

Kenya Medical Training College  
Department of Clinical Medicine

Homa-Bay Campus

Module : Human Anatomy II  
Topic : Osteology of the Femur  
Year of Study : First Year  
Semester : Two (2)  
Date : 27<sup>th</sup> September 2019  
Time : 10:30-12:30 Hours  
Facilitator : James Okuku

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# The Femur

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- ▶ Femur/thigh bone; the longest, strongest and heaviest bone of the body
- ▶ Composed of *upper end*, *lower end* and *shaft*
- ▶ *Upper end* bears rounded head; *lower end* is widely expanded to form two large condyles
- ▶ The head is directed medially
- ▶ The cylindrical shaft is convex forwards

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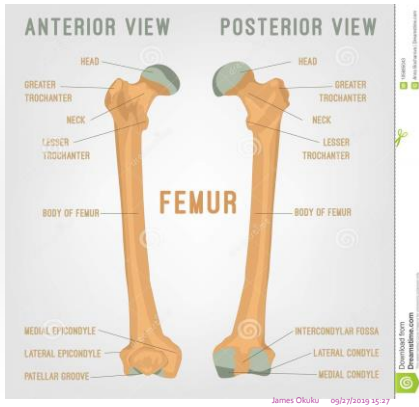
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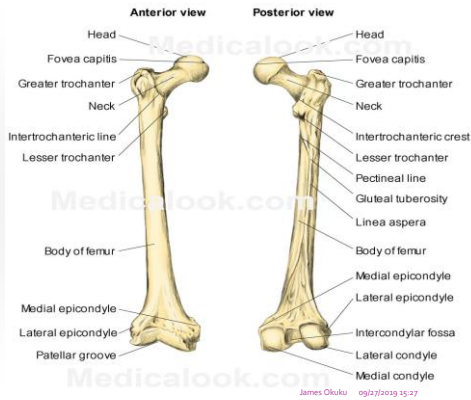
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# Upper End of Femur

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The upper end of the femur includes;

1. The head
2. The neck
3. The greater trochanter
4. The lesser trochanter
5. The intertrochanteric line
6. The intertrochanteric crest

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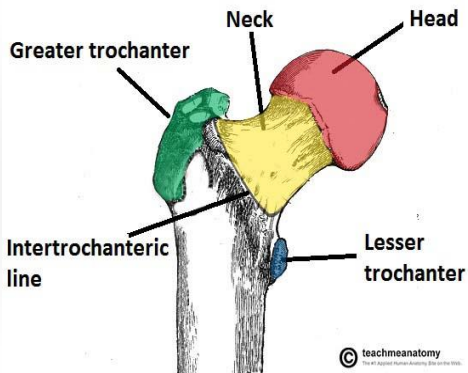
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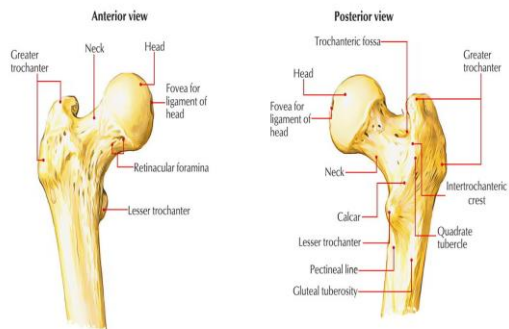
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### Head of Femur

- Articulates with acetabulum to form a hip joint
- More than half a sphere and is directed medially, upwards and slightly forwards
- The fovea is a roughened pit just below and behind the center of the head
- Head, in its most part, is covered by cartilage

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### Neck of Femur

- About 3-3.5 cm long & connects head with shaft.
- Forms an angle with the shaft, known as neck-shaft angle and is about 125 in adults [lesser in females].
- The angle facilitates movements of the hip joint.

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- Strengthened by a thickening of bone called the calcar femorale present along its concavity.

Has *two borders* and *two surfaces*

- **The upper border;** concave and horizontal, meets the shaft at the greater trochanter.
- **The lower border;** straight and oblique, meets the shaft near the lesser trochanter.

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## The Surfaces

### The anterior surface

- ◆ Is flat and meets the shaft at intertrochanteric line.
- ◆ Is entirely intracapsular.
- ◆ The upper part may be covered by articular cartilage.

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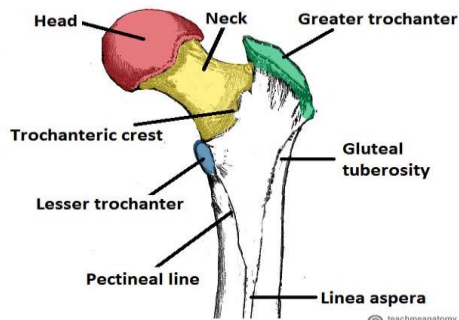
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### The posterior surface

- ◆ Is convex from above downwards and concave from side to side.
  - ◆ It meets the shaft at the intertrochanteric crest.
  - ◆ It is not intracapsular in its lower lateral part.
- Anteversion;** angle formed between the transverse axis of the upper and lower ends of the femur.
- ◆ It is about 15 degrees.

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### Greater Trochanter

- ▶ A large quadrangular prominence located at the upper part of the junction of the neck and shaft.
- ▶ Upper border lies at level of center of the head.
- ▶ Has an upper border with an apex, and 3 surfaces; Anterior, medial and lateral

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- ▶ The apex is the in turned posterior part of the posterior border.
- ▶ The anterior surface is rough in its lateral part.
- ▶ The medial surface presents a rough impression, above and a deep trochanteric fossa, below.
- ▶ The lateral surface is crossed by an oblique ridge directed downwards and forwards.

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### Lesser Trochanter

- ▶ A conical eminence directed medially and backwards from the junction of the posterior part of the neck with the shaft.

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### Intertrochanteric Line

- ◆ Marks the junction of neck with the femur.
- ◆ A roughened ridge from the anterosuperior angle of the greater trochanter (as a tubercle)
- ◆ Is continuous below with the spiral line in front of the lesser trochanter

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### The spiral line

- ◆ A curved line with its superior end adjacent to the lesser trochanter
- ◆ Nearly continuous with the intertrochanteric line
- ◆ Converging inferiorly with the pectineal line to form the medial lip of the linea aspera

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- ◆ It forms the medial boundary of the distal attachment of the iliac muscle
- ◆ The spiral line winds around the shaft below the lesser trochanter to reach the posterior surface of the shaft.

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### Intertrochanteric Crest

- ◆ It marks the junction of the posterior surface of the neck with the shaft of the femur.
- ◆ A smooth rounded ridge which begins above at the posterior superior angle of the greater trochanter and ends at the lesser trochanter.
- ◆ The rounded elevation, a little above its middle is called the quadrate tubercle.

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### Clinical Relevance: Proximal Femur Fractures

#### Neck of femur fractures (NOFs)

- ◆ Common among the elderly as a result of low energy falls in the presence of osteoporotic bone.
- ◆ More prevalent in women.
- ◆ In younger patients they tend to occur as a result of high energy accidents.

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- ◆ The distal fragment is pulled upwards and rotated laterally.
- ◆ This manifests clinically as a shortened and **externally rotated** lower limb.

*These fractures are classified into two main groups:*

**Extracapsular**-occurs within the capsule of the hip joint. It can damage the medial femoral circumflex artery – and cause avascular necrosis of the femoral head.

**Extracapsular**-the blood supply to the head of femur is intact, so avascular necrosis is a rare complication.

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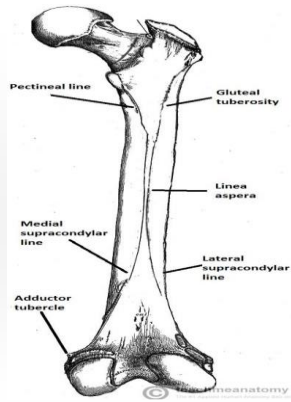
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# The Shaft of Femur

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- ◆ Is almost cylindrical structure wide superiorly and inferiorly and narrowest in the middle.
- ◆ It is convex forwards and is directed obliquely downwards and medially.

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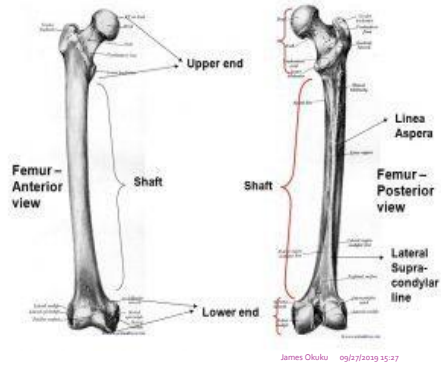
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### Features-Shaft of femur

- ◆ Cylindrical (more or less).
- ◆ Narrowest in the middle.
- ◆ More expanded inferiorly than superiorly.
- ◆ Convex forwards.
- ◆ Directed obliquely downwards and medially, because the upper ends of two femora are separated by the width of the pelvis, and their lower ends are close together.

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**Has three borders;** medial, lateral and posterior

**Has three surfaces;** anterior, medial and lateral.

- ◆ **Medial and lateral borders** are rounded and ill-defined.
- ◆ **Posterior border** is in the form of a broad roughened ridge, called the linea aspera which has distinct medial and lateral lips.

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◆ *Linea aspera* is an important landmark in orthopedics surgeries involving reduction of femoral fractures.

◆ Has distinct medial and lateral lips

◆ The medial and lateral surfaces are directed more backwards than to sides

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### The Shaft has Three Surfaces

◆ Anterior, Medial and Lateral Surfaces

◆ In the upper one-third of the shaft, the two lips of the Linea aspera diverge wide to form an additional posterior surface and four borders-medial, lateral, spiral line and the lateral lip of the gluteal tuberosity-and 4 surface-anterior, medial, lateral and posterior

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◆ The gluteal tuberosity is a broad roughened ridge on the *lateral* part of the posterior surface.

◆ The two lips of the Linea aspera diverge in lower one third and enclose an additional, popliteal surface.

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***This part of the shaft has;***

- ◆ **4 borders;** medial, lateral, supracondylar line and lateral supracondylar line
- ◆ **4 surfaces;** anterior, medial, lateral and popliteal.
- ◆ The medial border and medial supracondylar line meet inferiorly to obliterate the medial surface.

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**Clinical Relevance: Fractures Shaft**

- ◆ Are high energy injury but can occur in the elderly as a result of a low energy fall.
- ◆ They can be a **spiral** fracture, which causes leg shortening.
- ◆ Shortened leg length is due the bony fragments overriding, pulled by their attached muscles.

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- ◆ As a high energy injury, the surrounding soft tissues may also be damaged.
- ◆ Neurovascular structures at risk include the **femoral nerve** and **artery**.
- ◆ A closed femoral shaft fracture **may result in considerable hemorrhage** (1000-1500ml)

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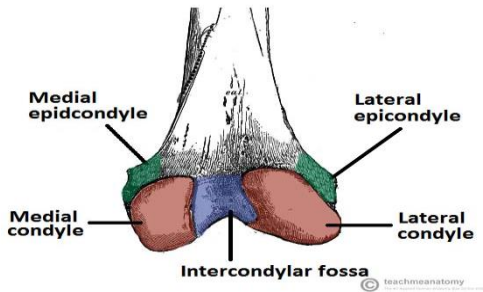
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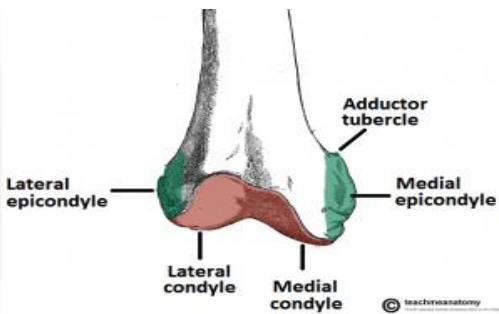
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# Lower End of Femur

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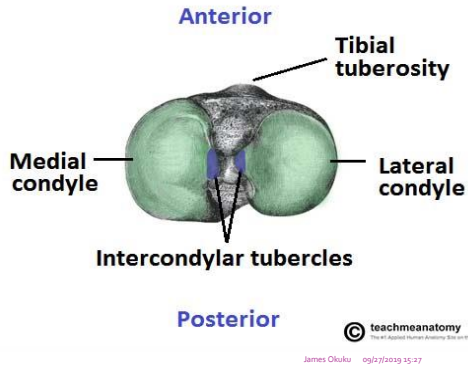
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### The lower end of the femur

- Ⓜ Is wide and expanded.
- Ⓜ It has two large condyles- *medial* and *lateral*.
- Ⓜ *Anteriorly*, the two condyles are united and are in a line with the front of the shaft.
- Ⓜ *Posteriorly*, they are separated by a deep gap, termed the intercondylar fossa or intercondylar notch, and project backwards much beyond the plane of the popliteal surface.

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### The Lateral Condyle

- Ⓜ Flat laterally, less prominent than medial condyle and stouter than it
- Ⓜ Has prominence called the *lateral epicondyle*
- Ⓜ Below it lies the popliteal groove with a deeper anterior part and a shallower posterior part.

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### Medial Condyle

- Ⓢ Convex medially.
- Ⓢ It bears a prominent point-the medial epicondyle
- Ⓢ **Adductor tubercle**-projection posterosuperior to the epicondyle which serves as an important landmark
- Ⓢ The **epiphyseal line** for the lower end of the femur passes through it

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### Intercondylar Fossa or Notch

- Ⓢ Separates the lower and posterior parts of the two condyles.
- Ⓢ The intercondylar line separates the notch from the popliteal surface.
- Ⓢ Anteriorly, the notch is limited by the patellar articular surface.

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- Ⓢ The two condyles are partially covered by a large articular surface.
- Ⓢ **Anteriorly**, the condyles articulate with patella and this articulation extends more on the lateral condyle than on the medial.
- Ⓢ Between the two condyles, the surface is grooved vertically.

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Two faint grooves separate the patellar articulation surface from tibial surfaces.

Tibial articulation surface over the lateral condyle is short and straight anteroposteriorly whereas the part over the medial condyle is longer and is convex medially

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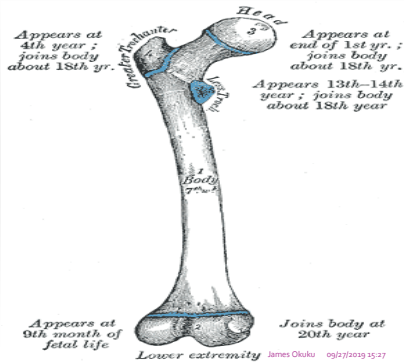
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### Ossification of Femur



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- ◆ 1 primary and 4 secondary centers.
- ◆ The primary center for the shaft appears in the 7 weeks of intrauterine life.
- ◆ The secondary centers appear as follows;

**Lower end of Femur**-The end of the 9th month of intrauterine life

**Head**-first six months of life

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- ◆ Greater trochanter-4 years
- ◆ Lesser trochanter-12 years
- ◆ The upper apophyses (lesser trochanter, greater trochanter and head, in that order) fuse with the shaft at about 18 years.
- ◆ The lower epiphysis fuses by the 20th year.

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