Kenya Medical Training College
Department of Clinical Medicine
Homa-Bay Campus

Module	:	Human Anatomy II
Topic	:	The Hip Bones
Year of Study	:	First Year
Semester	:	Two (2)
Date	:	26th September 2019
Time	:	10:30-12:30 Hours
Facilitator	:	James Okuku

The Hip Bones

Video-Hip Bone

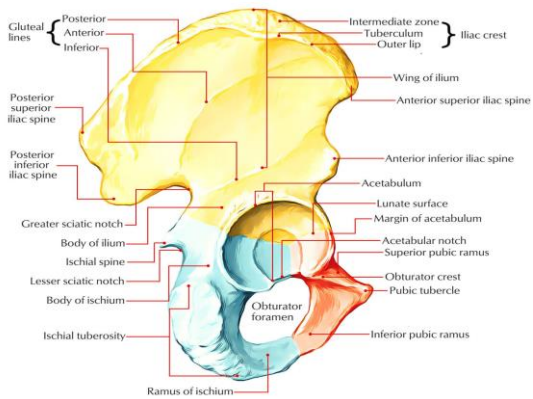
The Hip Bones

- The left and right **hip bones** (innominate bones, pelvic bones)
- Are two irregularly shaped bones that form part of the pelvic girdle
- The bony structure that attaches the axial skeleton to the lower limbs.

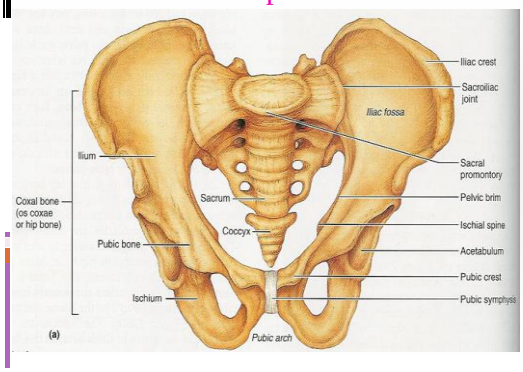
Articulations of the Hip Bones

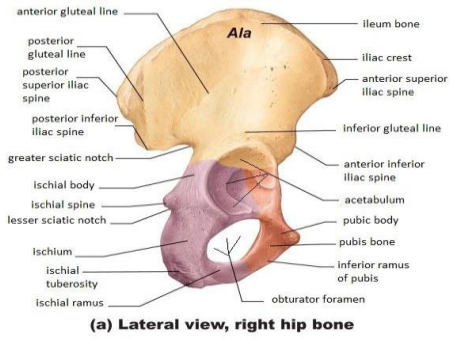
Have three main articulations:

1. **Sacroiliac joint**-articulation with the sacrum.
2. **Pubic symphysis**-articulation between the left and right hip bones.
3. **Hip joint**-articulation with the head of femur.



Structure of the Hip Bones

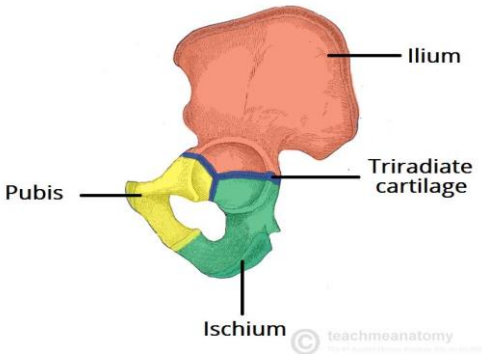




The hip bone is comprised of the three parts;

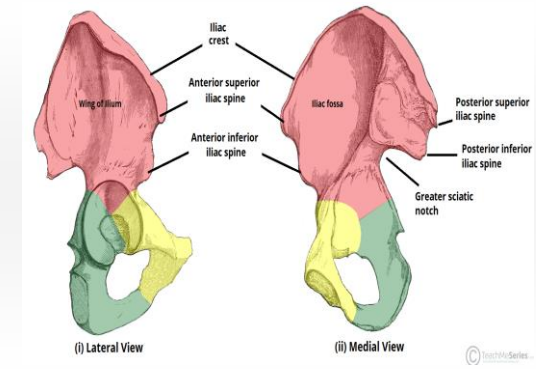
1. The ilium
2. The pubis
3. The ischium

Prior to puberty, ***triradiate cartilage*** separates these parts-and fusion only begins at the age of 15-17 years.



- Together, the ilium, pubis and ischium form a cup-shaped socket known as the ***acetabulum*** (in Latin is '*vinegar cup*')
- The ***head of the femur*** articulates with the ***acetabulum*** to form the ***hip joint***

The Ilium



The Ilium

- Is the ***widest*** and ***largest*** of the three parts of the hip bone, and is located superiorly.
- The body of the ilium forms the superior part of the acetabulum (acetabular roof).
- Immediately above the acetabulum, the ilium expands to form the wing (or ala).

The wing of the ilium has two surfaces:

- ***Inner surface****-has* a concave shape, which produces the iliac fossa (site of origin of the ***iliacus muscle***).
- ***External surface*** (gluteal surface)-has a convex shape and provides attachments to the ***gluteal muscles***.

- The superior margin of the wing is thickened, forming the ***iliac crest.***
- It extends from the ***anterior superior iliac spine*** (ASIS) to the ***posterior superior iliac spine*** (PSIS).
- On the posterior aspect of the ilium there is an indentation known as the ***greater sciatic notch***.

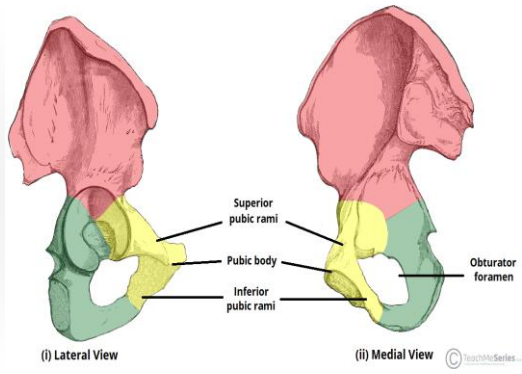
Clinical Relevance: ASIS

ASIS is an important anatomical landmark:

- ***Mid-inguinal point***-halfway between the ASIS and the centre of the pubic symphysis.
- The femoral artery can be palpated here.
- ***Mid-point of the inguinal ligament***-halfway between the ASIS and the pubic tubercle.

- A patient's ***"true" leg length*** is measured from the ASIS to the medial malleolus at the ankle joint.
- ***"Apparent" leg length,*** which is measured from the umbilicus to the medial malleolus.
- True leg length discrepancy is a feature of various hip disorders, as well as being a potential complication of ***hip joint replacement*** (arthroplasty).

The Pubis



The Pubis

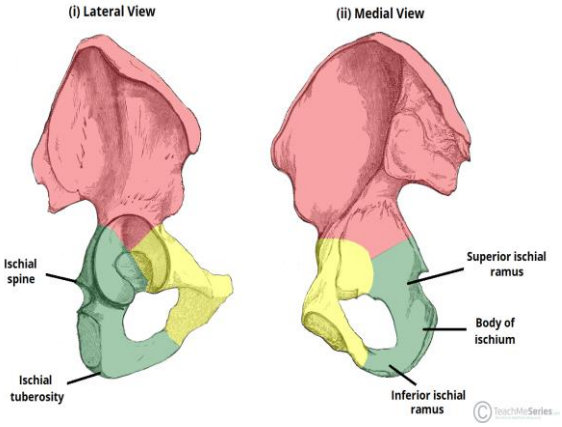
- The most anterior portion of the hip bone.
- It consists of a ***body***, ***superior ramus*** and ***inferior ramus*** (ramus-branch).
- **Pubic body**-located medially, it articulates with the opposite pubic body at the pubic symphysis.
- Its superior aspect is marked by a rounded thickening (the pubic crest), which extends laterally as the pubic tubercle.

- ***Superior pubic ramus***-extends laterally from the body to form part of the acetabulum.
- ***Inferior pubic ramus***-projects towards the ischium.
- The superior and inferior rami enclose part of the ***obturator foramen***-the ***obturator nerve***, ***artery & vein*** pass through to reach the lower limb.

Clinical Relevance-Pubic Rami Fractures

- Can sometimes be observed on x-rays in elderly patients who are investigated after simple low energy falls from standing height.
- In this context and provided they are the only injury a patient has sustained, these fractures are usually treated without surgery.
- Healing can be expected within 6-8 weeks and patients are encouraged to fully weight bear straightaway.

The Ischium



The Ischium

- Forms the posteroinferior part of the hip bone
- Much like the pubis, composed of body, inferior ramus and superior ramus
- ***Inferior ischial ramus*** combines with the ***inferior pubic ramus*** forming the ***ischiopubic ramus***, which encloses part of the ***obturator foramen***

- The posterorinferior aspect of the ischium forms the ***ischial tuberosities*** and when sitting, it is these tuberosities on which our body weight falls.
- Near the junction of the superior ramus and body is a posteromedial projection of bone; the ***ischial spine***.

Two important ligaments attach to the ischium:

- ***Sacrospinous ligament****-runs* from the ***ischial spine to the sacrum***, thus creating the greater sciatic foramen through which lower limb neurovasculature (including the sciatic nerve) transcends.
- ***Sacrotuberous ligament***-runs from the ***sacrum to the ischial tuberosity***, forming the ***lesser sciatic foramen.***

Clinical Relevance: Pelvic Fractures

There are two broad groups of pelvic fractures:

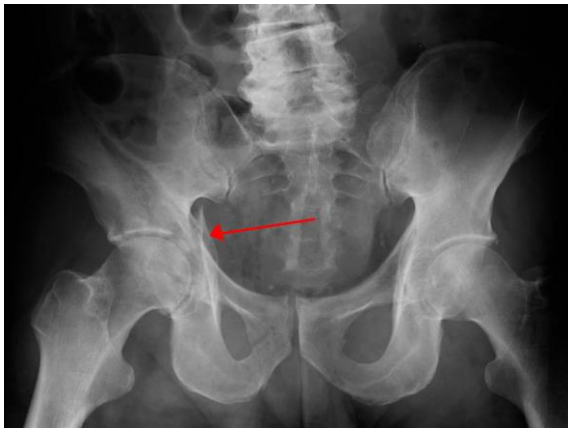
Low energy injuries:

- ***Example;*** a simple fall from standing height in an osteoporotic patient resulting in pubic rami fracture.

- These are usually ‘stable’ injuries, not requiring surgery.

High energy injuries with direct or transmitted trauma:

Example; after a high speed road traffic accident. These result in more extensive fractures which may include the acetabulum and sacroiliac joint.



- These can be 'unstable' injuries and may require urgent surgery.
- Higher energy injuries can be associated with ***soft tissue and vascular injury***.
- The bladder & urethra are at high risk of damage.
- Vascular injury can result in ***life threatening hemorrhage.***

- In the context of a high energy major trauma patient, the pelvis can be a major source of bleeding due to fracture.
- As a result, major trauma patients are assumed to have a pelvic fracture until proven otherwise and a ***'pelvic binder'*** is used to stabilize the pelvis and minimize further bleeding.

Pelvic Binder

- Circumferential pressure is applied by the binder at the level of the greater trochanters- an important anatomical landmark.

Ossification

The hip bone is ossified from ***eight centers***

Three **primary**-one each for the ***ilium***, ***ischium***, and ***pubis***

Five **secondary**-one each for the crest of the ilium, the anterior inferior spine (said to occur more frequently in the male than in the female), the tuberosity of the ischium, the pubic symphysis (more frequent in the female than in the male), and one or more for the Y-shaped piece at the bottom of the acetabulum

The centers appear in the following order:

- The lower part of the ilium, immediately above the greater sciatic notch, about the eighth or ninth week of fetal life
- The superior ramus of the ischium, about the third month
- The superior ramus of the pubis, between the fourth and fifth months

- At birth, the three primary centers are quite separate, the crest, the bottom of the acetabulum, the ischial tuberosity, and the inferior rami of the ischium and pubis being still cartilaginous.
- By the seventh or eighth year, the inferior rami of the pubis and ischium are almost completely united by bone.

About the 13th or 14th year, the 3 primary centers have extended their growth into the bottom of the acetabulum, and are there separated from each other by a Y-shaped portion of cartilage, which now presents traces of ossification, often by two or more centers.

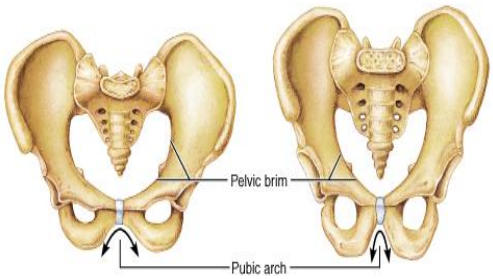
One of these, the *os acetabuli*, appears about the age of twelve, between the ilium and pubis, and fuses with them about the age of 18; it forms the pubic part of the acetabulum.

The ilium and ischium then become joined, and lastly the pubis and ischium, through the intervention of this Y-shaped portion.

At about the age of puberty, ossification takes place in each of the remaining portions, and they join with the rest of the bone between the 19th and 25th years.

Separate centers are frequently found for the pubic tubercle and the ischial spine, and for the crest and angle of the pubis.

Female Male



Video-Hip Bones; Gender Variations

The Differences in Terms of Gender

Function

- A male pelvis is designed to support a heavy body build and a stronger muscle structure while a female pelvis mainly serves for the purpose of childbearing.

Structure

- A male pelvis is smaller and narrower while a female pelvis is wider and roomier.

- ***Male;*** is ***heavier, taller***, and ***much thicker*** while a female pelvic bone is ***thinner and denser***.
- ***Male;*** has a ***v-shaped pubic arch*** while a female pelvis has a ***pubic arch that is wider***.
- ***Male;*** coccyx is projected inwards and immovable while a female pelvis has a flexible and straighter coccyx.

- ***Male;*** has a longer and narrower sacrum while a female pelvis has a sacrum that is wider, shorter, and less curved.
- ***Male***; acetabulum is larger while a female pelvis has a smaller one.

- ***Male;*** has narrower sciatic notch while a female pelvis has a wider sciatic notch.
- ***Male;*** has a heart-shaped pelvic inlet while a female pelvis has a pelvic inlet that is slightly oval in shape.

Pelvis Differences in Gender

	Female	Male
1.	Coccyx is movable or flexible and more curved anteriorly. i.e. straighter	Coccyx is immoveable and less curved anteriorly i.e. projected inwards.
2.	Pelvic brim (pelvic inlet) is large and oval.	Pelvic brim is smaller and heart shaped.
3.	Pelvic outlet is wider.	Pelvic outlet is narrower.
4.	Greater sciatic notch is wider.	G sciatic notch is narrower.
5.	Obturator foramen is oval.	Obturator foramen is round.
6.	Sacrum is shorter, wider and less curved.	Sacrum is longer, narrower and more curved.
7.	Ilium less vertical with less curved iliac crest.	Ilium more vertical with more curved iliac crest.
8.	Ischial tuberosity is shorter, farther apart and more medially projecting.	Ischial tuberosity is longer, close together and more laterally projecting.