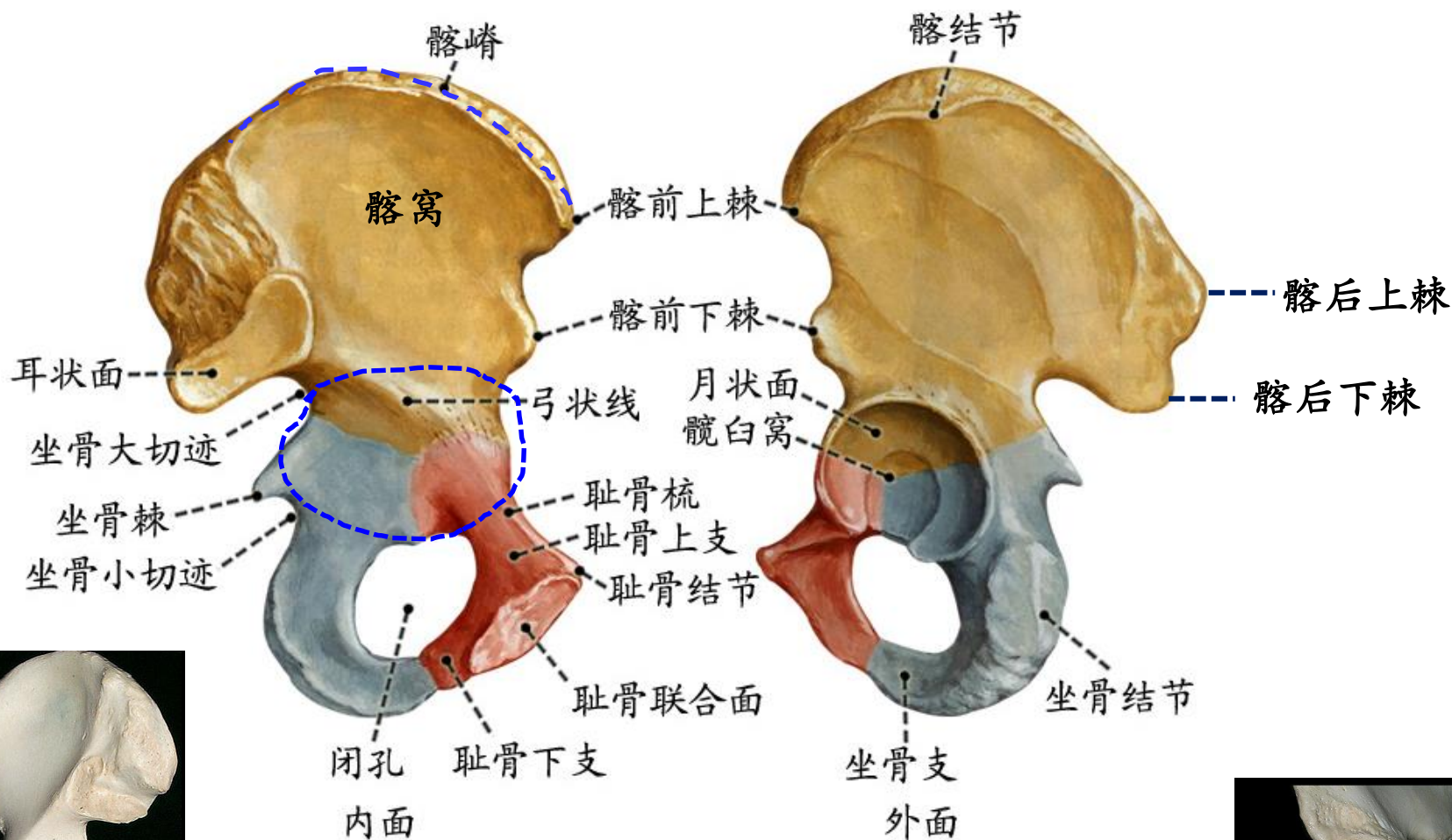


跗七跖五趾十四

髌股髌胫腓各一

Consist of three fused bones, **ilium**, **ischium**, **pubis**

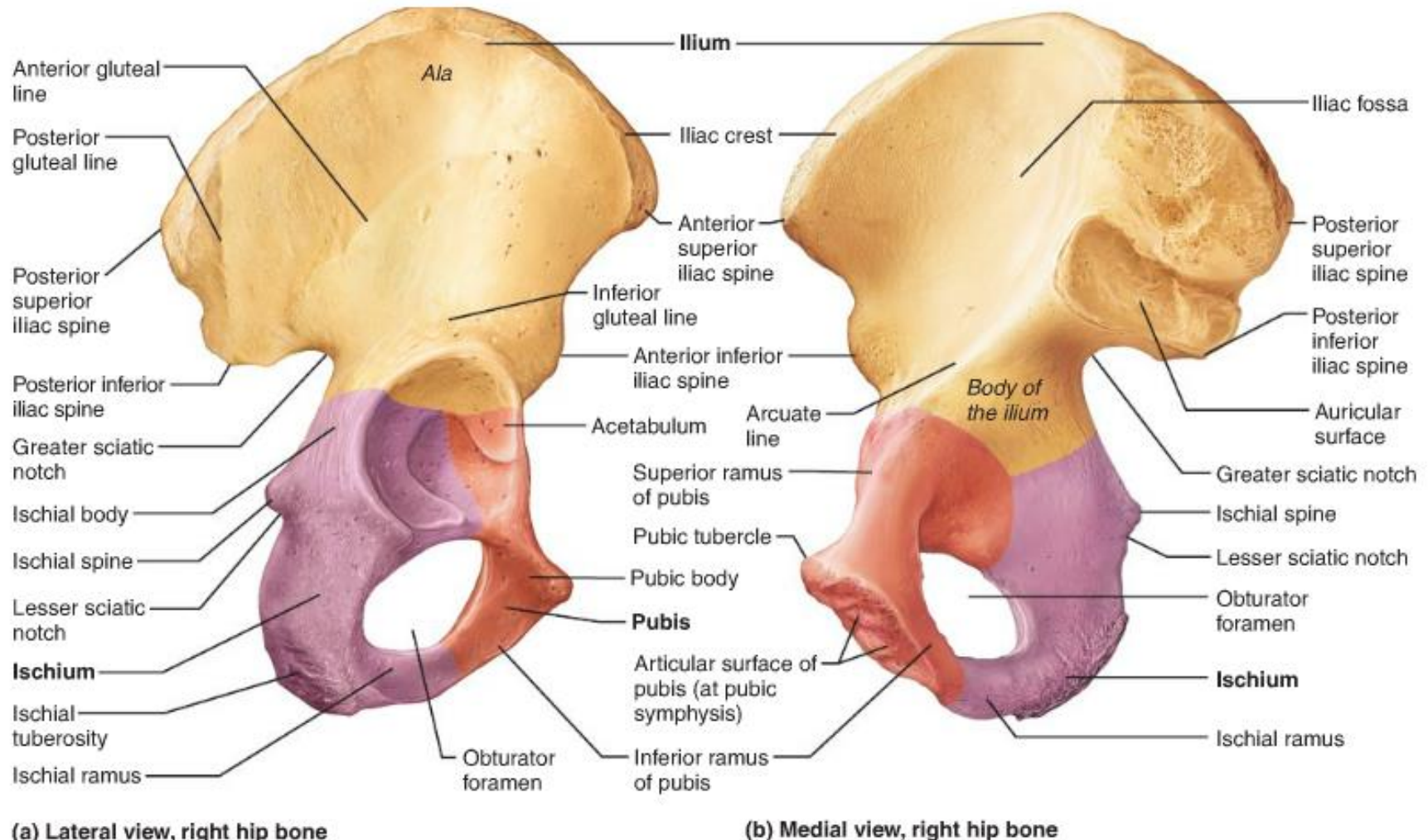




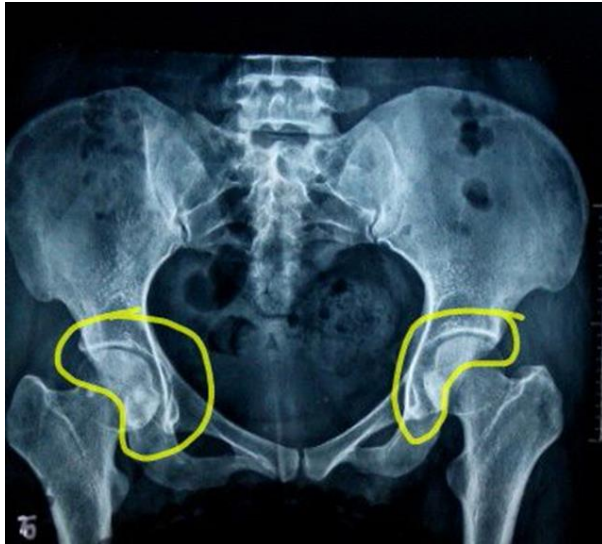
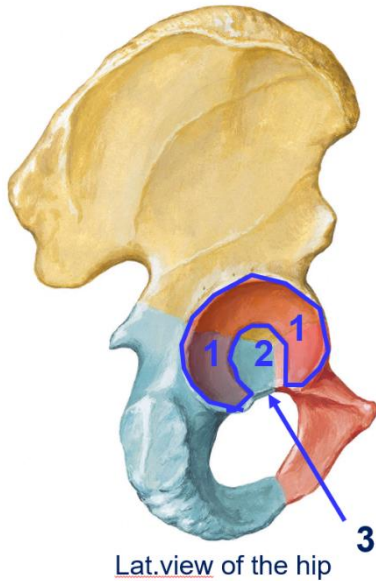
Irregular bone



Hip bone (medial and external surface)



Acetabulum 髋臼

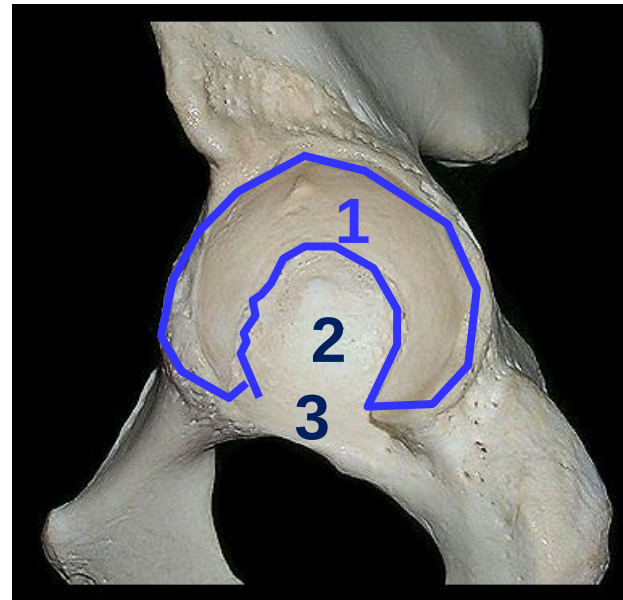


Formed by bodies of
Ischium, ilium & pubis

1-Lunate surface 月状面

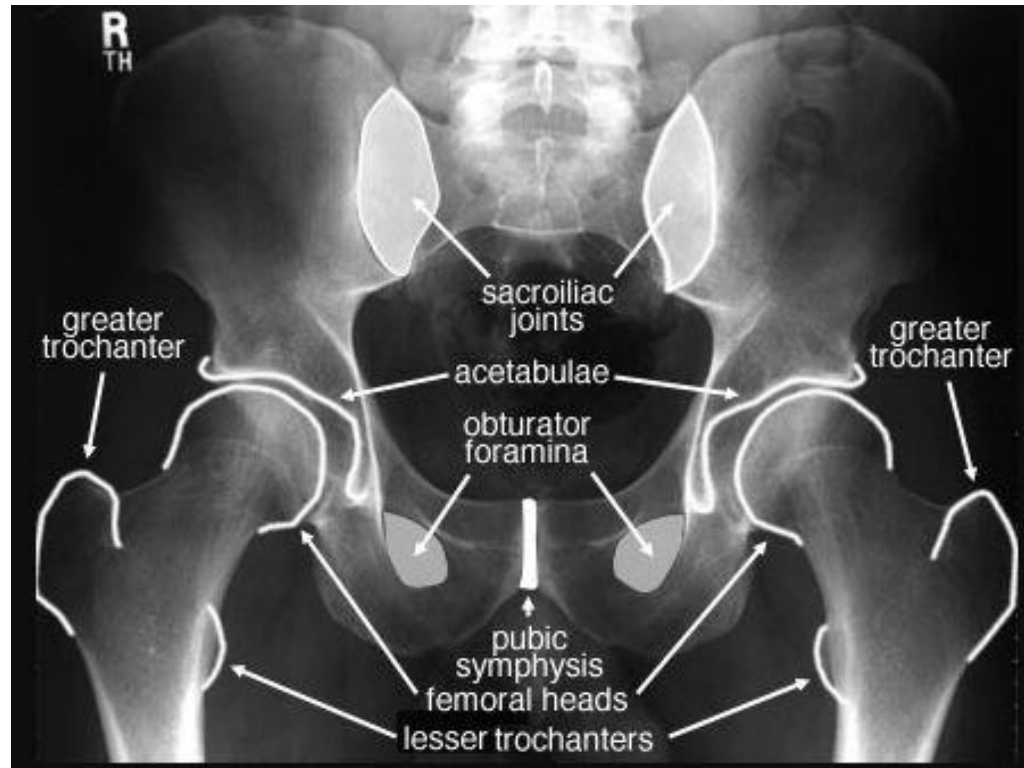
2-Acetabular fossa 髋臼窝

3-Acetabular notch 髋臼切迹

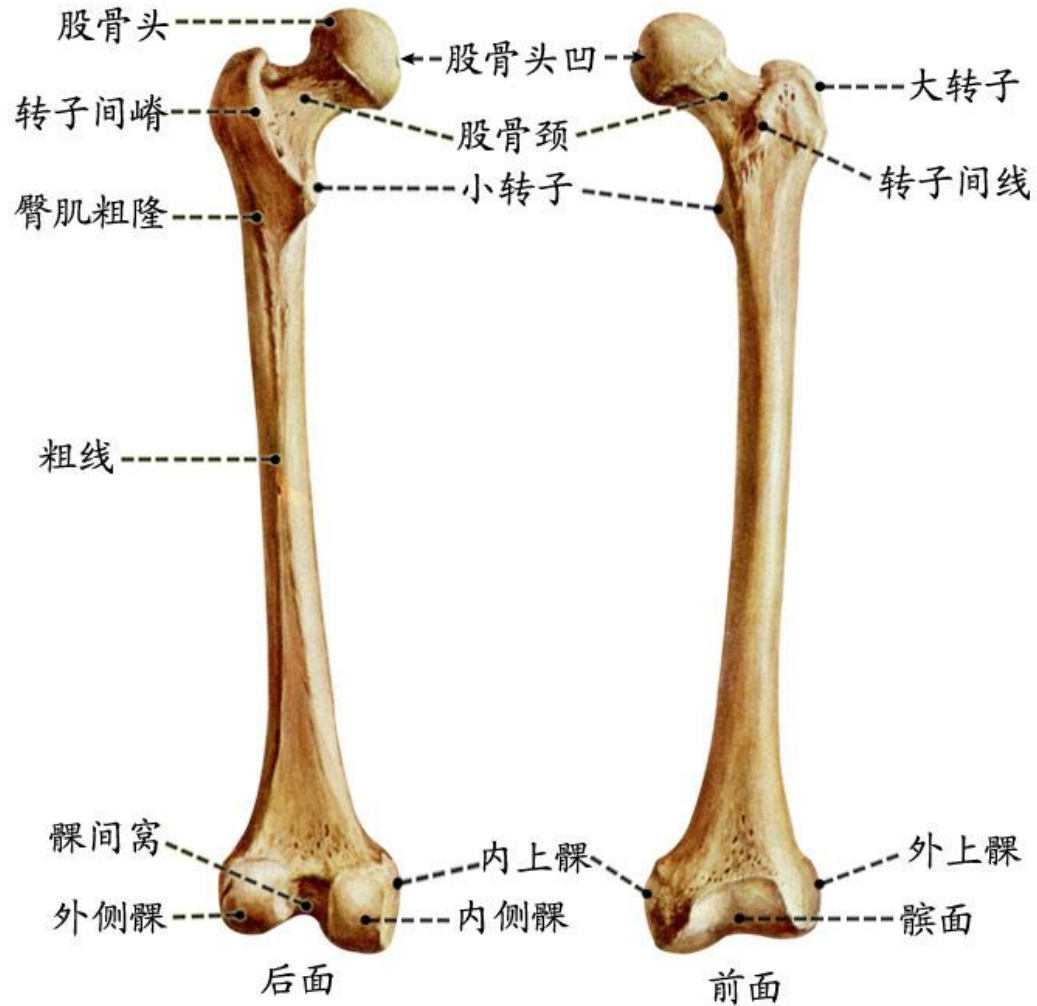
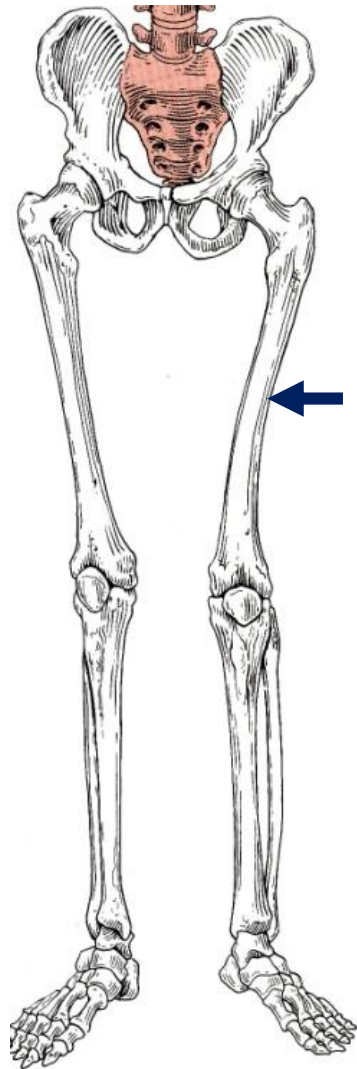


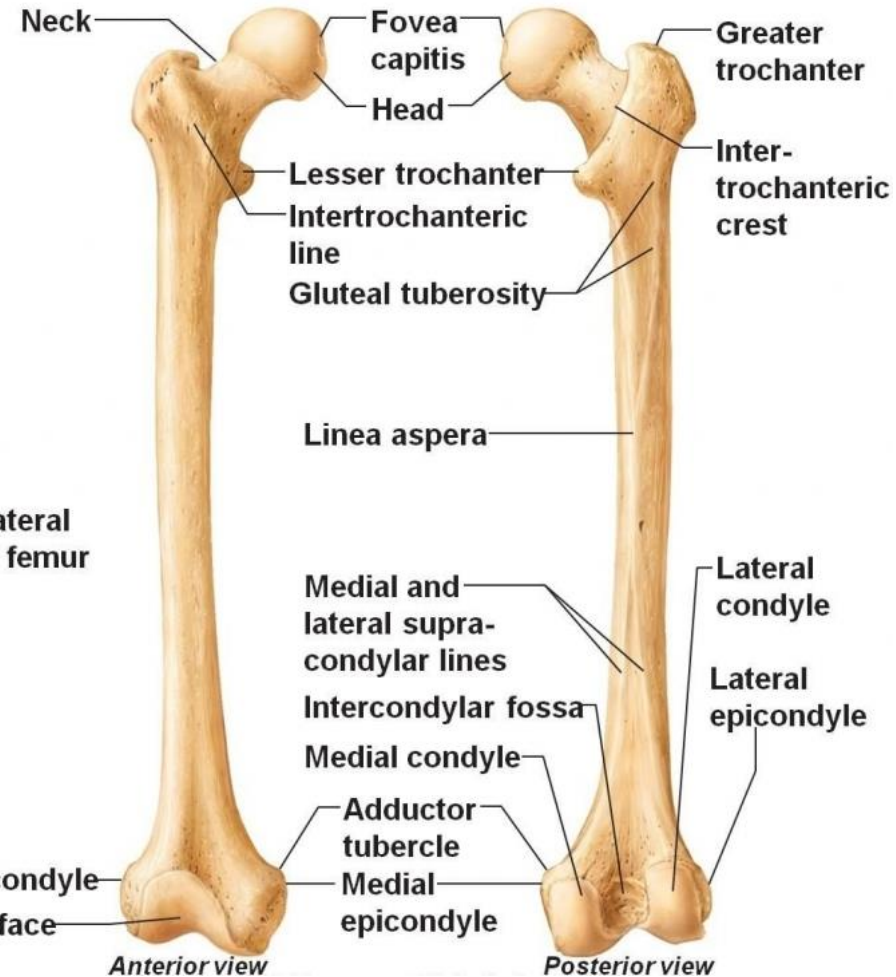
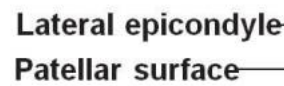
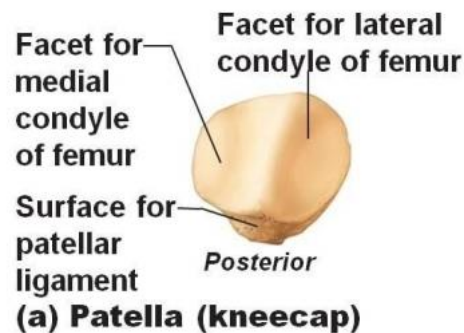
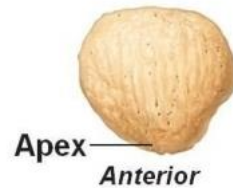
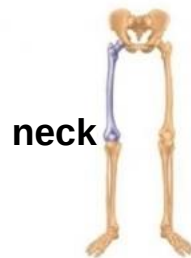
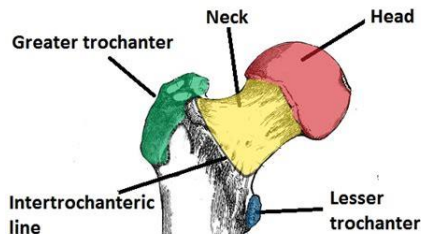
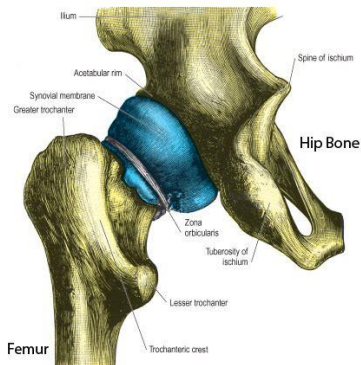
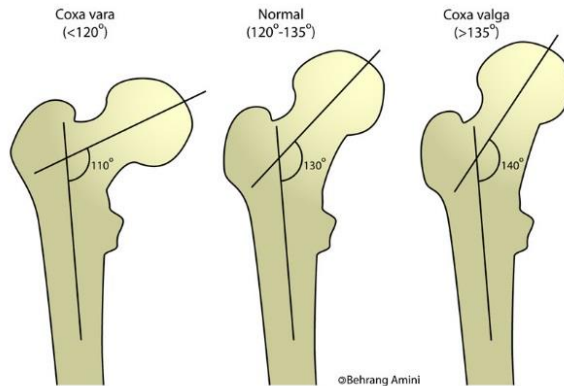
Lat.view of the acetabulum

Pelvis and hip joint x-ray image

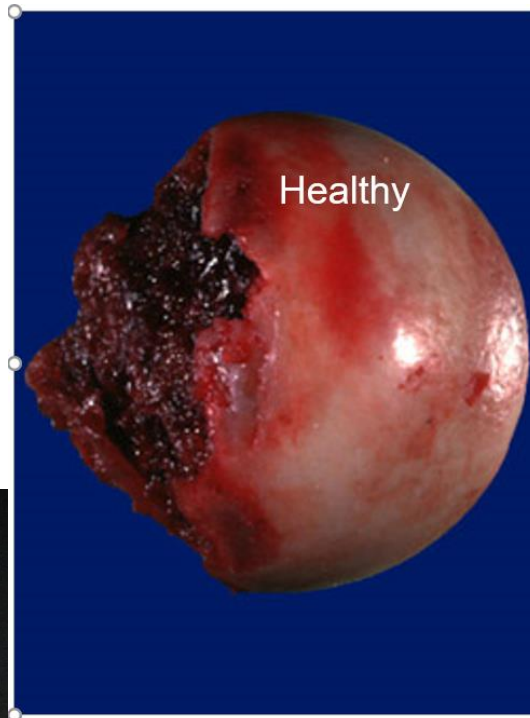
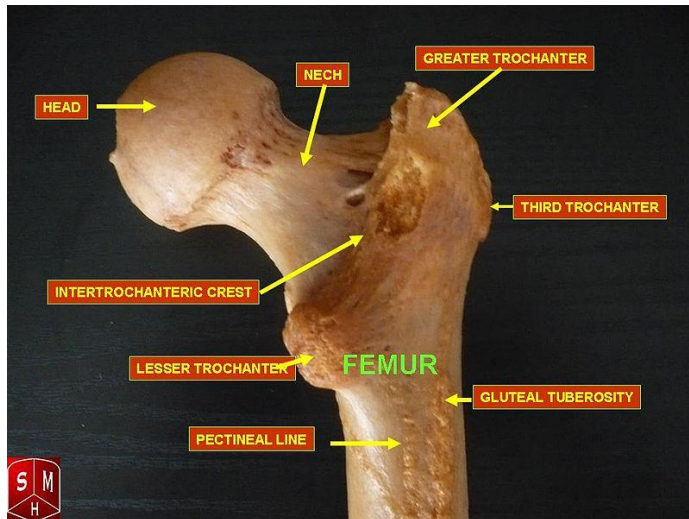
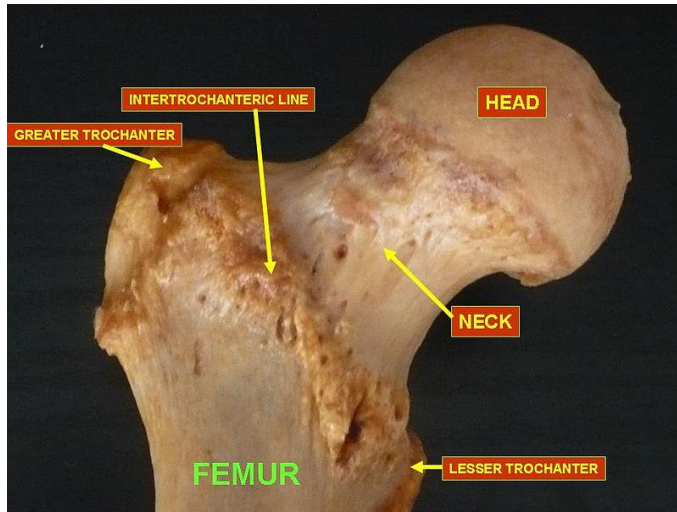


股骨长度占身高的四分之一。

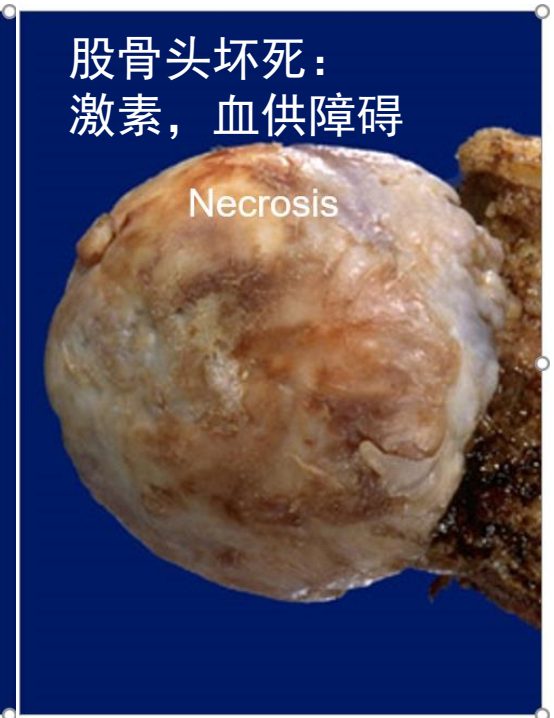




Femur head & Necrosis of femur head



The shiny articular cartilage.



Rough, lobulated head indicative of **osteoarthritis**.

Femur neck fracture 股骨颈骨折

股骨颈骨折

人生的最后一次骨折

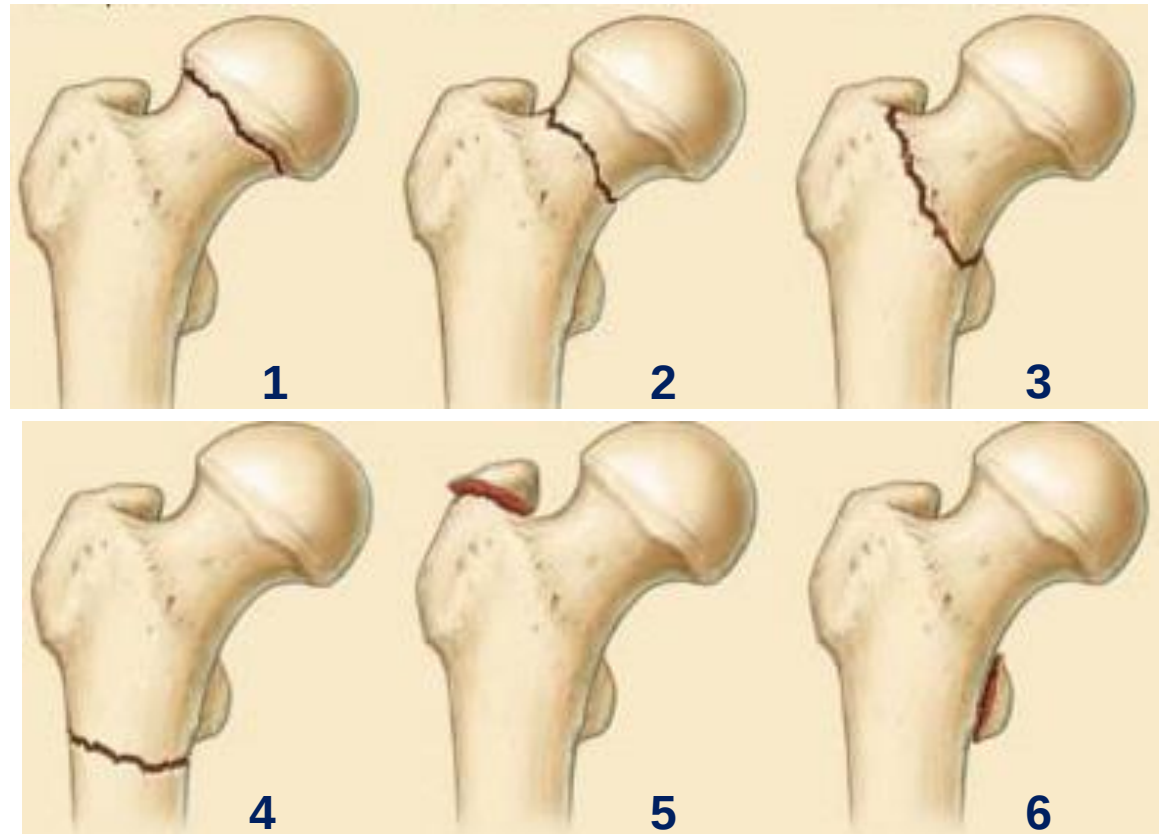
半年之内死亡率50%。

四种并发症：

1. 肺栓塞
2. 压疮，
3. 泌尿系感染
4. 深静脉血栓

预防措施：

补钙，营养、晒太阳
锻炼等。



1-Subcapital neck fracture 头下骨折

2-Transcervical neck fracture 跨颈骨折

3-Intertrochanteric fracture 转子间骨折

4-Subtrochanter fracture 转子下骨折

5-Fracture of the greater trochanter 大转子骨折

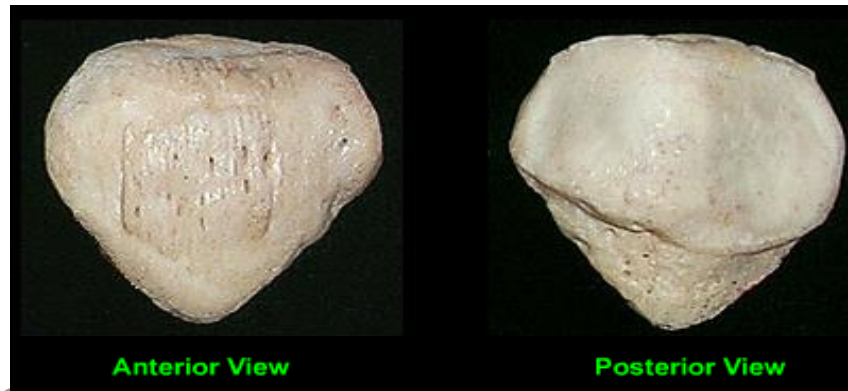
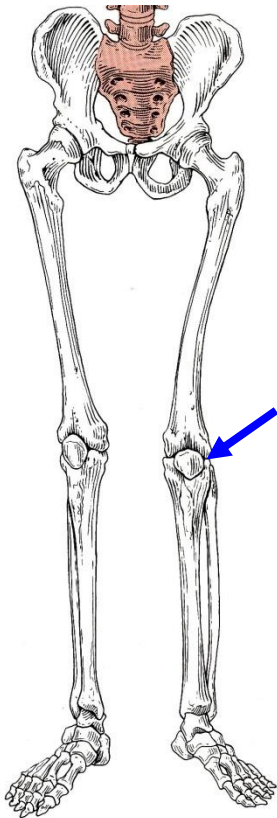
6-Fracture of the lesser trochanter 小转子骨折

Radiographs of the femur

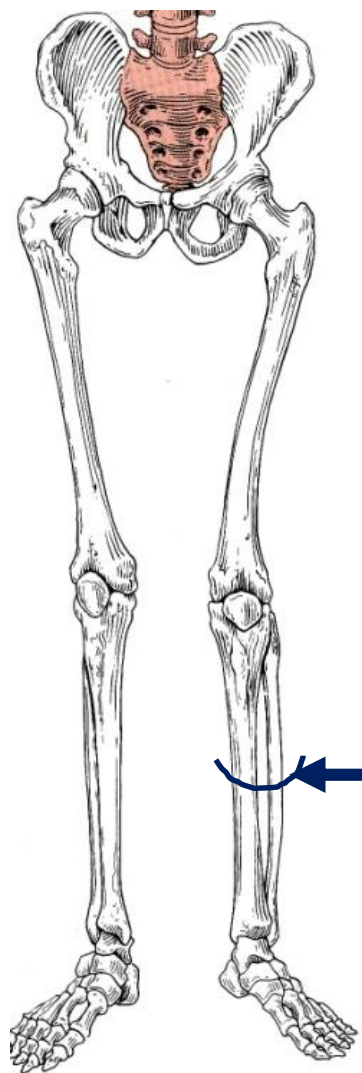


The patella 髌骨 - the largest sesamoid

Triangular, largest sesamoid 最大的籽骨

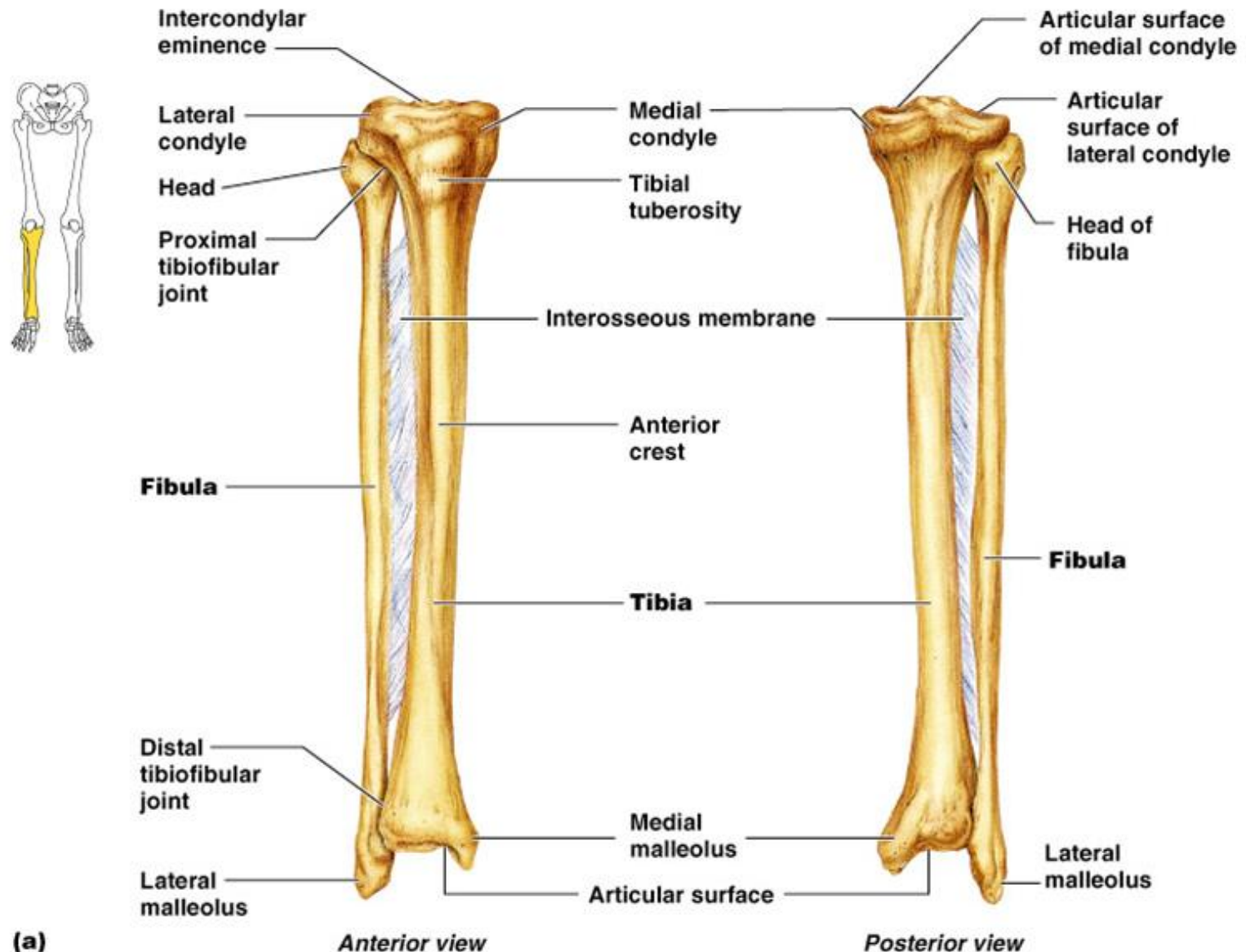


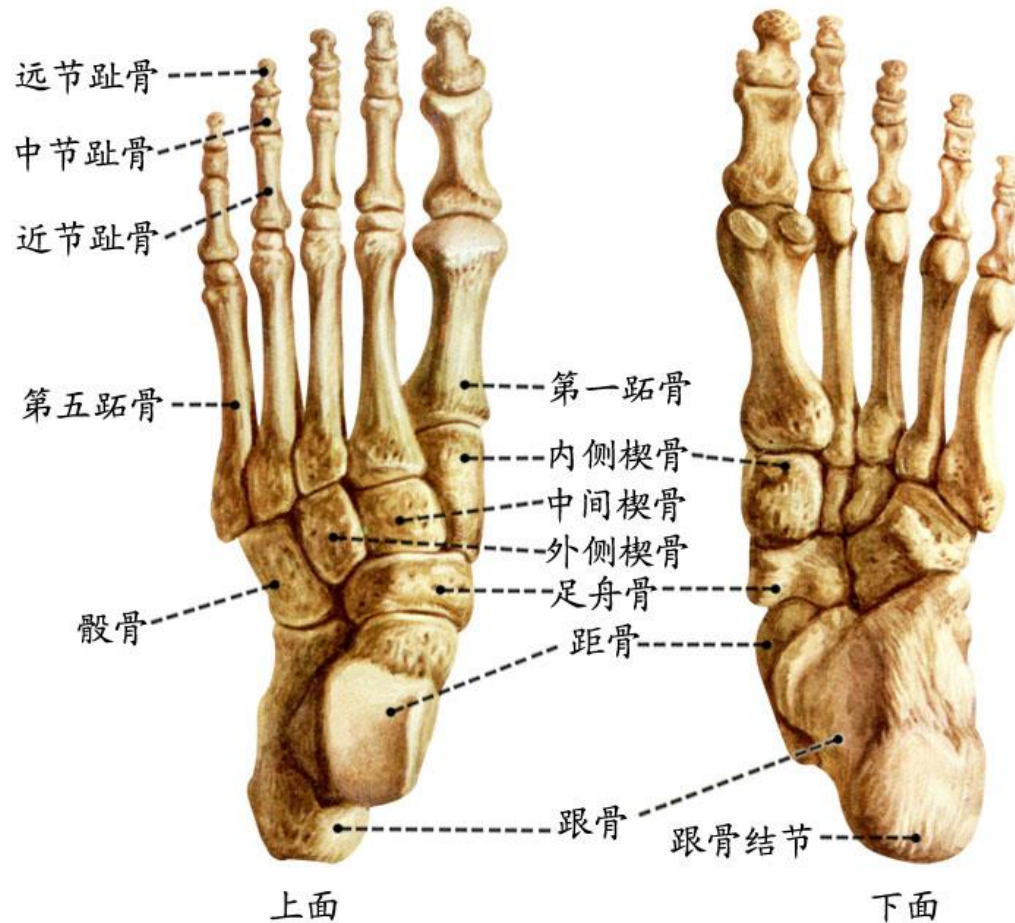
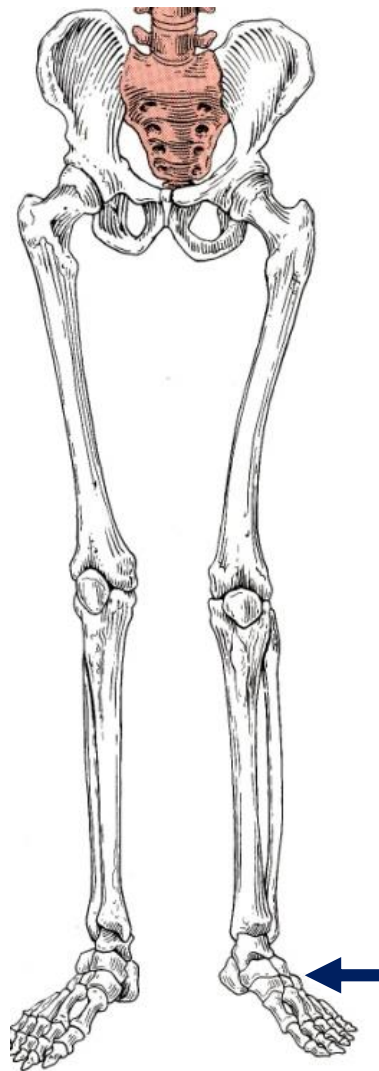
Tibia and fibula 胫骨与腓骨



Copy

Tibia & fibula (anterior and posterior view)



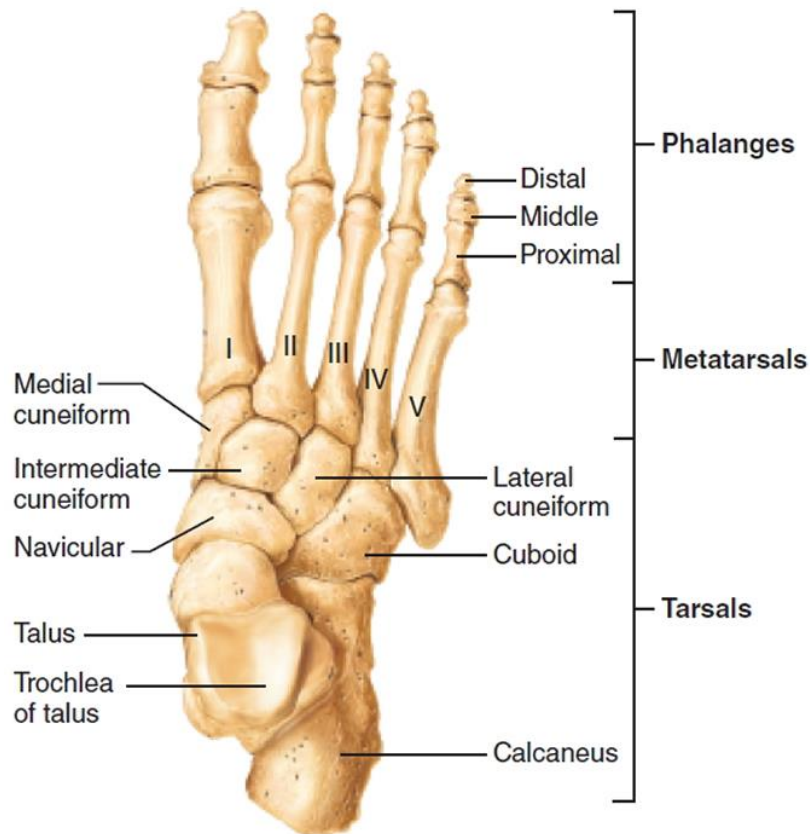


跗骨

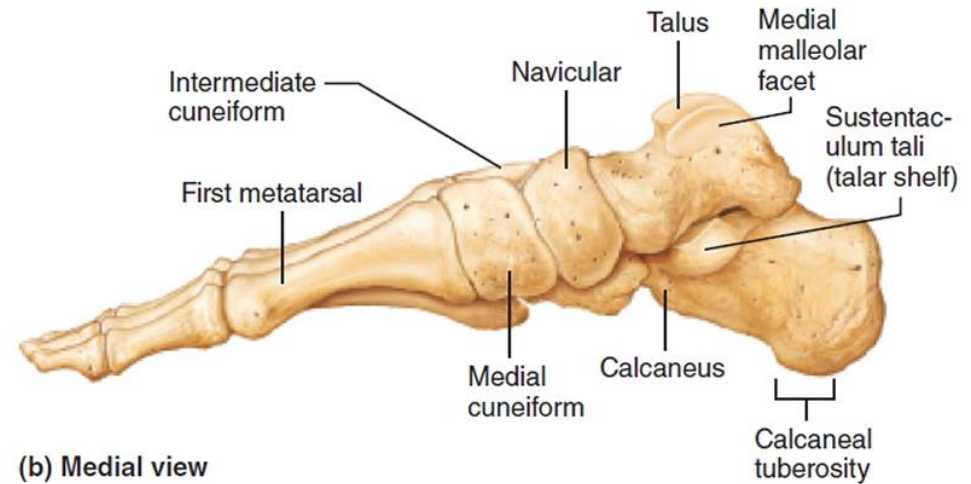
一二三楔骰内舟

距上跟下后出头

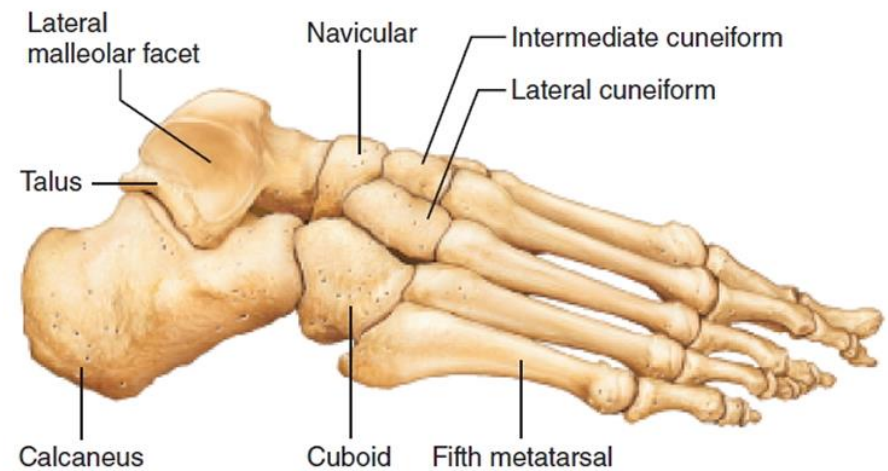
Boot bones 足骨



(a) Superior view

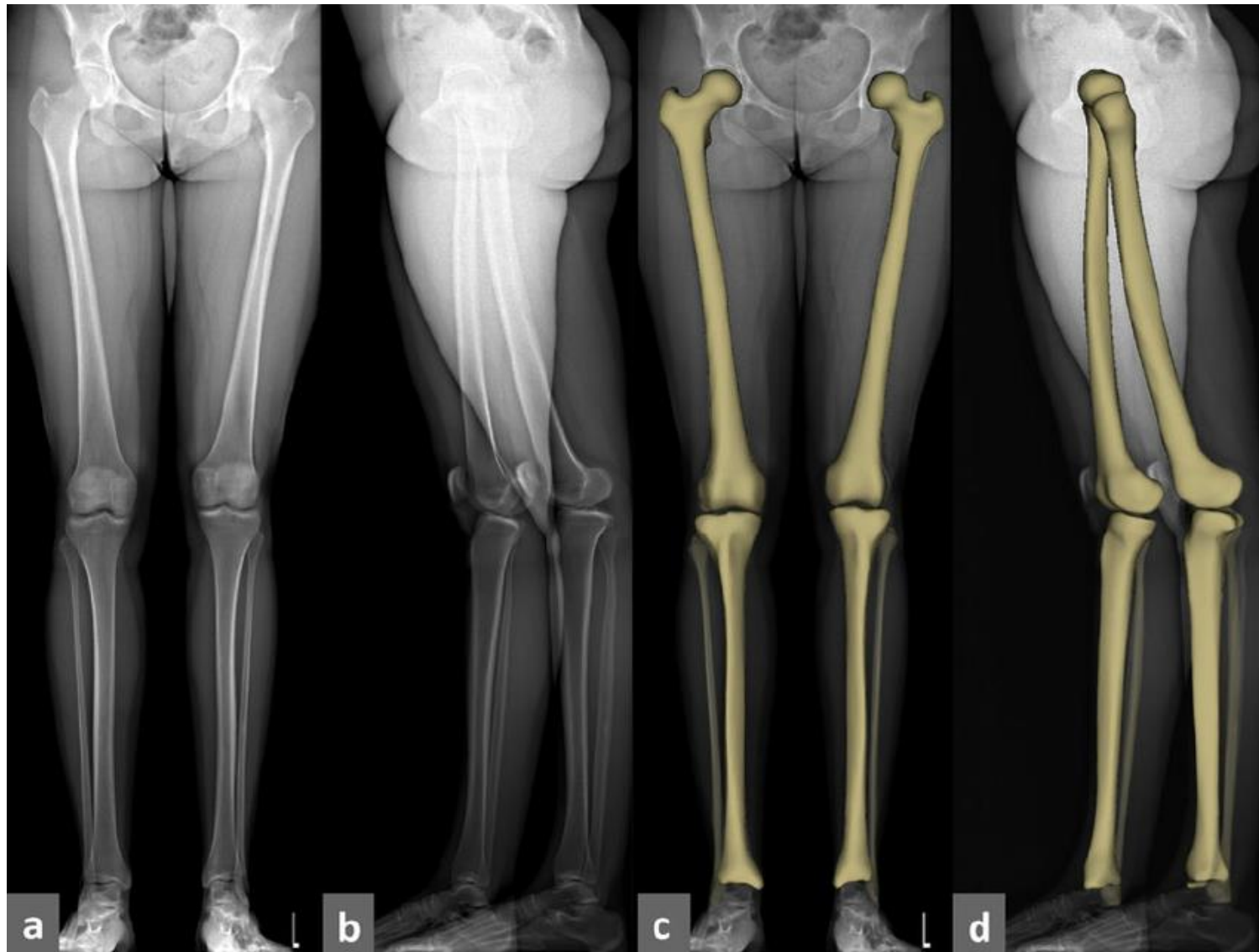


(b) Medial view



(c) Lateral view

The bones of lower limb

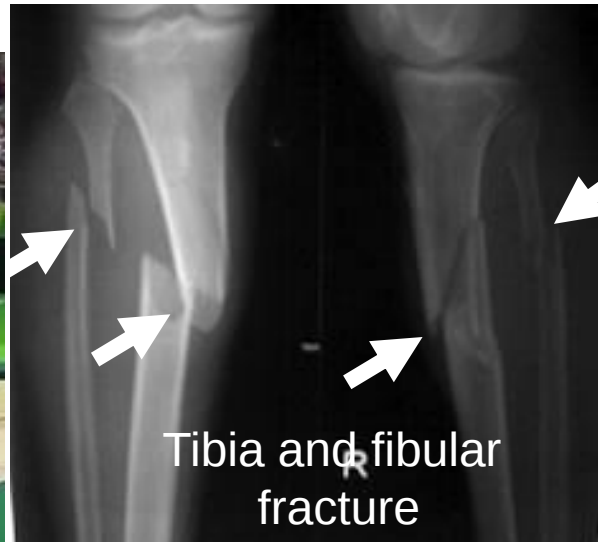


Ankle radiograph:lateral view





The fracture of lower limb 下肢骨折



Patellar fracture and surgical fixation



髌骨骨折后的固定

X-ray of the lower limb - fracture



Joints of the lower limb bones

Articulations of lower limb

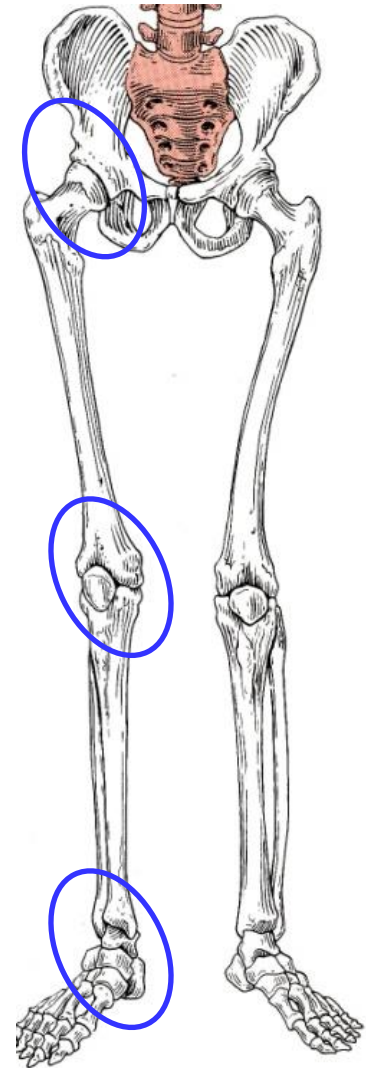
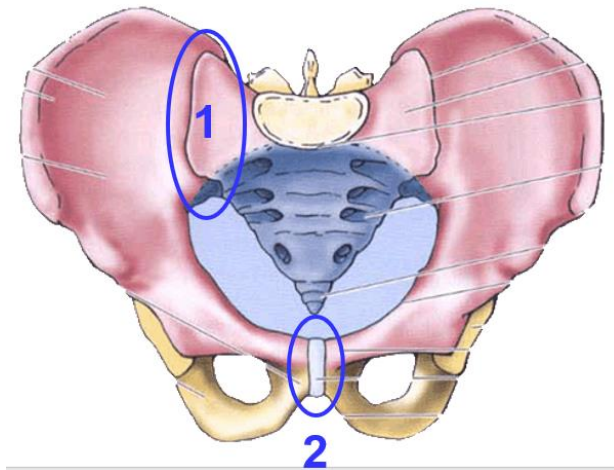
Joints of pelvic girdle

1-Sacroiliac joint 骶髂关节

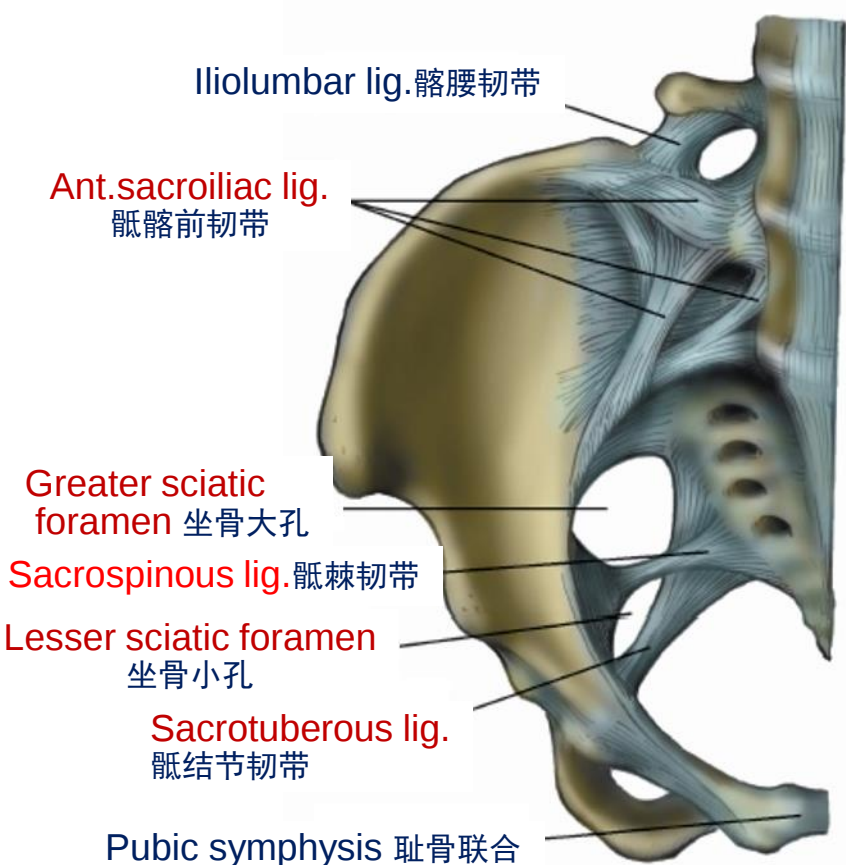
2-Pubis symphysis 耻骨联合

Bones: auricular surface of sacrum & ilium

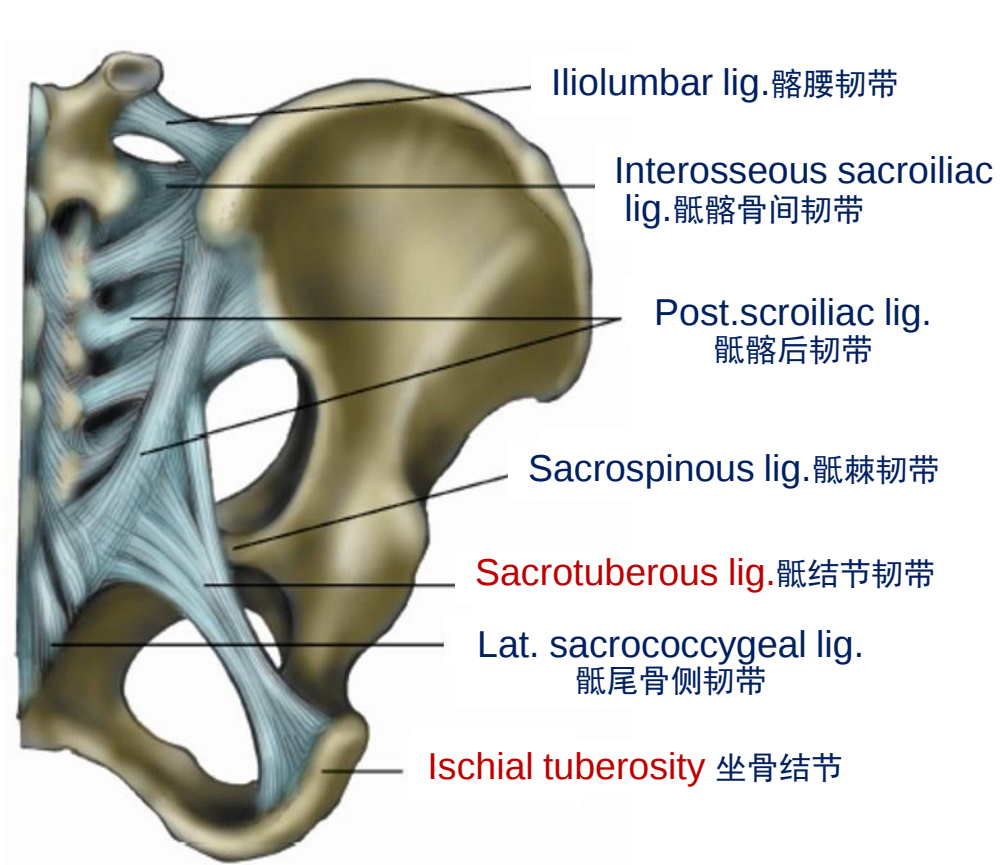
Capsule: very tight and reinforced by lig.



iliolumbar joints 髂腰关节



Ant.view



Post.view

耻骨联合 Pubis symphysis

Pubis symphysis

Articulation:

Symphysial surface &
Interpubic disc (fibrocartilage)

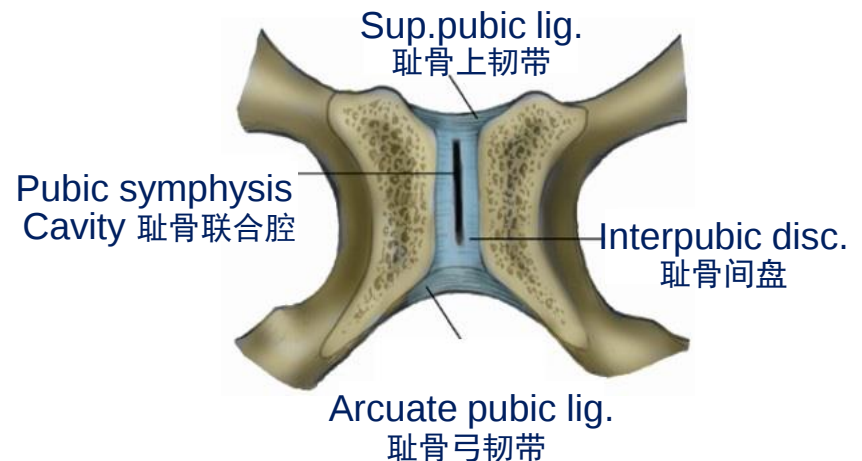
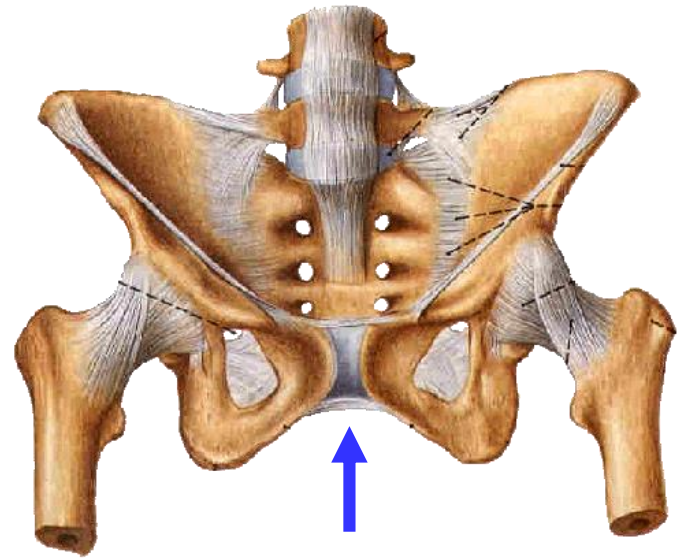
Ligaments:

Superior pubic lig. &

Arcuate pubic ligament

Obturator membrane 闭孔膜

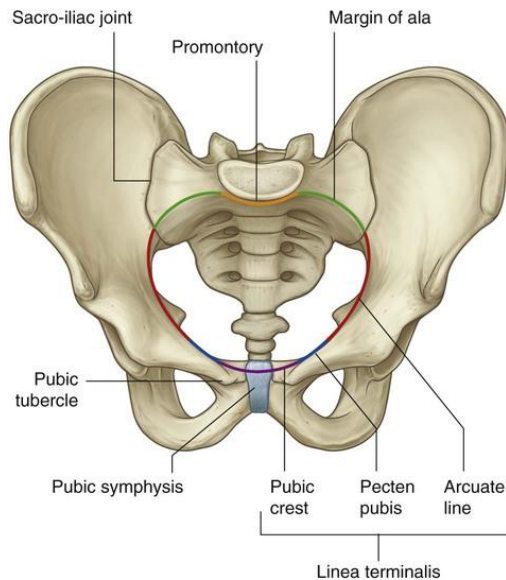
Obturator canal 闭膜管



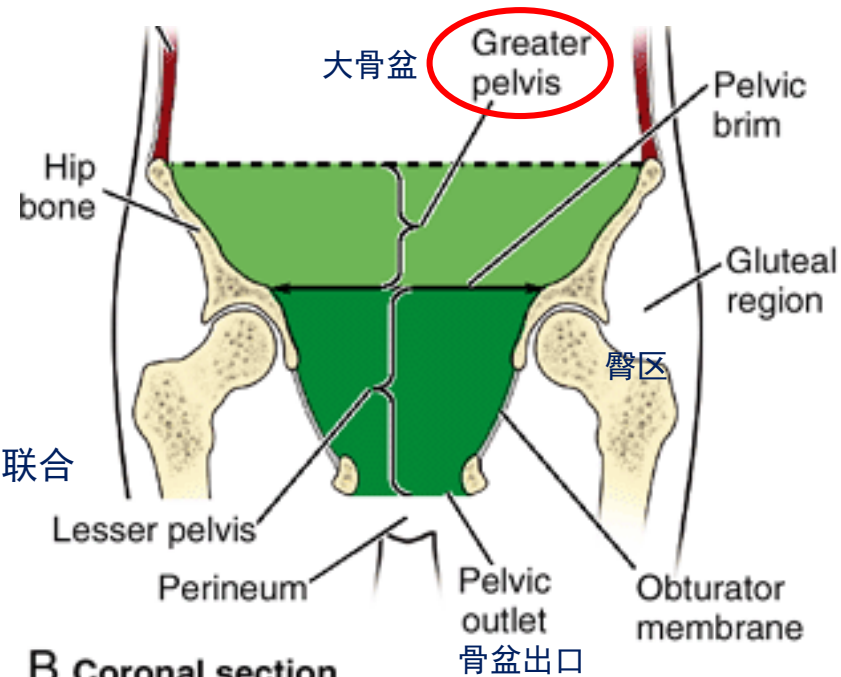
Composition组成: formed by paired hip bones, sacrum, coccyx, and their articulations

◆ **Terminal line**界线: formed by promontory 岬 of sacrum, arcuate line 弓状线, pecten of pubis 耻骨梳, pubic tubercle 耻骨结节, upper border of pubic symphysis 耻骨联合上缘

◆ **Two portions**: a greater pelvis 大骨盆 and a lesser pelvis 小骨盆



1. Promontory 骶骨岬
2. Margin of ala 翼缘
3. Arcuate line 弓状线
4. Pecten pubis 耻骨梳
5. Pubic crest 耻骨嵴
6. Pubic symphysis 耻骨联合



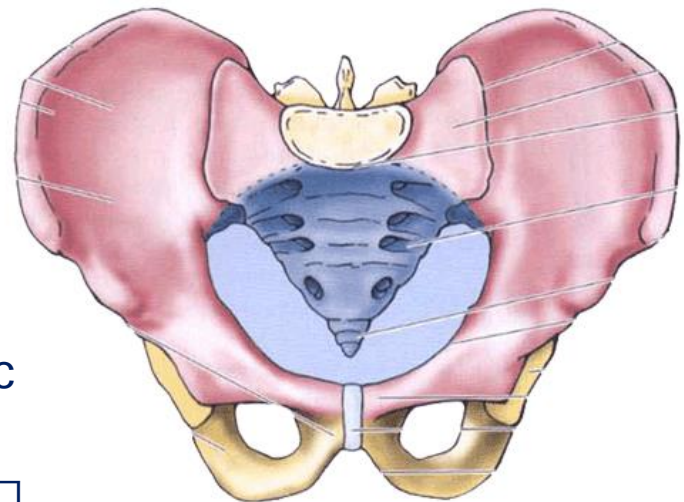
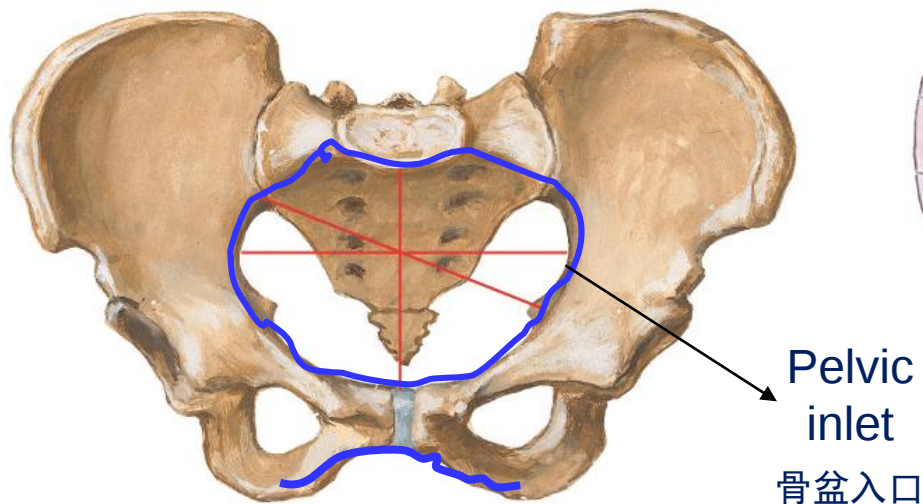
B Coronal section

Lesser pelvis 小骨盆

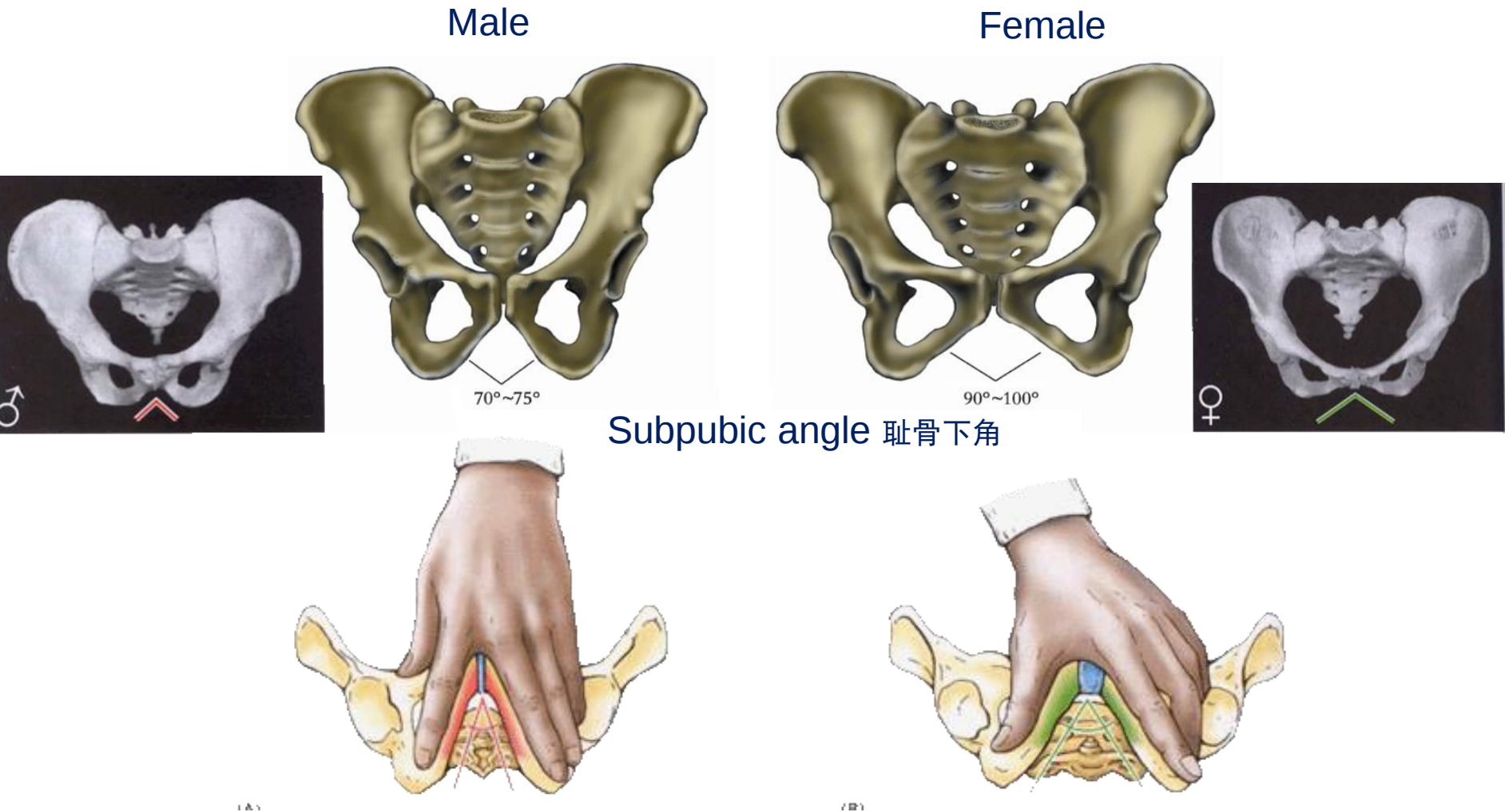
Pelvic inlet 入口 (terminal line): formed by promontory 岬 of sacrum, arcuate line 弓状线, pecten of pubis 耻骨梳, pubic tubercle 耻骨结节, upper border of pubic symphysis 耻骨联合上缘

Pelvic outlet 出口 formed by tip of coccyx 尾骨, sacrotuberous lig. 骶结节韧带, ischial tuberosity 坐骨结节, ramus of ischium 坐骨支, inferior ramus of pubis 耻骨下支, symphysis 耻骨联合

Pelvic cavity 盆腔, **Pubic arch** 耻骨弓, **subpubic angle** 耻骨下角

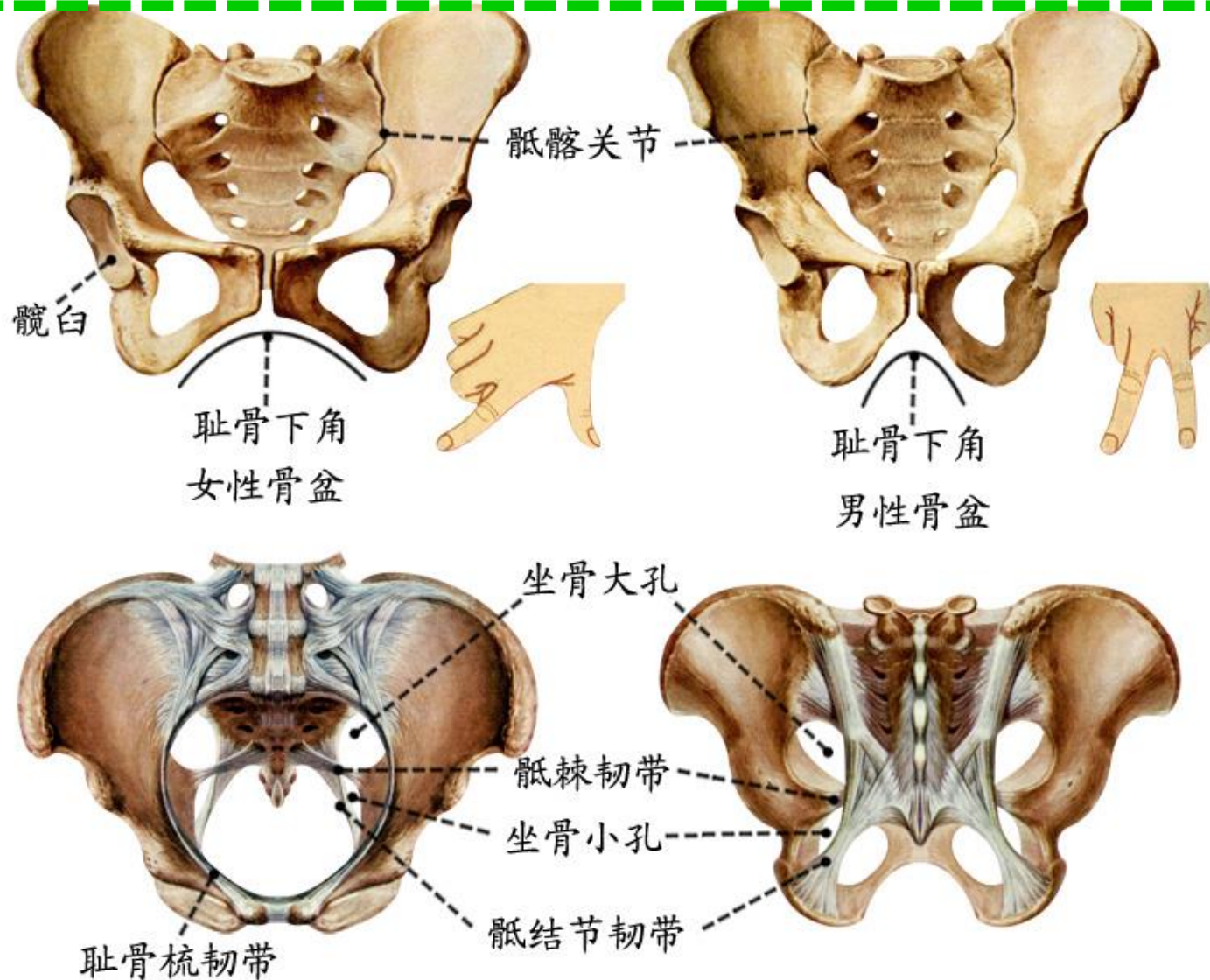


Difference between male & female pelvis 骨盆性差

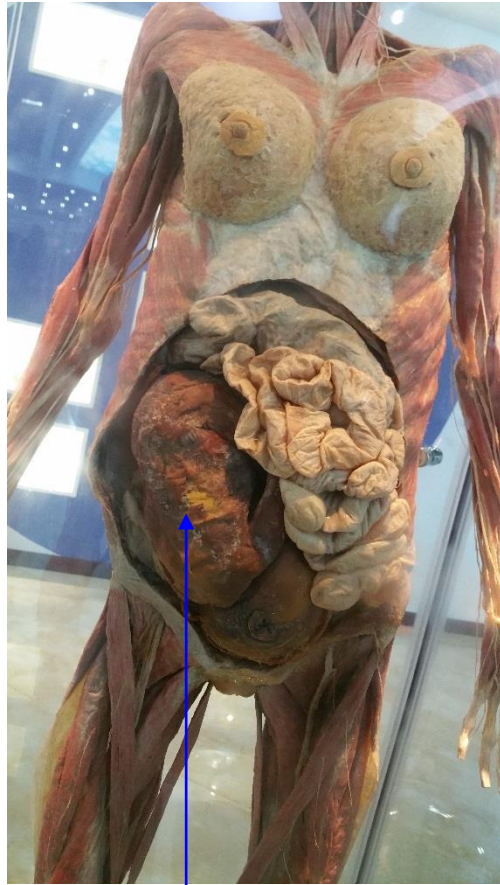


While give a birth and protect the perineum

骨盆性差 difference between male & female pelvis



Comparison between male & female pelvis



Fetus

Female



Pelvic inlet

骨盆入口



Pelvic outlet

骨盆出口



Pelvic cavity

骨盆腔

Male



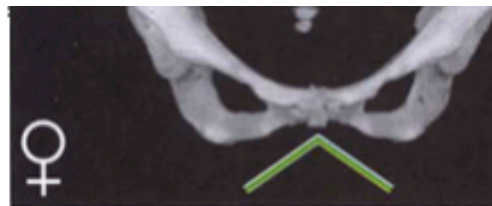
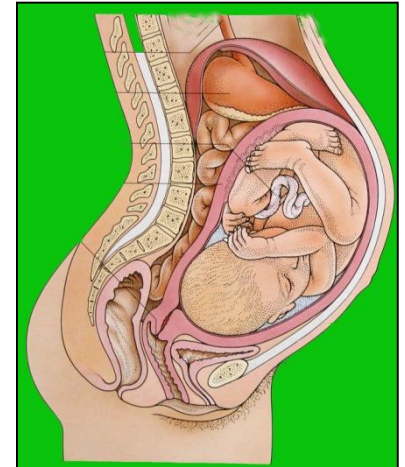
Pelvic inlet



Pelvic outlet

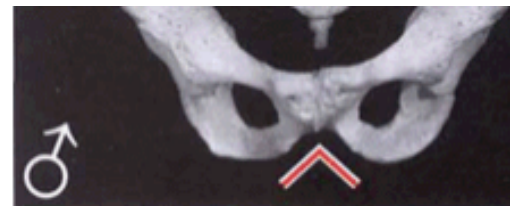


Pelvic cavity



♀

90~100°



♂

Pubic arch 70~75°

Comparison between male & female pelvis

	Male	Female
Overall	Narrow and long	Wide and short
Iliac ala	More vertical	More horizontal
Inlet	Oval or heart shaped	Round
Subpubic angle	Acute angle (about 70~75 ⁰)	Right angle (about 90~100 ⁰)
Pelvic cavity	Deep narrow	Shallower, wide
Outlet	Small	Larger

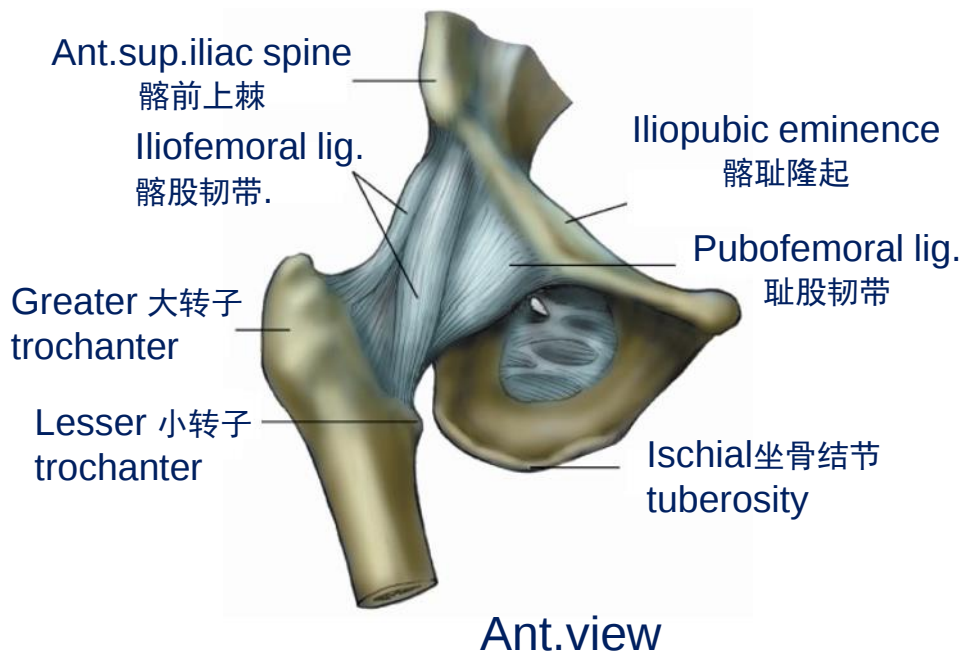
Hip joints 髋关节

Constitution: acetabulum & femoral head

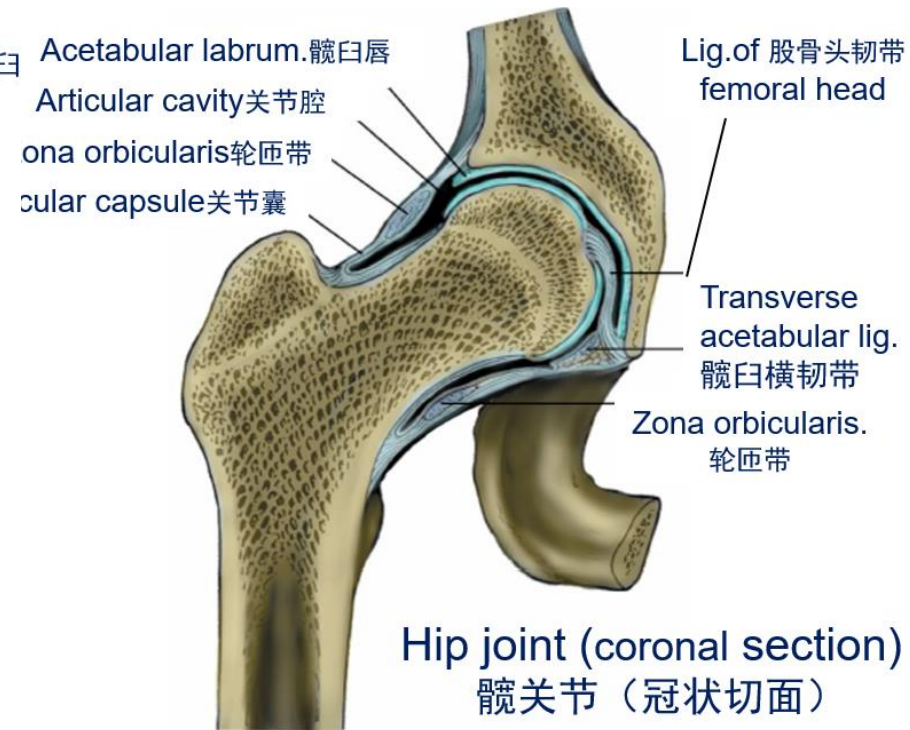
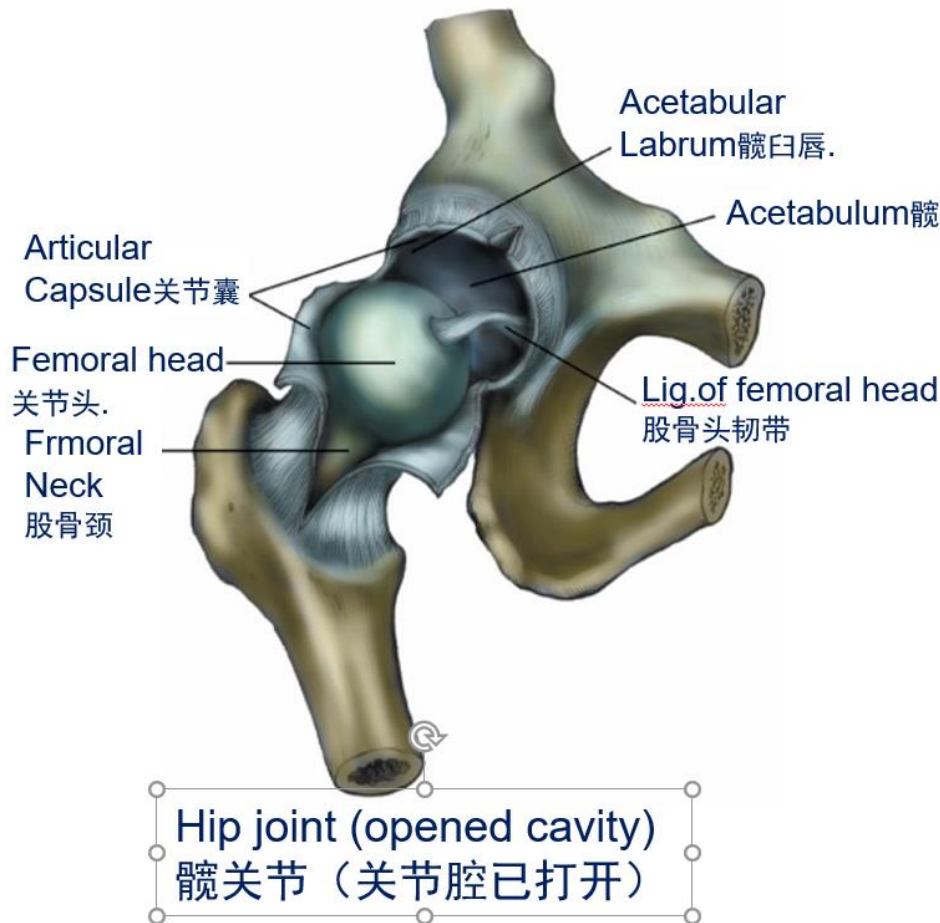
Articular capsule: tense and strong

Above: margins of acetabulum & transverse acetabular lig.

Below: in front to intertrochanteric line; behind, to the neck of femur above 1 cm above the intertrochanteric crest



Accessory structure of hip joints



髋关节 Hip joints

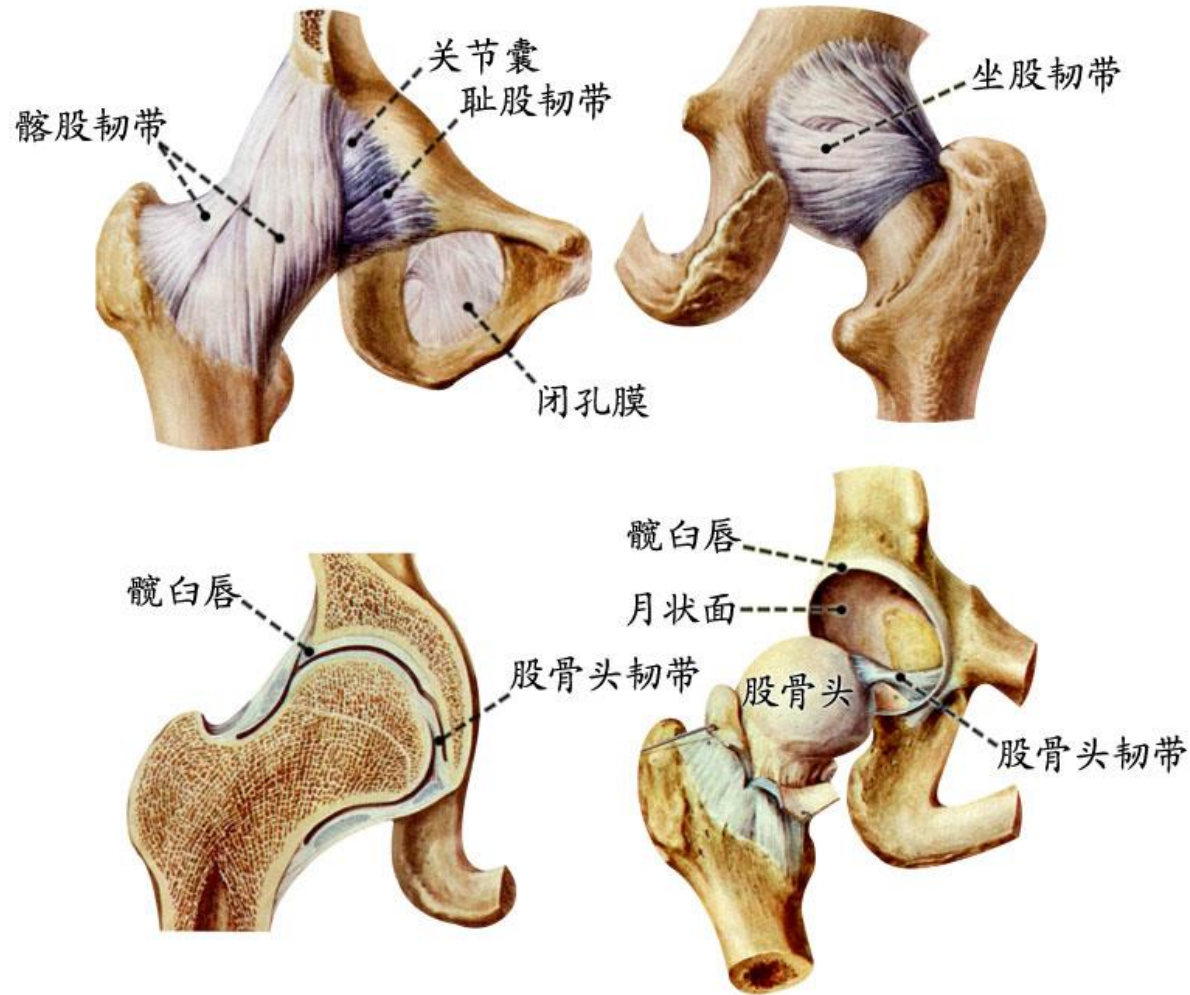
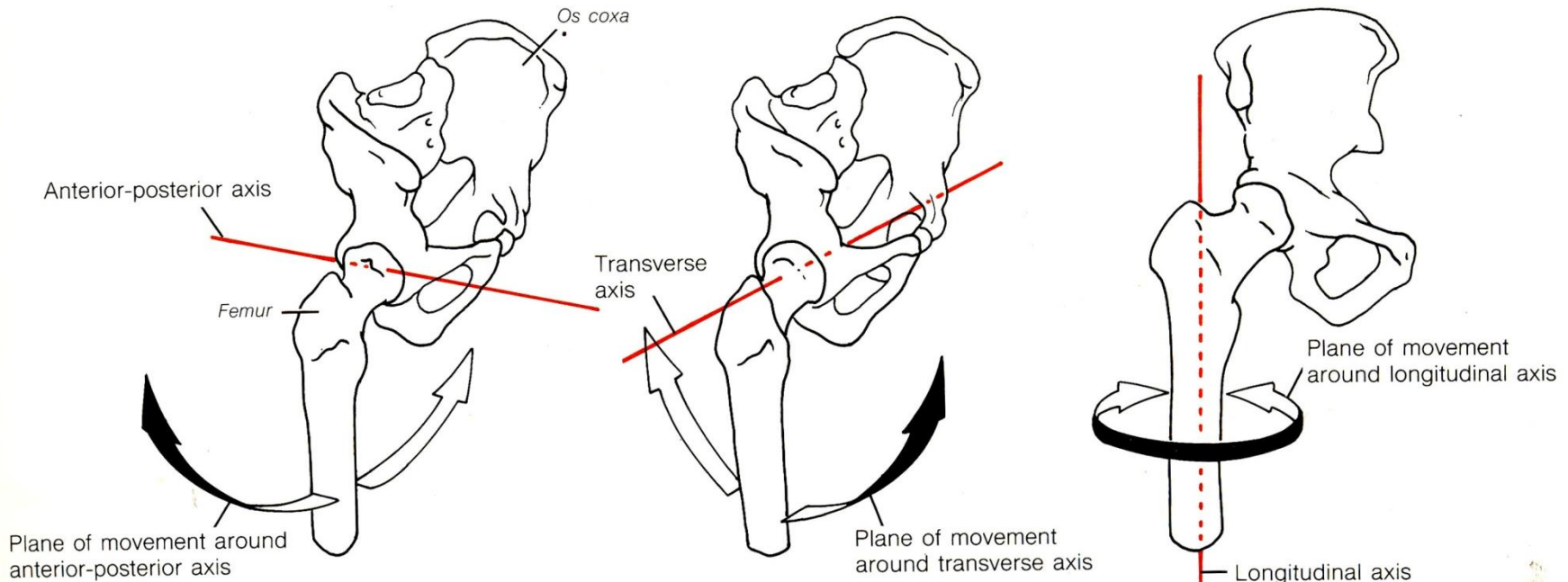


Figure 5. Hip Joint. (a) The ball-and-socket joint of the hip is a multiaxial joint that provides both stability and a wide range of motion. (b–c) When standing, the supporting ligaments are tight, pulling the head of the femur into the acetabulum.

Movement of the hip joints

It's movement are similar to shoulder joint

- ◆ Flexion-extension 屈和伸
- ◆ Adduction-abduction 内收与外展
- ◆ Medial and lateral rotation 旋内和旋外
- ◆ Circumduction 环转



(c) Multiaxial

Adduction-abduction 内收旋内

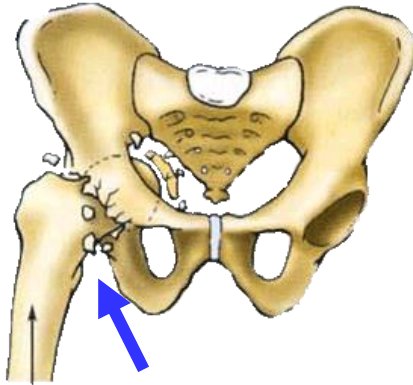
Flexion 屈-extension 伸

Circumduction 环转

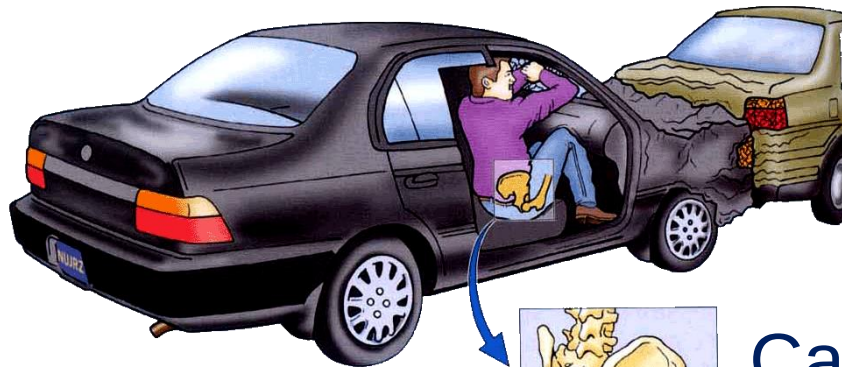
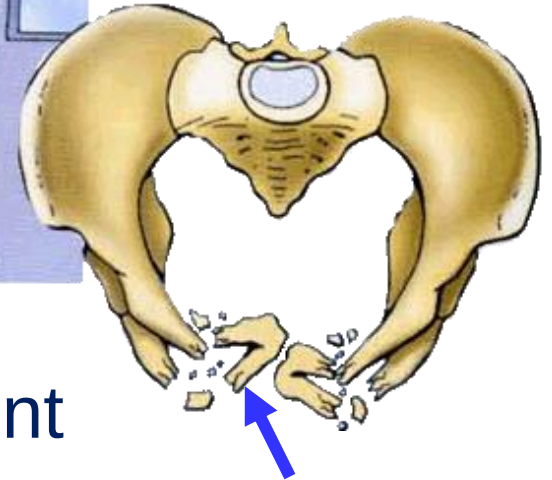
Hip bone and the clinic



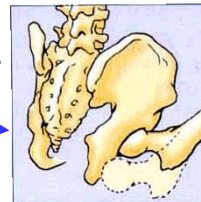
Parachuting 跳伞



Car accident



Car accident



Osteoarthritis 骨关节炎

Learn it by yourself

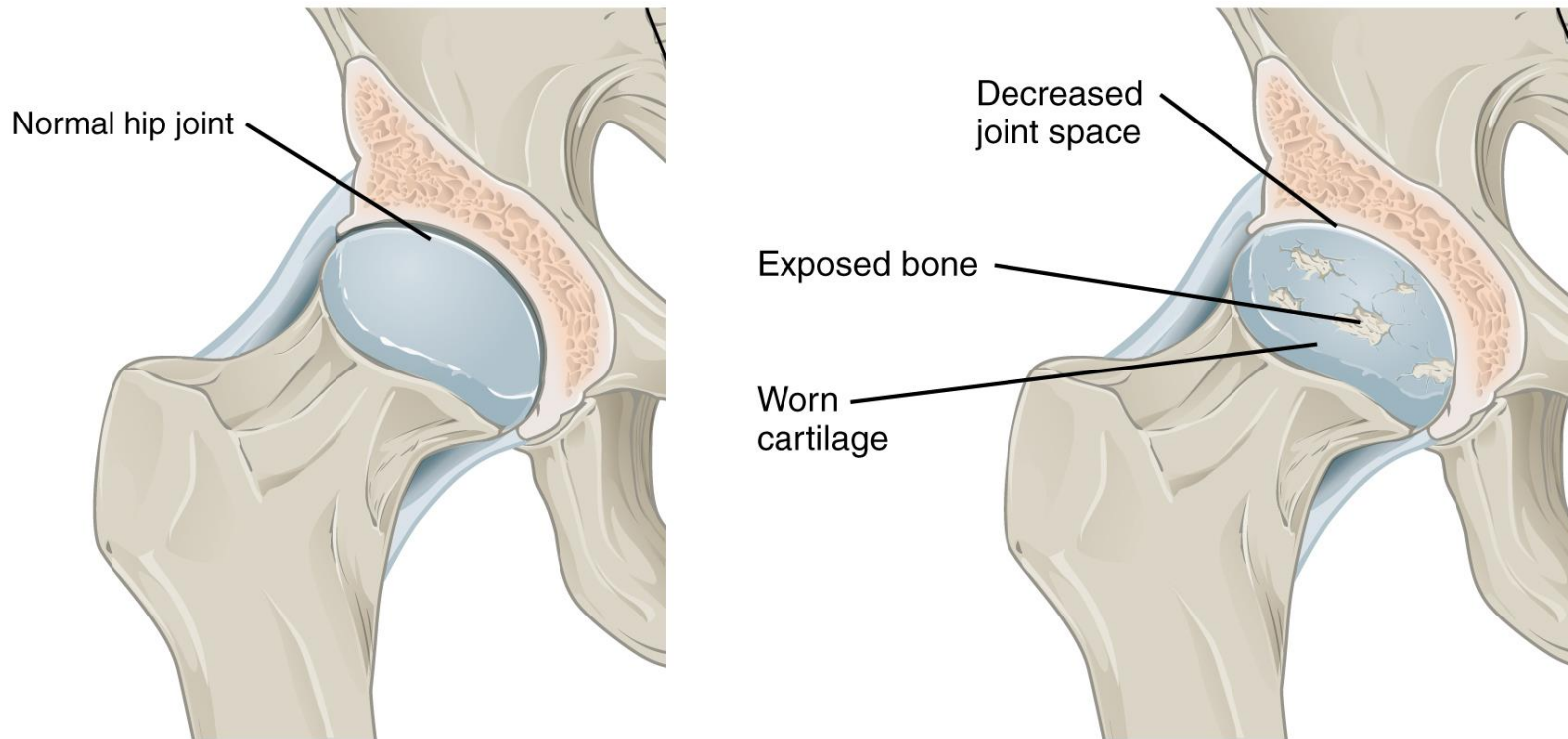


Figure 4. Osteoarthritis. Osteoarthritis of a synovial joint results from aging or prolonged joint wear and tear. These cause erosion and loss of the articular cartilage covering the surfaces of the bones, resulting in inflammation that causes joint stiffness and pain.

“髋关节脱位”的姿势

学不可以已——《荀子·劝学》

念经典 读名著 探人体奥秘 悟生命伟大

解剖学微知识之“探人体之奥秘 悟生命之伟大”，已提出 90 个小问题，再提 5 个并讨论问题 91。

91. 什么情况下易导致髋关节脱位？
92. 什么动脉没有自己的独立起源？
93. 平行的动脉主干会合二为一吗？
94. 心房与心室之间有房室间隔吗？
95. 主动脉弓可以有两个吗？如何形成的？

关于髋关节脱位，国内现行《系统解剖学》教科书记述，“髋关节囊的后下部较薄弱，脱位时，股骨头易向下方脱出。”以此授课，难免乏味。

格兰特，Grant，解剖学三部曲的作者，说（下图），导致髋关节脱位的一种姿势是髋关节处于充分屈曲，旋内，即弯腰、大脚趾向内。屈髋使得髋臼浅部接触股骨；内旋，使股骨头朝向后。若重力（如一麻袋土豆）施加于腰背，就会使股骨头脱出至髂骨背面（上图）。

每当吾念到 *Grant's Method of Anatomy* 的此段记述时，都为 Grant 的智慧和幽默所折服！为什么是用“一麻袋土豆”？而不是“一麻袋石头或铁块”或“一麻袋西红柿”？！而所描述的屈髋“姿势”，正是人们天天做的弯腰在脸盆上洗脸的姿势，想像此时“一麻袋土豆”高空坠落，砸向腰间，髋关节不脱位也难！



3. The posture conducive to dislocation of the hip joint is one in which the joint is fully flexed and medially rotated, as on bending forward with toes turned in. Flexion brings the shallow part of the acetabulum to rest on the femur; medial rotation brings the head of the femur to the back. A weight (such as a sack of potatoes) then falling on the back will dislocate the head of the femur onto the dorsum ilii.

用“一麻袋土豆”？而不是“一麻袋石头或铁块”或“一麻袋西红柿”？！而所描述的屈髋“姿势”，正是人们天天做的弯腰在脸盆上洗脸的姿势，想像此时“一麻袋土豆”高空坠落，砸向腰间，髋关节不脱位也难！

forward with toes turned in. Flexion brings the shallow part of the acetabulum to rest on the femur; medial rotation brings the head of the femur to the back. A weight (such as a sack of potatoes) then falling on the back will dislocate the head of the femur onto the dorsum ilii.

穆尔，Moore (Grant 的优秀学生与事业继承者，Ho Gwang Tsi 的师兄弟) 在其著名著作 *clinically oriented Anatomy* 中说 (下图)：由于髋关节坚固而稳定，所以获得性髋关节脱位并不常见。然而，当髋关节呈屈曲、外展并内旋姿态开车时，若发生冲撞性车祸，就有可能导致其脱位，最常见的是后脱位。强大的正面撞击力致膝关节冲抵仪表台，股骨头将撕裂的关节囊的下后部，冲出髋臼至髂骨外面。

Acquired dislocation of the hip joint is uncommon because this articulation is so strong and stable. Nevertheless, dislocation may occur during an automobile accident when the hip is flexed, adducted, and medially rotated—the position of the lower limb when a person is riding in a car. Posterior dislocations (as illustrated on p. 616) are most common. A head-on collision that causes the knee to strike the dashboard (A) may dislocate the hip when the femoral head is forced out of the acetabulum. The fibrous capsule ruptures inferiorly and posteriorly, allowing the femoral head to pass through the tear in the capsule and over the posterior margin of the acetabulum onto the lateral surface of the ilium, shortening and medially rotating the affected



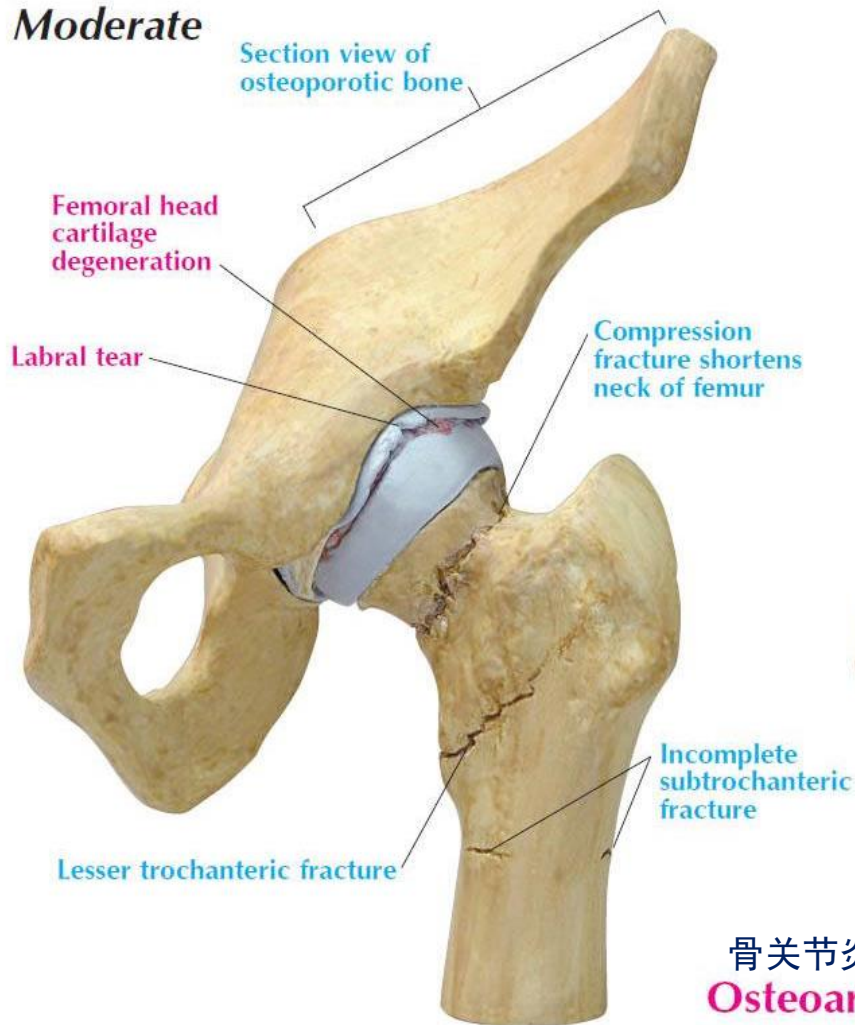
格兰特，Grant 和穆尔，Moore 的解剖学著作记述人体结构，最突出特点是运用逻辑推理思维，在紧密结合临床的同时，又特别注重结合现实、结合生活、结合功能、结合比较解剖。充分体现进化史观、反映功能决定形态、形态与功能相统一的生命观。



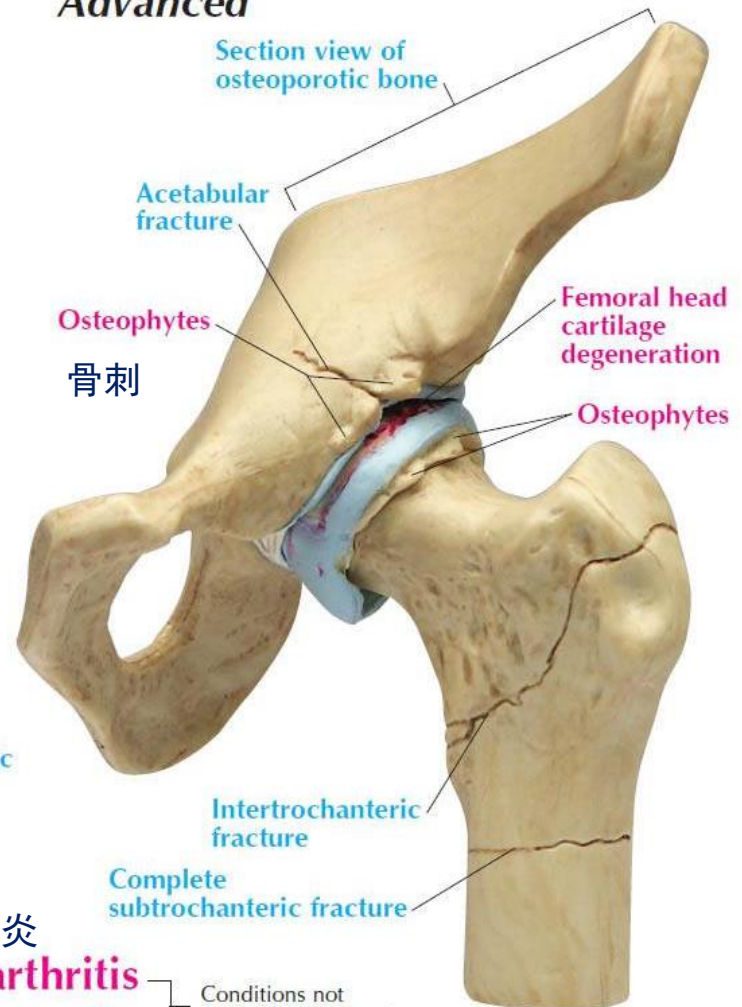
复旦大学 李瑞锡

Learn it by yourself

Moderate



Advanced



骨关节炎
Osteoarthritis
Osteoporosis

Conditions not typically concurrent

Copy

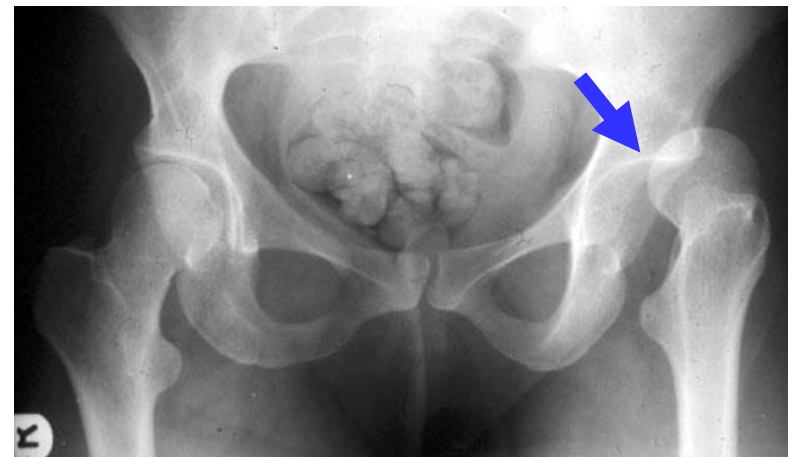
髋关节影像解剖 Radiograph of hip joint



Anteroposterior radiograph



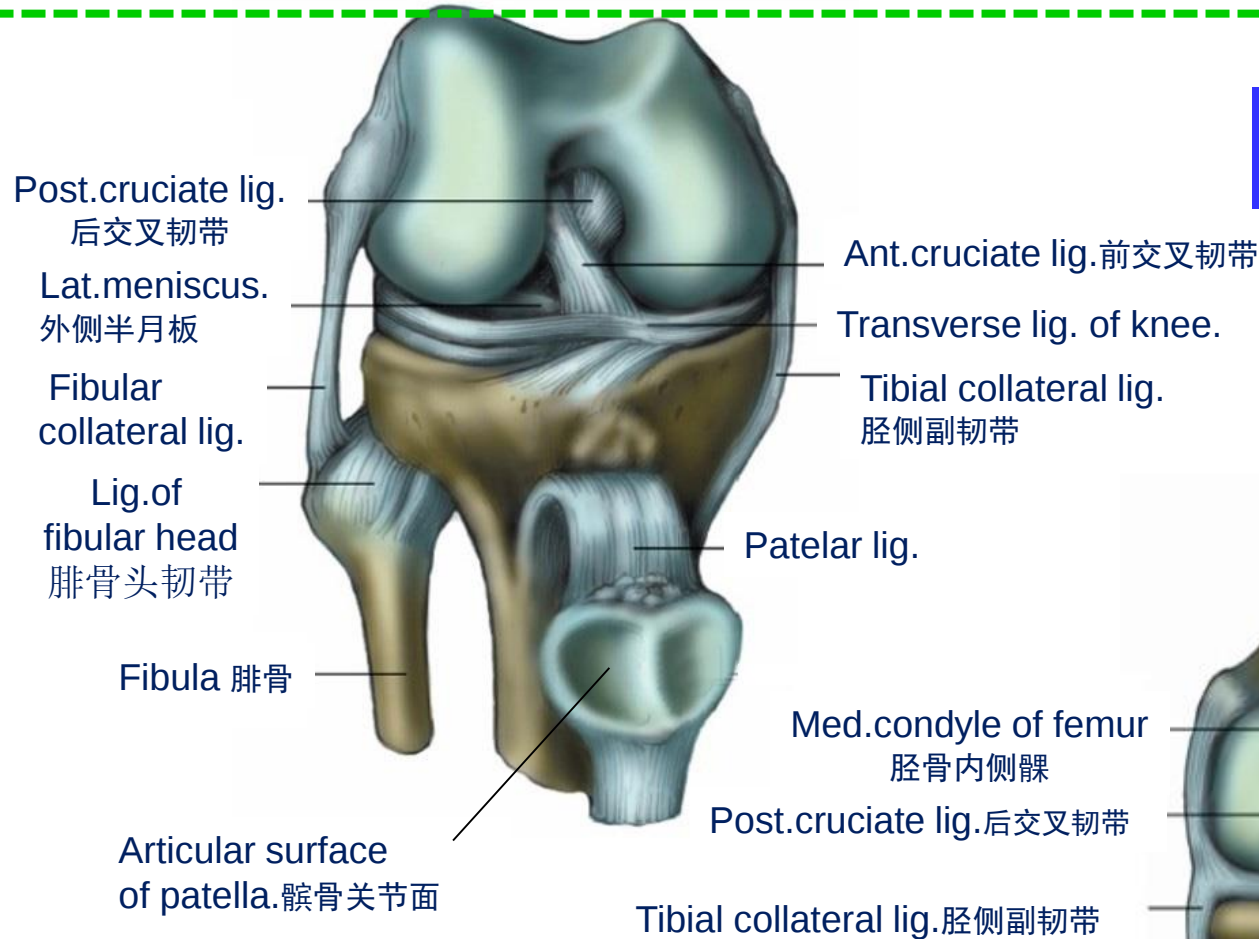
artificial hip joint



dislocation of hip joint

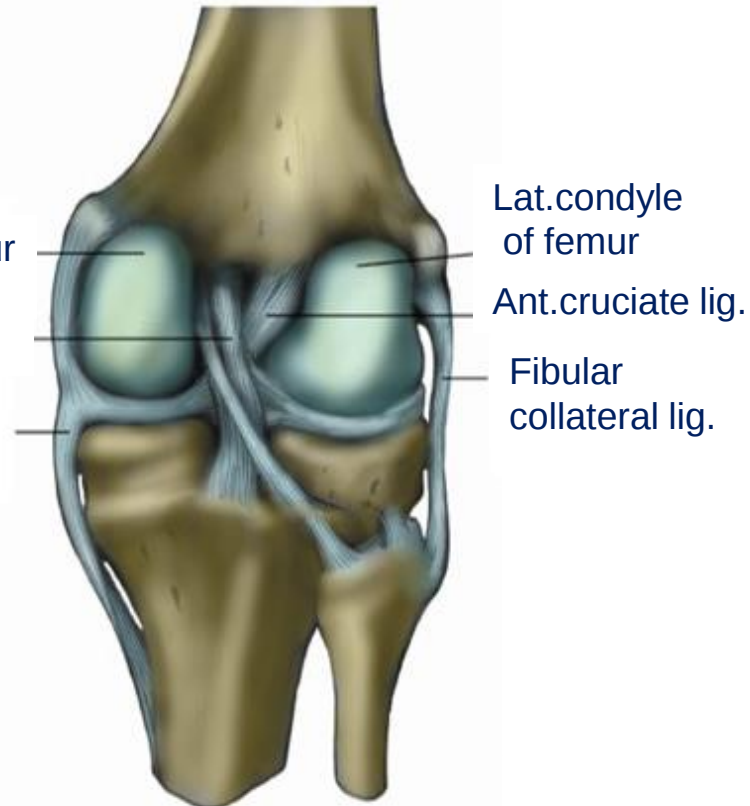
Knee joints 膝关节 - summary

- ◆ **特点**：最大最复杂最易受伤的关节。
- ◆ **组成**：股骨下端、胫骨上端和髌骨。**注意**腓骨上端不参与膝关节组成。
- ◆ **关节囊**：薄而松弛。
- ◆ **基本结构**：关节面，关节囊，关节腔。
- ◆ **辅助结构**：
 - 7条韧带：胫侧副韧带、腓侧副韧带、髌韧带、膝横韧带、前交叉的韧带，后交叉韧带，腓斜韧带。
 - 2个半月板：内侧半月板，外侧半月板。
- ◆ **运动**：主要是屈伸，在半屈曲时，可以做轻度的旋转运动。

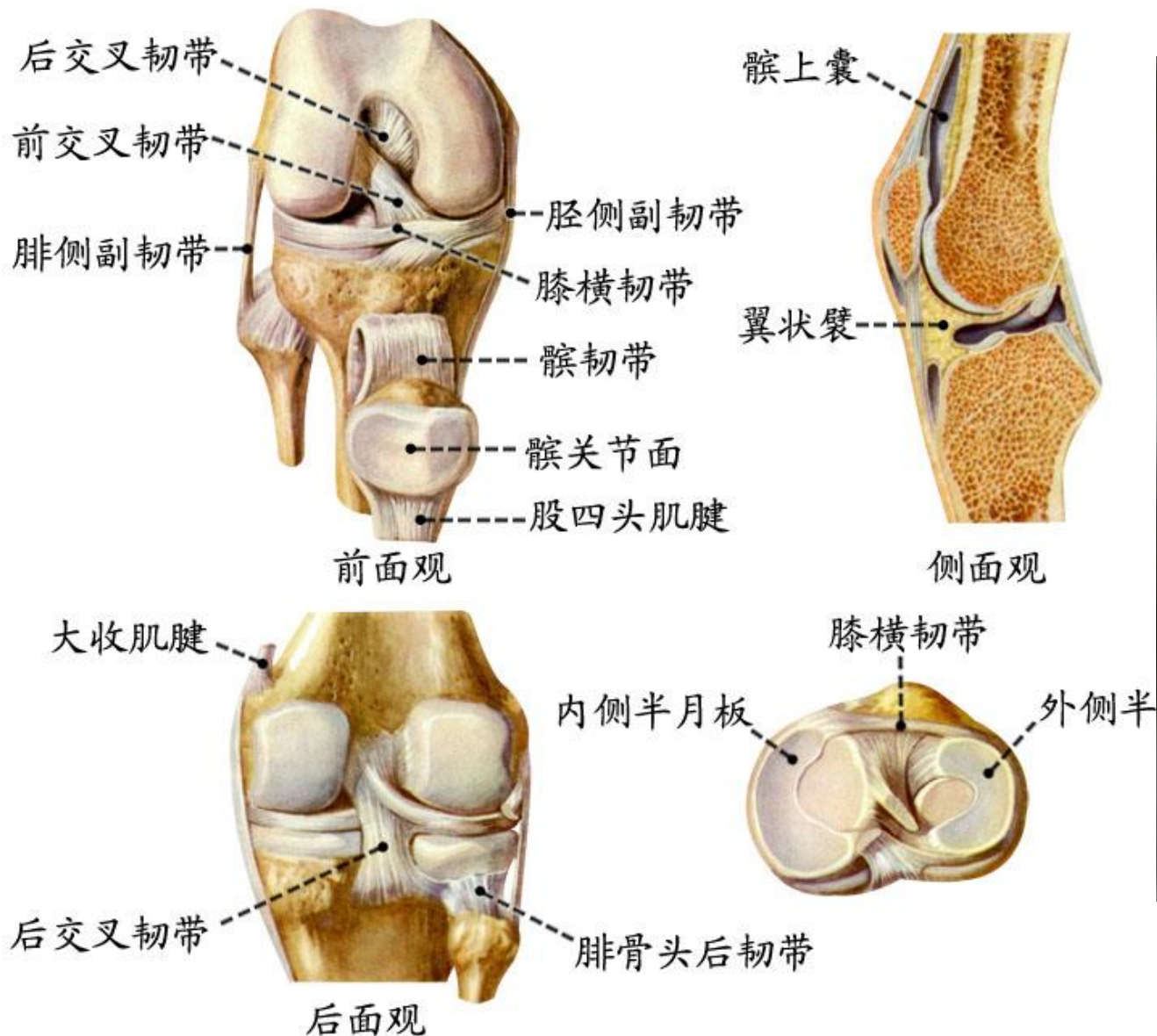


Knee joints

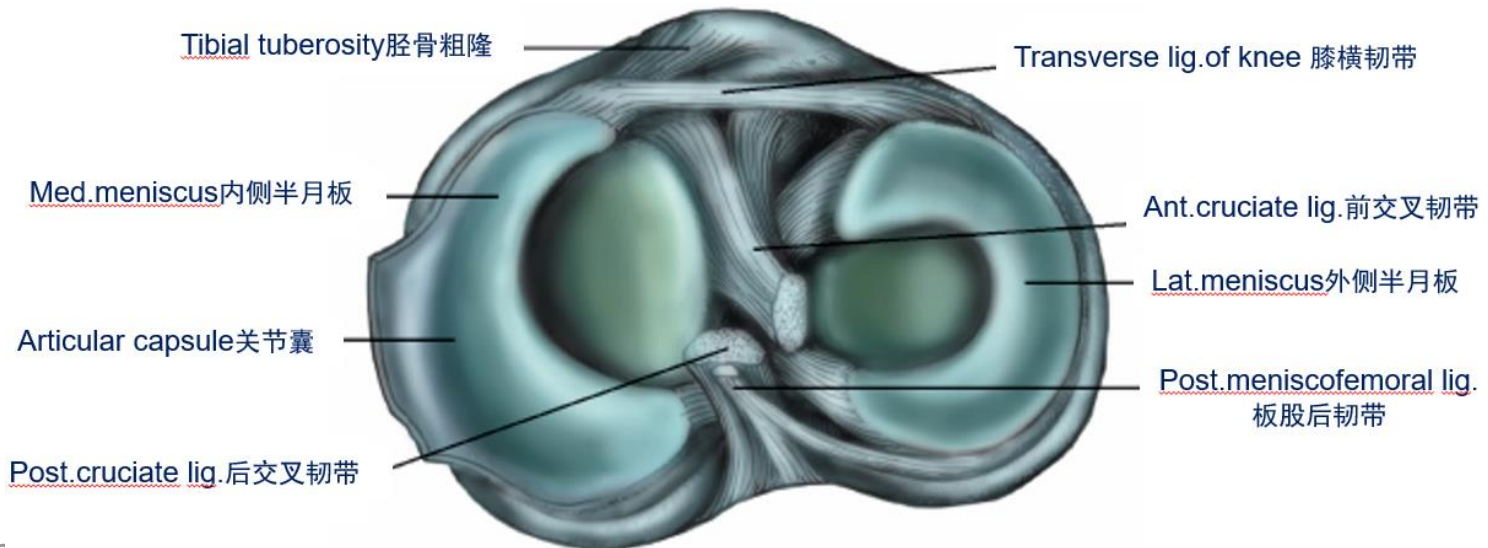
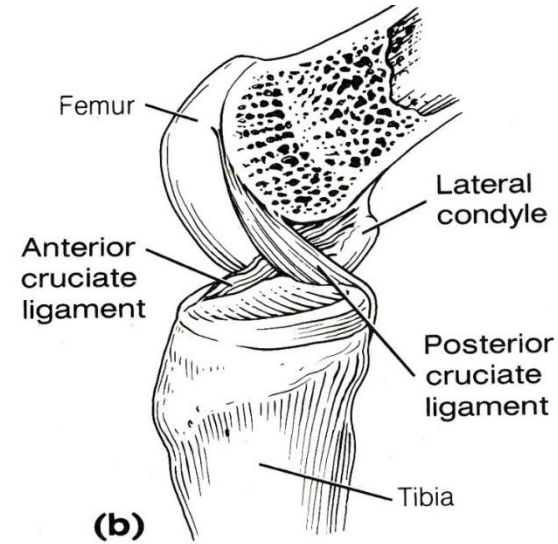
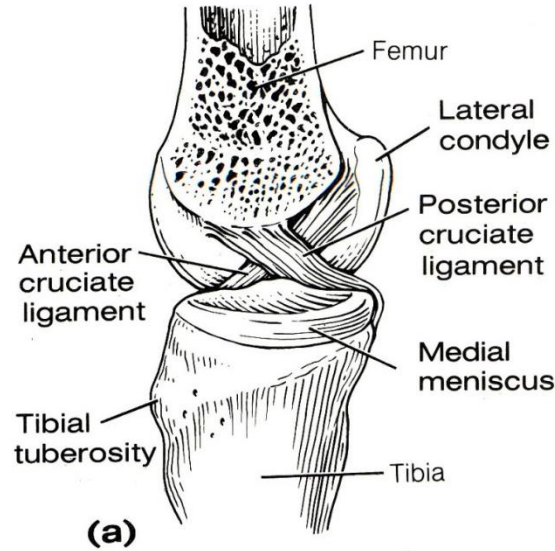
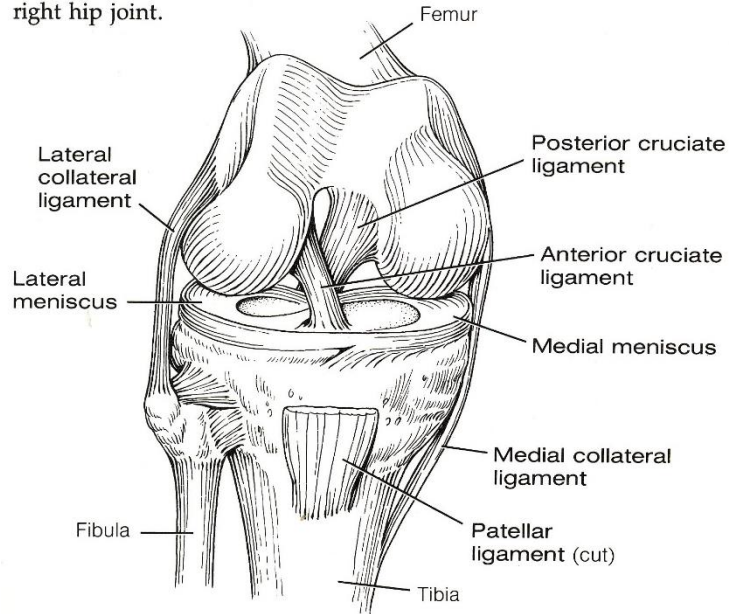
Knee joint (capsule opened. post.aspect)



Knee joint (joint capsule opened anteriorly)



right hip joint.



Knee joints-meniscus injury



Vertical



Transverse



Peripheral



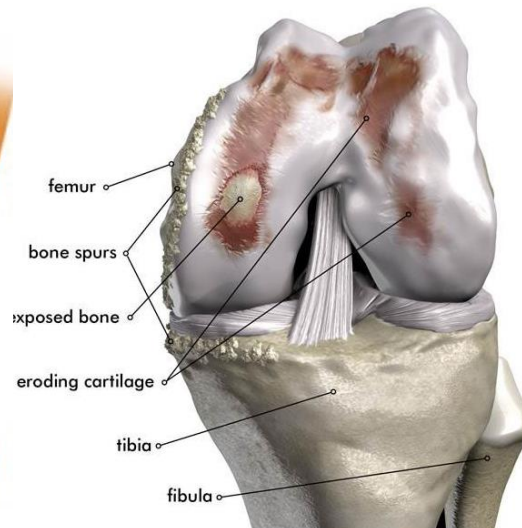
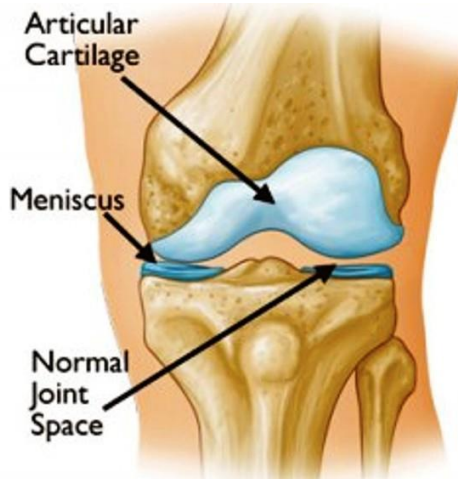
Bucket-handle



Parrot-beak



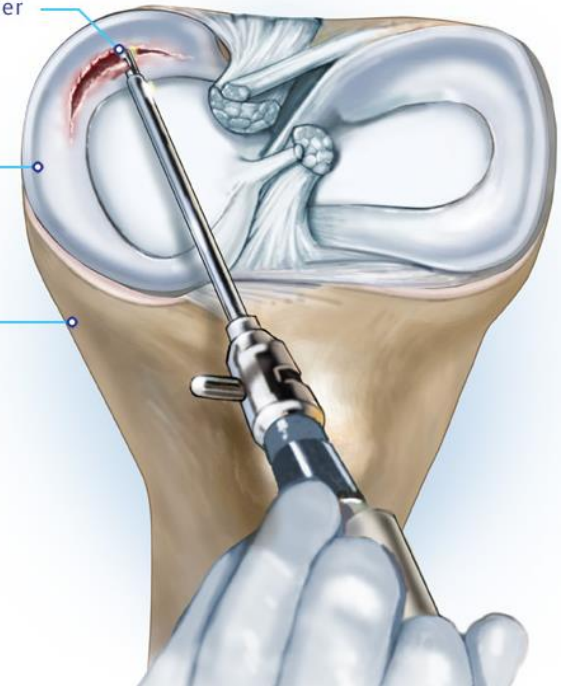
Flap



Meniscus tear debrided with arthroscopic shaver

Meniscus

Tibia



Learn it by yourself

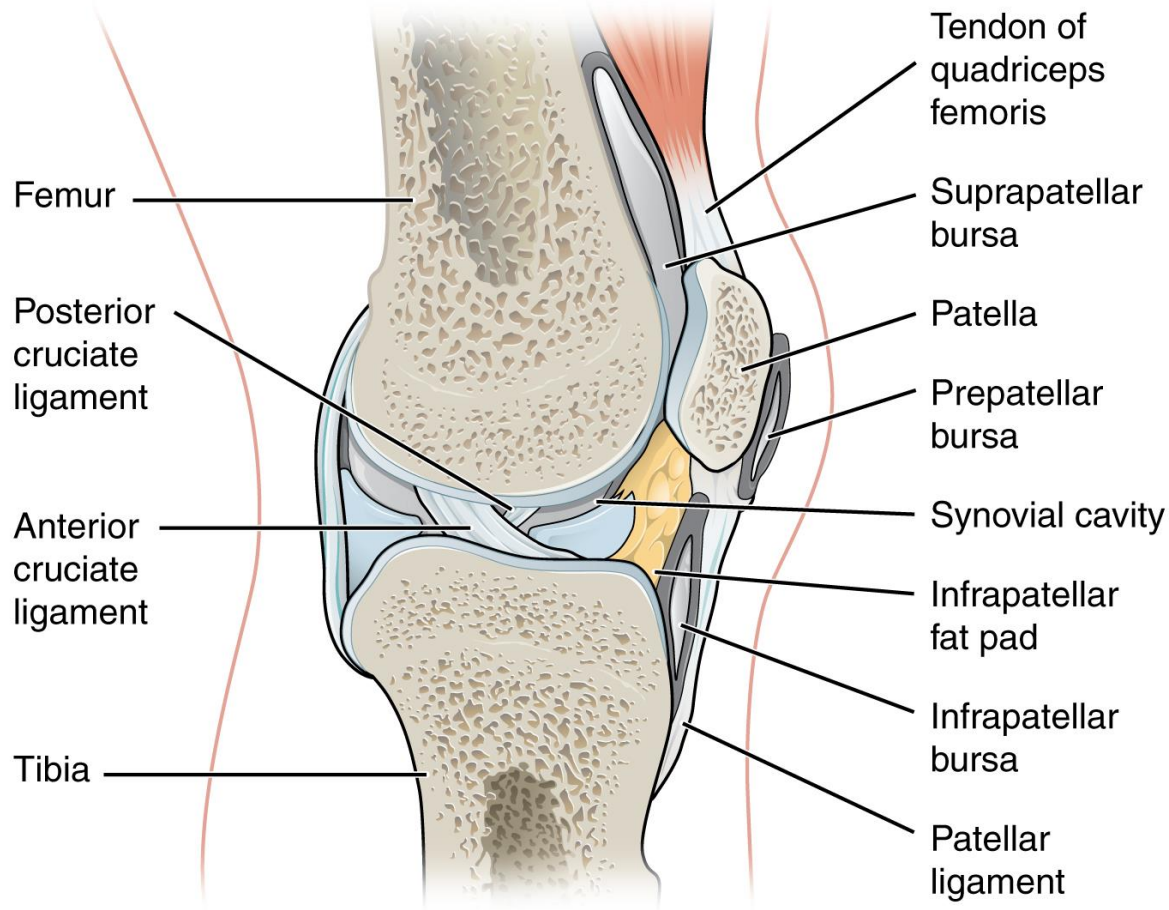
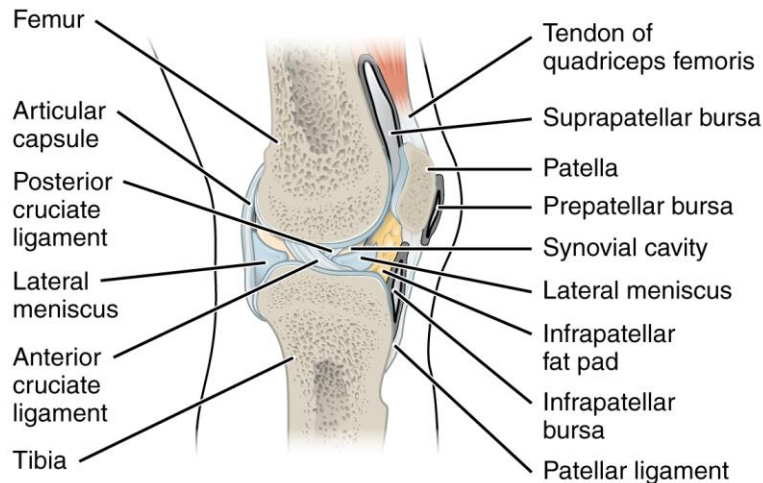
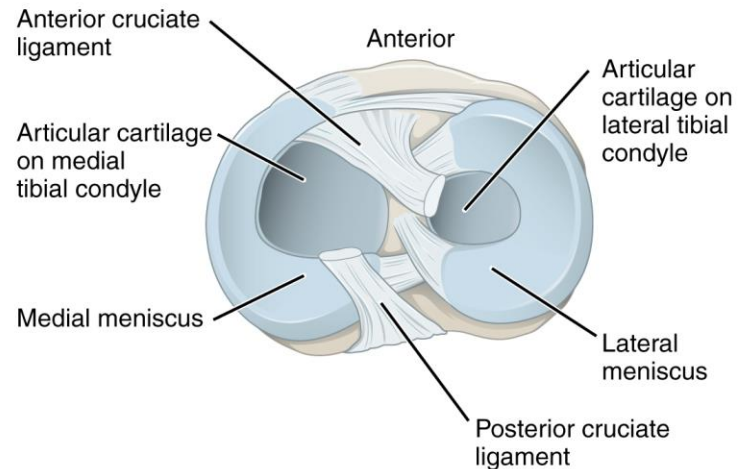


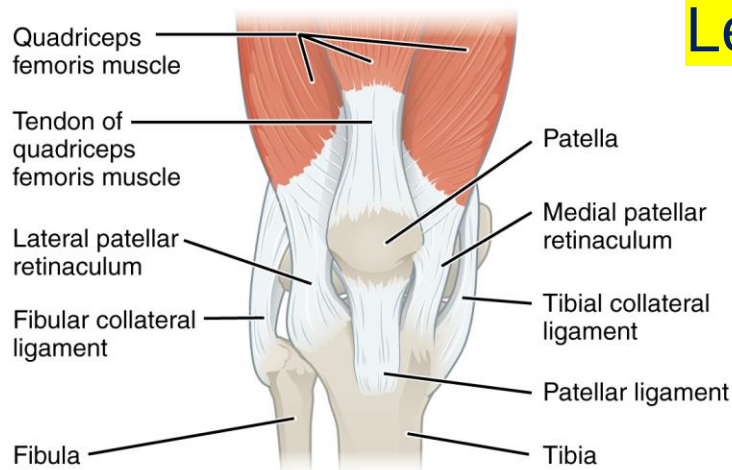
Figure 2. Bursae. Bursae are fluid-filled sacs that serve to prevent friction between skin, muscle, or tendon and an underlying bone. Three major bursae and a fat pad are part of the complex joint that unites the femur and tibia of the leg.



(a) Sagittal section through the right knee joint



(b) Superior view of the right tibia in the knee joint, showing the menisci and cruciate ligaments



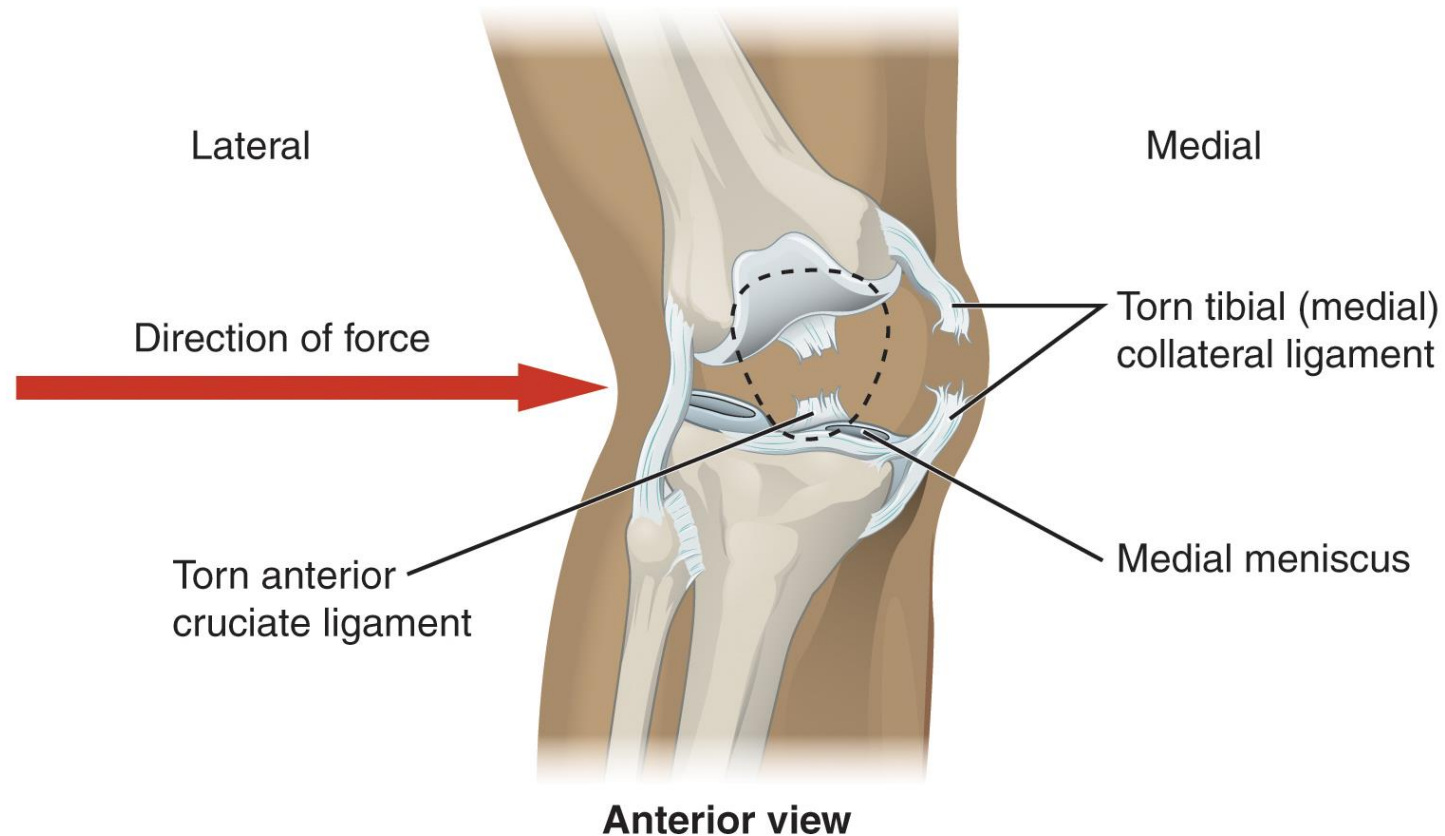
(c) Anterior view of right knee

Learn it by yourself

Figure 6. Knee Joint. (a) The knee joint is the largest joint of the body. (b)–(c) It is supported by the tibial and fibular collateral ligaments located on the sides of the knee outside of the articular capsule, and the anterior and posterior cruciate ligaments found inside the capsule. The medial and lateral menisci provide padding and support between the femoral condyles and tibial condyles.

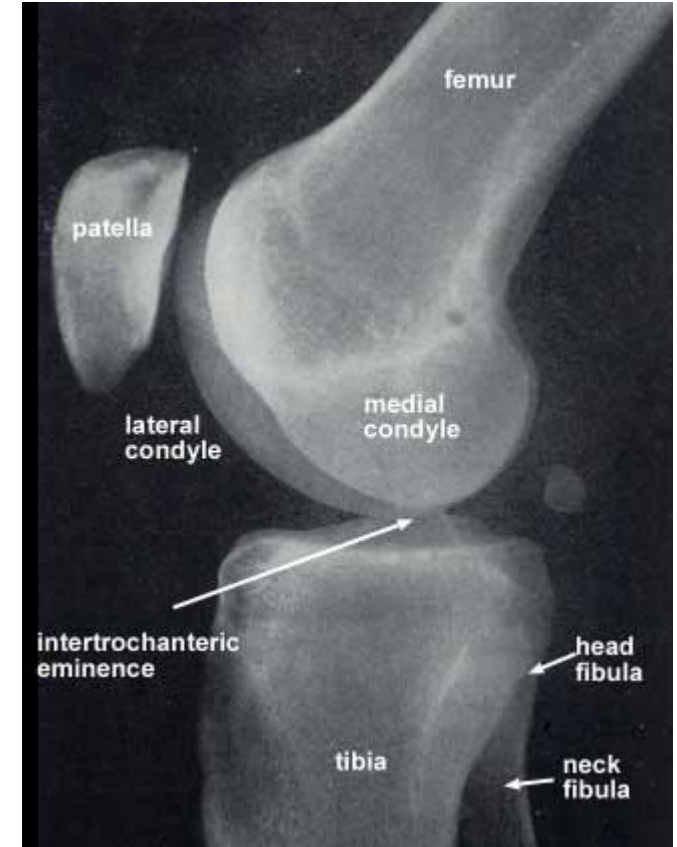
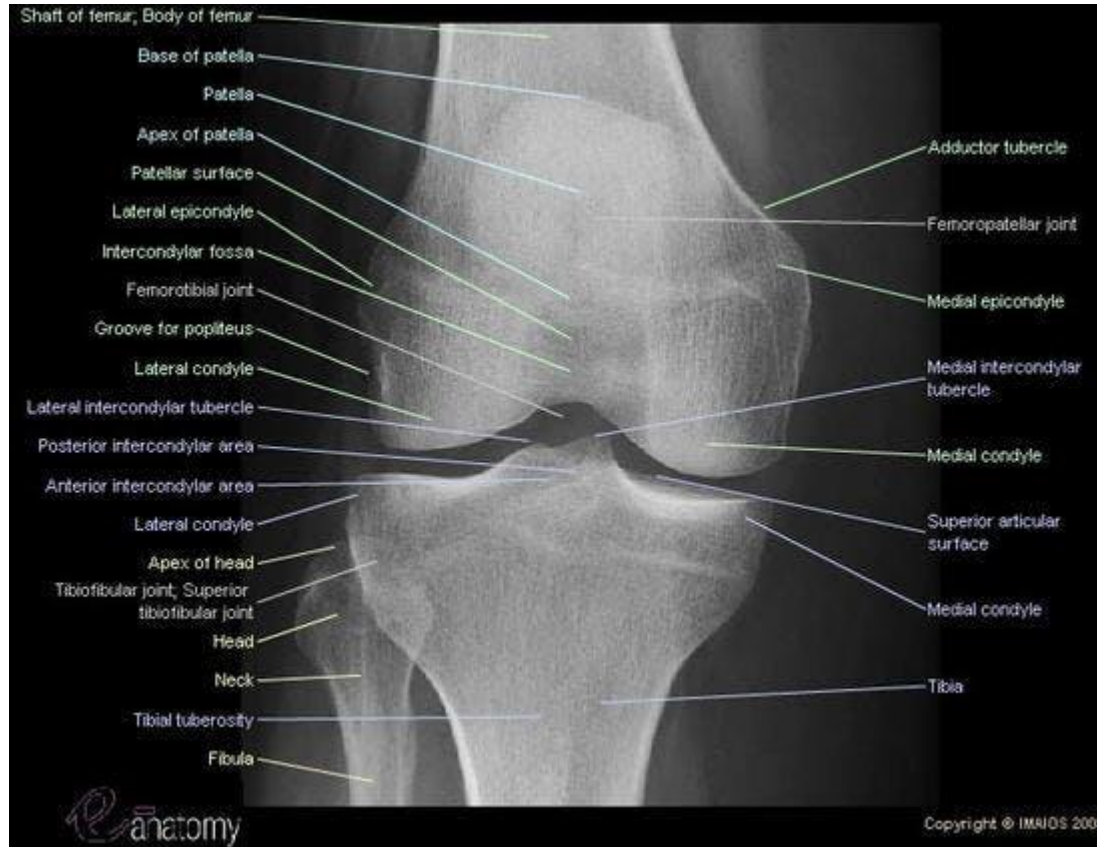
Knee joint injury

Learn it by yourself



Knee Injury A strong blow to the lateral side of the extended knee will cause three injuries, in sequence: tearing of the tibial collateral lig., damage to the medial meniscus, and rupture of the anterior cruciate lig.

X-ray of knee joint



X-ray of knee joint



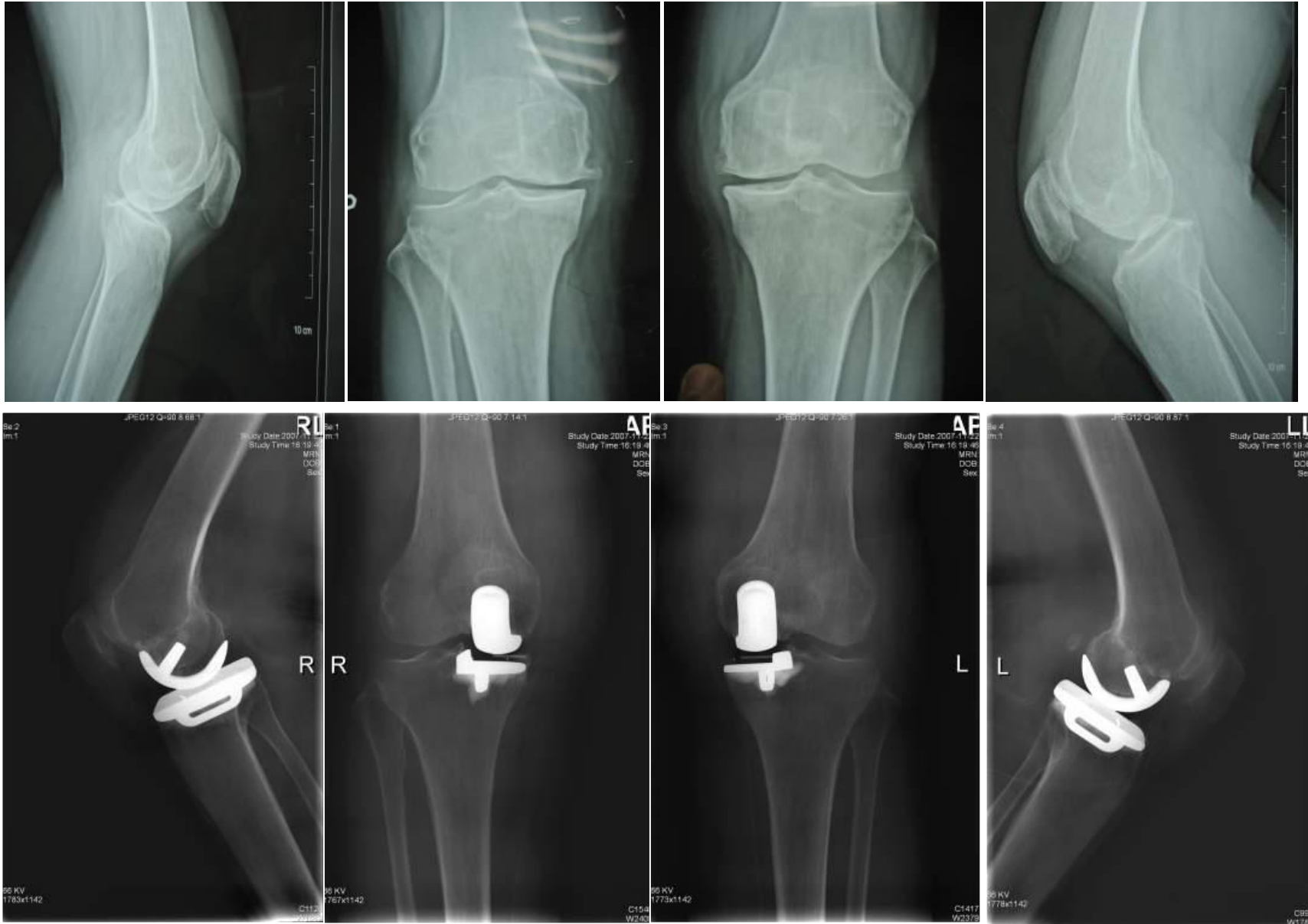
膝关节的正位与侧位



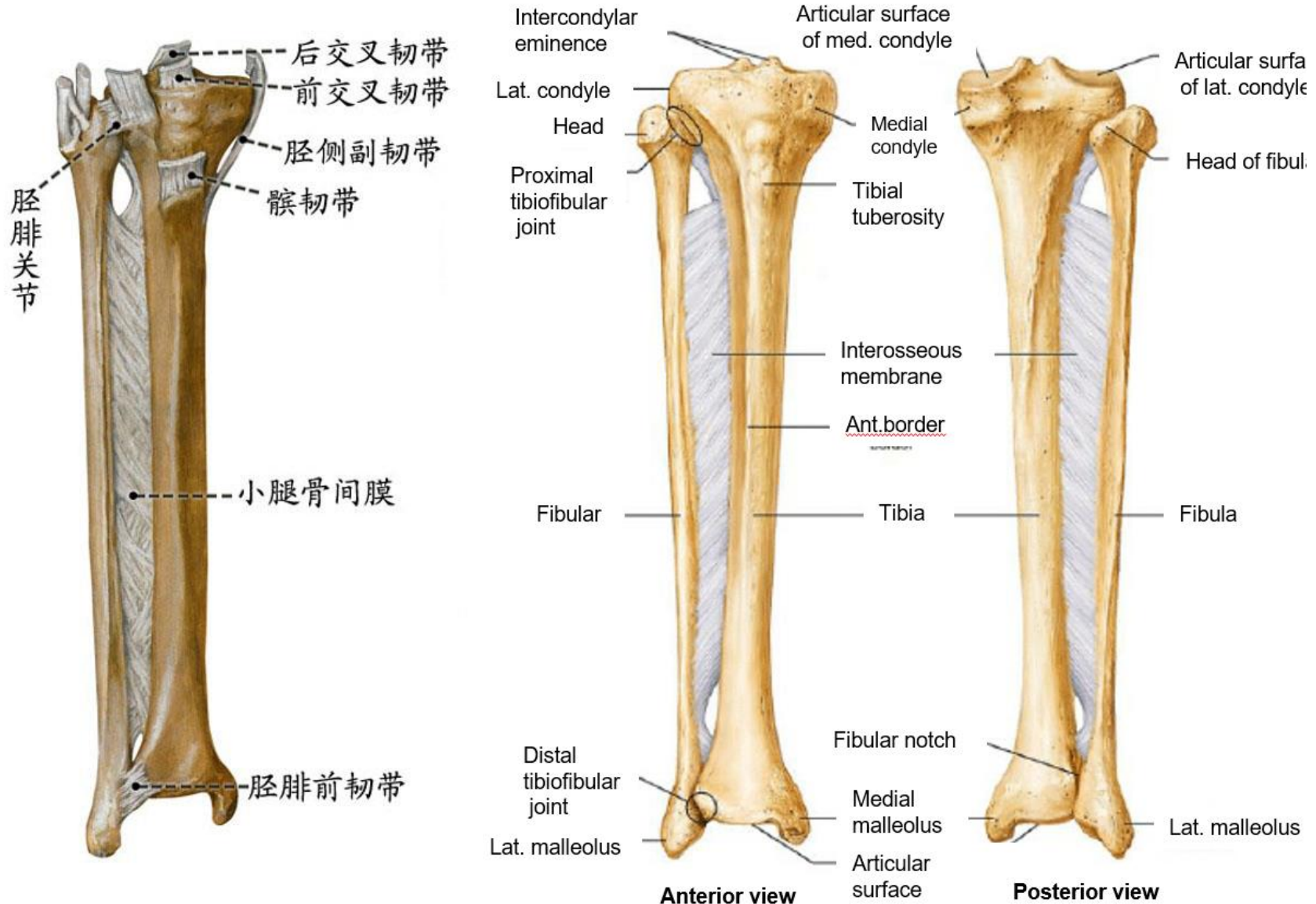
Artificial knee joint



Artificial knee joint (prosthesis 假体)



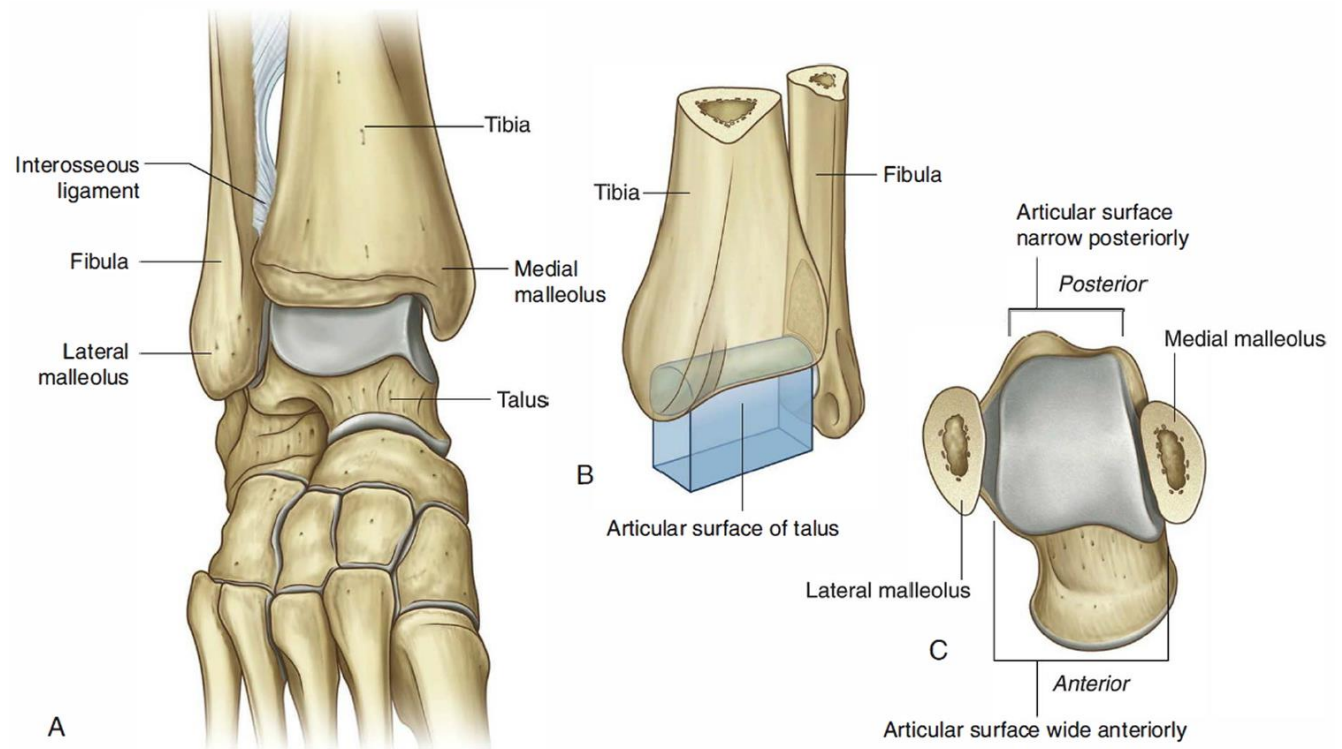
Articulation between the tibia & fibula



Articulation between the tibia & fibula



- 1 - Tibiofibular joint
- 2 - Tibiofibular syndesmosis
- 3 - Interosseous membrane of leg



Talocrural (ankle) joint 踝关节

Bones:

lower ends of tibia & fibula, trochlea of talus

Articular capsule

thin and lax in front and behind, and supported on each side by strong collateral ligaments

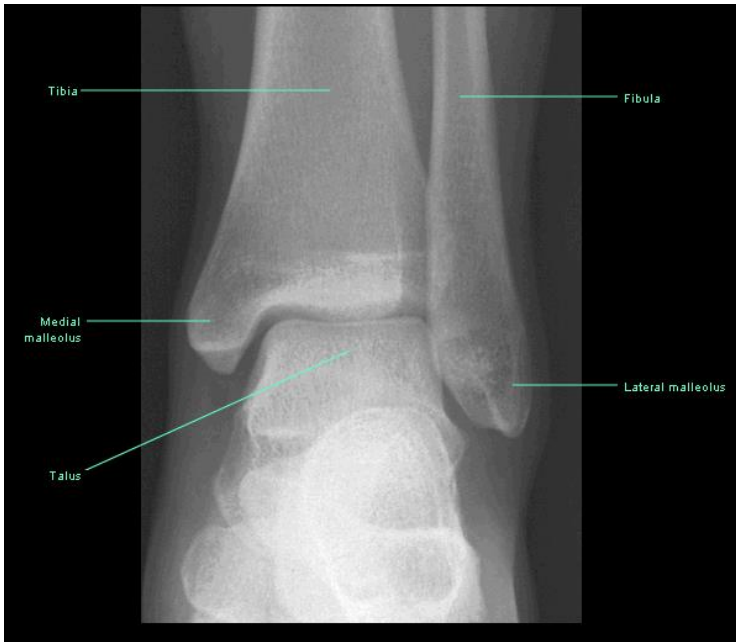
Main ligaments

Medial lig.

Lateral lig.

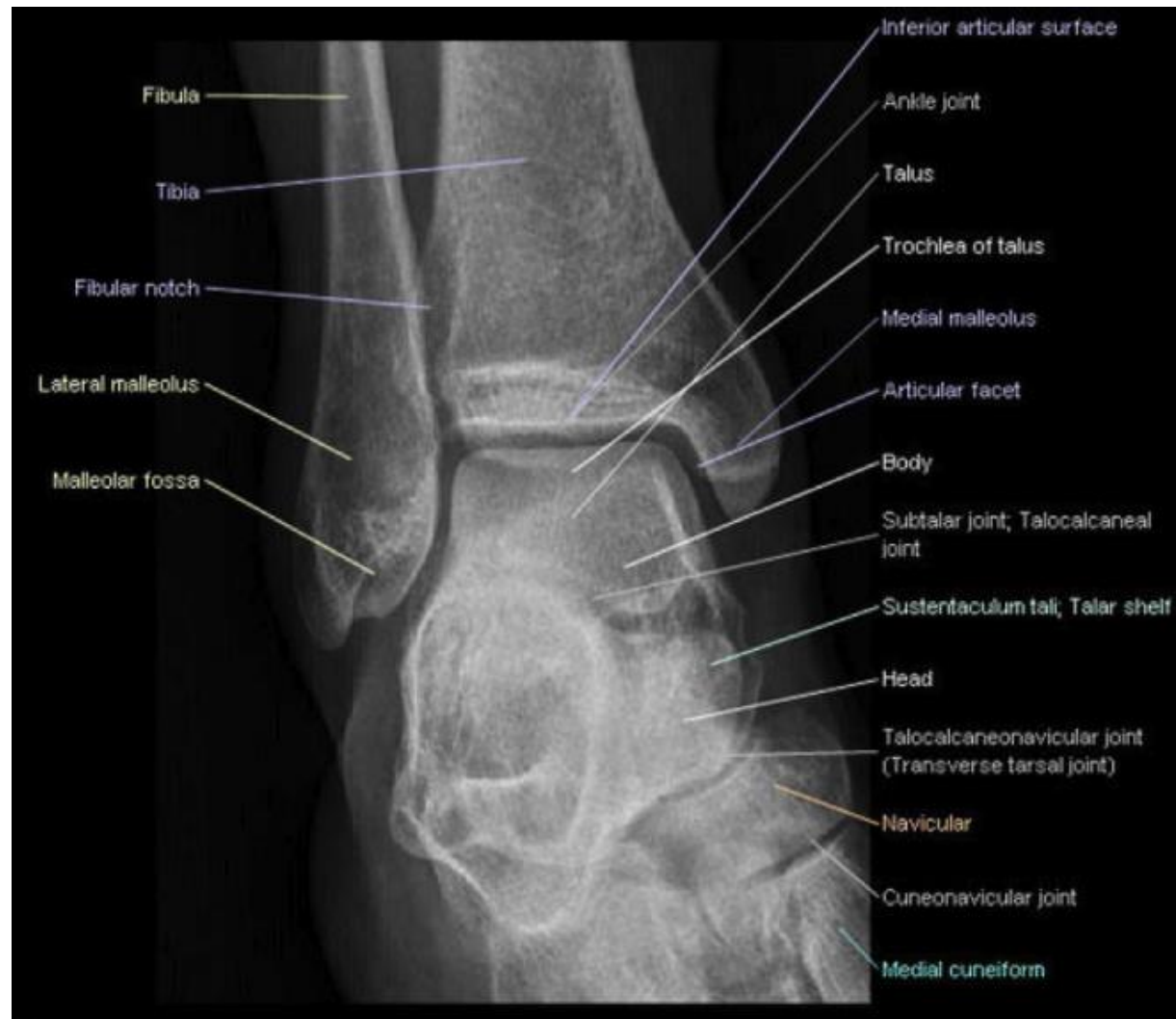
Movements:

dorsiflexion (extension) and plantar flexion (flexion); when the ankle joint is fully plantar flexed, small amounts of abduction, and adduction are possible



Ankle radiograph
anterior view

Talocrural (ankle) joint 踝关节



The joint of the foot

Intertarsal joints

Talocalcaneal joint 距跟关节

Talocalcaneonavicular joint 距跟舟关节

Calcaneocuboid joint 距骰关节

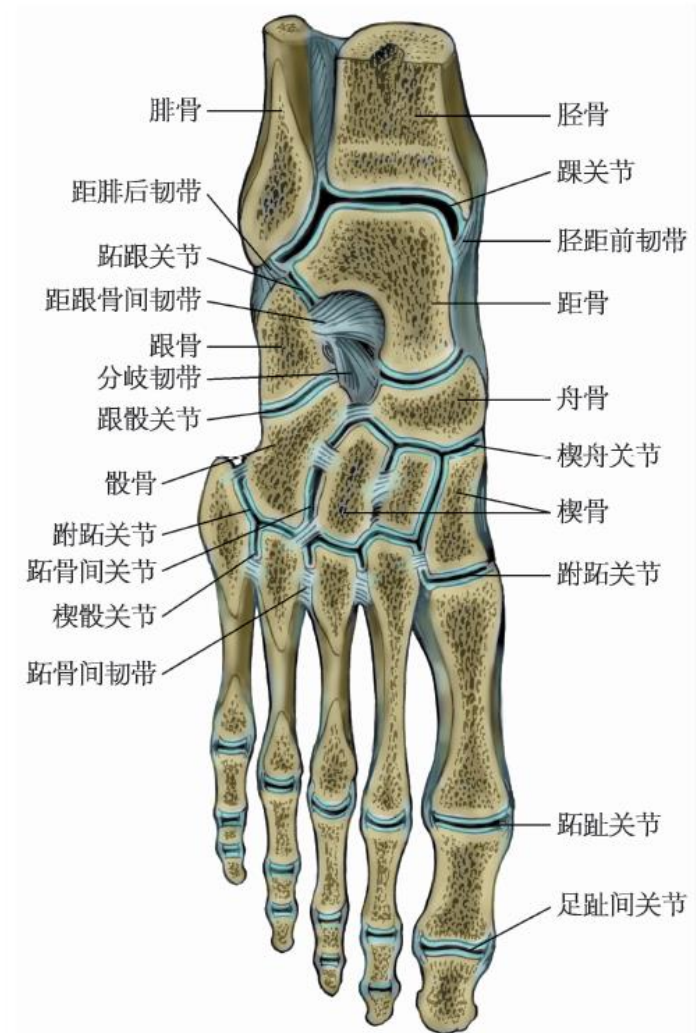
Intermetatarsal joints

1-Transverse tarsal joints 跗横关节

2-Tarsometatarsal joint 跗趾关节

3-Metatarsophalangeal joints 跖趾关节

4-Interphalangeal joints 趾骨间关节



距骨滑车前宽后窄，上山容易下山难

Medial & lateral ligs. of the ankle joint

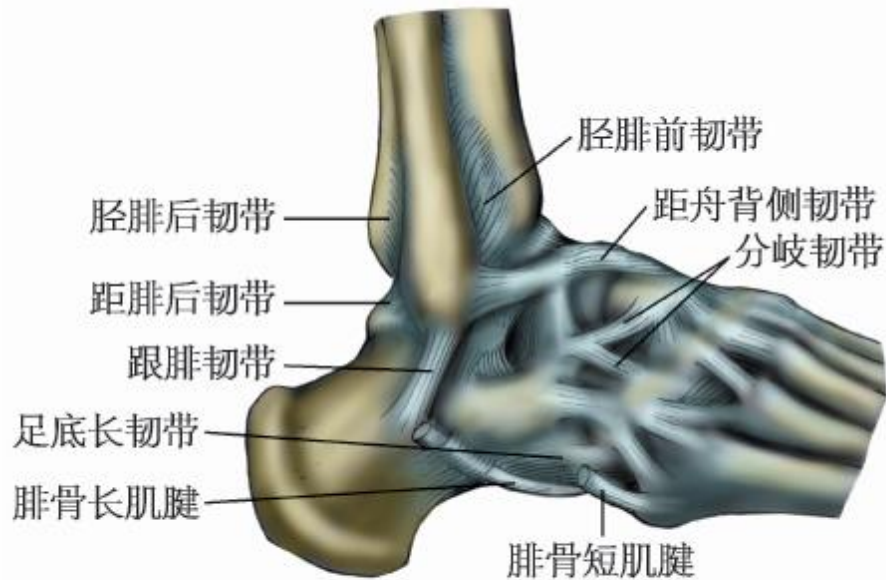


图 1-41 踝和足的韧带(外侧面观)

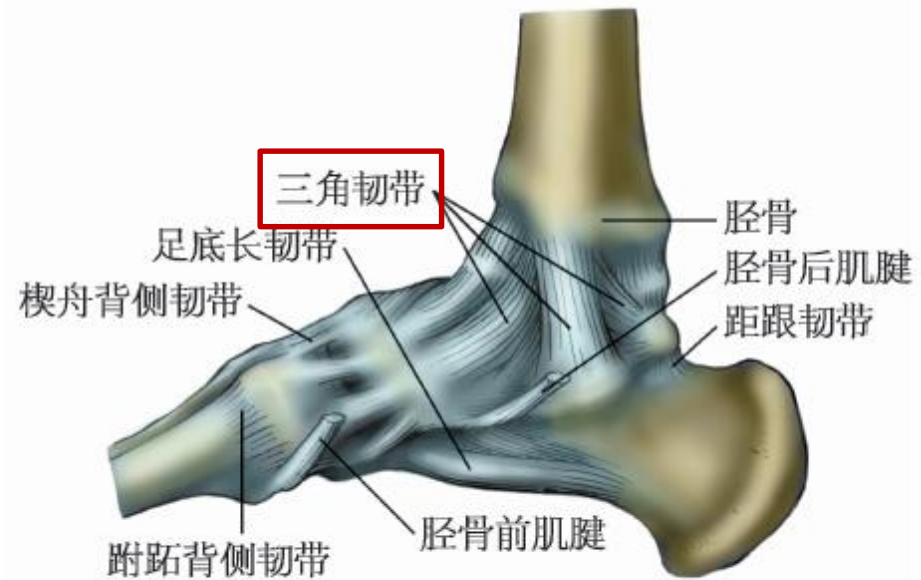


图 1-42 踝和足的韧带(内侧面观)

Lateral lig.of ankle

1-Ant. talofibular lig.距腓前韧带

2-Calcaneofibular lig.跟腓韧带

3-Post.talofibular lig.距腓前韧带

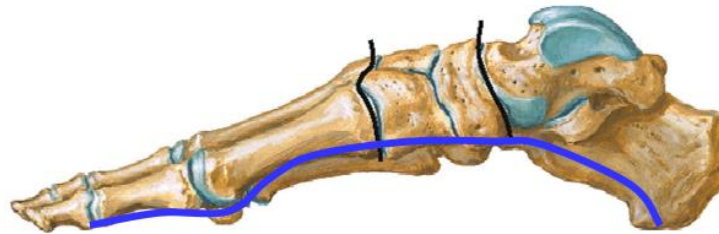
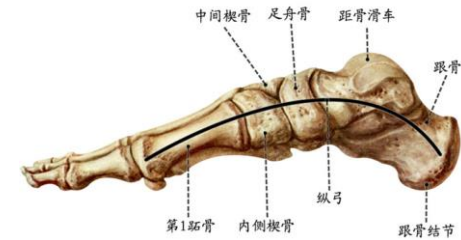
Foot arch

Medial longitudinal arch 内侧纵弓

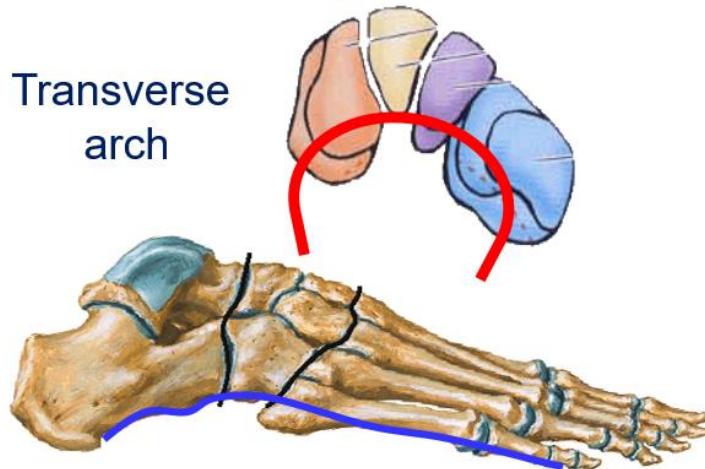
Lateral longitudinal arch 外侧纵弓

Transverse arch 横弓

Function: give to foot stability & resilience; protect plantar vessels and nerves



Med.longitudinal arch



Transverse arch

Lat.longitudinal arch

Normal arch



Flat foot



Normal arch



Flat foot

Description of Bone of lower limb

Bone	Part	Description
Pelvic (2 hip bones)	• Ilium • Iliac crest • Posterior superior iliac spine • Ischium • Pubis • Pubic symphysis • Acetabulum	• Flared, upper portion • Upper edge of ilium • Posterior continuation of iliac crest • Lower, posterior portion • Anterior, medial portion • Joint between the 2 pubic bones • Deep depression that articulates with femur
Femur	• Head • Neck • Greater trochanter • Lesser trochanter • Condyles	• Round process that articulates with hip bone • Constricted portion distal to head • Large lateral process for muscle attachment • Medial process for muscle attachment • Rounded processes that articulate with tibia

Description of Bone of lower limb

Bone	Part	Description
Tibia	• Condyles • Tibial tuberosity • Anterior crest • Medial malleolus	• Articulate with the femur • Round process for the patellar ligament • Vertical ridge • Distal process; medial “ankle bone”
Fibula	• Head • Lateral malleolus	• Articulates with scapula • Articulates with manubrium of sternum
Tarsals (7)	• Calcaneus • Talus • Cuboid, navicular • Cuneiform: 1st, 2nd, 3rd	• Heel bone • Articulates with calcaneus and tibia

The important contents today

1. Master the name, number and location of the lower limb bones.
2. Master the morphological feature of the hip, femur, tibia & fibula.
3. Master the arrangement of the foot bone
4. Master the structure and movement of the hip joint
5. Master the structure and movement of the knee joint
6. Master the structure and movement of ankle joint.
7. Master difference of pelvis between the male & the female.

Important English words

1. Hip bone 髋骨
2. Ischium 坐骨
3. Pubis 耻骨
4. Ilium 髌骨
5. Ant.sup.ilic spine 髌前上棘
6. Acetabulum 髌臼
7. Ischial tuberosity 坐骨结节
8. Obturator foramen 闭孔
9. Femur 股骨
10. Greater trochanter 大转子
11. Gluteal tuberosity 臀肌粗隆
12. Patella 髌骨
13. Tibia 胫骨
14. Fibula 腓骨
15. Cuneiform 楔骨
16. Tarsal bone 跗骨
17. Calcaneus 跟骨
18. Bony pelvis 骨盆
19. Pelvic inlet/outlet 骨盆入口/出口
20. Terminal line 界线
21. Sacrotuberous ligament 骶结节韧带
22. Sacrospinous ligament 骶棘韧带
23. Cuboid bone 骰骨
24. Metatarsal bone 跖骨
25. Phalanx 趾骨
26. Great sciatic foramen 坐骨大孔
27. Meniscus 半月板
28. Ant. cruciate ligament 前交叉韧带
29. Patellar ligament 髌韧带
30. Talocrural joint 距小腿关节/踝关节



The end !

Bye !