



## **Module 5 - The Skeletal System**

### **Bones of the Pelvis and Legs / Joints and Movements**

In this module we will learn the bones, bone regions and bony structures for the pelvis and legs. Similar to the arms, there are quite a few long bones in the legs. We will also learn the different types of joints in the body and the movements that occur at those joints. We have attempted to create an animation for each type of movement so that it will be clear what the movement is. These animations are found in the online atlas.

Similar to the upper extremities, we will require you to be able to tell right and left bones for some of the bones. You may be required to tell right and left bones for any of the bones that have a description of how to tell right and left.

## LIST OF TERMS FOR THE BONES AND BONY LANDMARKS OF THE PELVIS AND LEGS

### Os Coxae

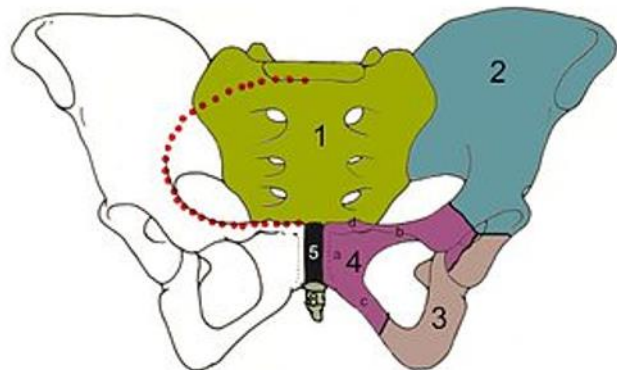
- **Acetabulum**
- **Anterior Inferior Iliac Spine**
- **Anterior Superior Iliac Spine**
- **Auricular Surface**
- **Greater Sciatic Notch**
- **Iliac Crest**
- **Iliac Fossa**
- **Ilium**
- **Inferior Pubic Ramus**
- **Ischial Ramus**
- **Ischial Spine**
- **Ischial Tuberosity**
- **Ischium**
- **Lesser Sciatic Notch**
- **Obturator Foramen**
- **Posterior Inferior Iliac Spine**
- **Posterior Superior Iliac Spine**
- **Pubic Crest**
- **Pubis**
- **Superior Pubic Ramus**



A student holding a right os coxa bone like a phone. This is one of the favorite ways for students to tell which is right and which is left if they are given only one side to identify. It is probably fortuitous that the large hole in this bone is called the "obturator" foramen. I have heard more than one student hold this bone up and speak into it like a phone and say "hello is this the operator". It makes us laugh. But then, funny things are easier to remember.

This bone has had several names over the years. It has been called the hip bone, innominate bone, pelvic bone and coxal bone. This bone is actually made up of three smaller bones (the ilium, ischium and pubis). These three bones are fused to form the Os Coxae. You can see these three bones in the picture below labeled 2,3 and 4. You can see the fusion of these three bones in the acetabulum. The acetabulum is the socket that the femur connects to at the hip joint. The pubic symphysis is where the two os coxa bones connect anteriorly. The auricular surface is where the os coxae bones connect to the sacrum. The greater sciatic notch is where the sciatic nerve leaves the pelvis and enters the posterior thigh. The other structures and bony landmarks on the list are regions or areas that muscles attach to.

**To identify right or left**, position the os coxa bone so that the pubic symphysis is anterior and the acetabulum is lateral. Then, imagine that you are connecting to the other pubic symphysis as you imagine which side of the body this would be on. Many of the students in class will hold the os coxa like a phone. As long as the hand is in the greater sciatic notch in a way that the finger cross into the acetabulum, and the part that forms the pubic symphysis is where you would "speak into", then the hand that the bone is in is the side that the bone belongs on. The picture of the student holding the bone is showing a right os coxa.



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## Patella

- **Anterior Surface**
- **Apex**
- **Base**
- **Lateral Articular Facet**
- **Medial Articular Facet**
- **Posterior Surface**

The patella is also known as the kneecap. This bone protects the hyaline cartilage of the knee joint. It also acts as a fulcrum for the tendons of the quadriceps muscle. This little bone greatly increases the force that can be applied to the lower leg.

**To identify right or left**, turn the patella around so that you can look at the posterior surface. The posterior surface has two facets. These facets contain cartilage in a living person and glide along the cartilage in the shallow anterior groove between the condyles of the femur. The facet that glides with the lateral condyle is always bigger. So, once you discover which facet is bigger, you have to imagine in your mind which leg the patella belongs to if the bigger facet is on the lateral side. The picture below shows a right patella. In class, I see students holding the patella down over their own knees to imagine which leg puts the larger facet on the lateral side. Those who study online sometimes tell us that they imagine putting their own knee right up to the screen on the picture of the posterior surface. This helps them keep track of which leg would put the larger facet on the lateral side.



**Anterior**



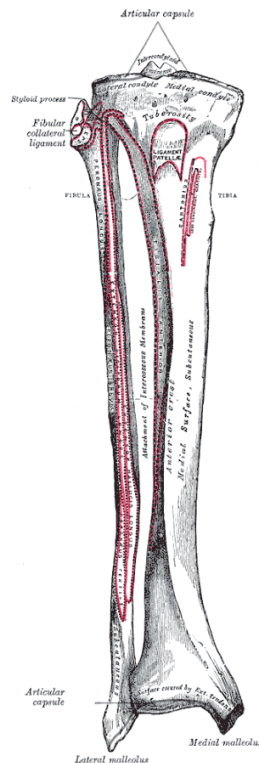
**Posterior**

## Tibia

- **Anterior Crest**
- **Fibular Notch**
- **Intercondylar Eminence**
- **Lateral Condyle**
- **Medial Condyle**
- **Medial Malleolus**
- **Tibial Tuberosity**

Also known as the “shin bone”. This bone is one of two large long bones in the lower leg. The Fibula is the other bone. The Tibia is the larger of the two and is always on the medial side of the two bones in the lower leg. The tibia and fibula are connected to each other by a very strong fibrous membrane. This membrane has been removed in most skeletons and pictures used to teach anatomy, but it is there in a living person.

**To identify right or left.** Turn the tibia so that the tibial tuberosity is facing anterior and then realize that the medial malleolus is named “medial” because it is always on the medial side of the leg. Ask yourself which side of the body the bone would have to be on to make the anterior facing tibia have a malleolus on the medial side of the leg. The Tibia in this picture is a right tibia.



## Fibula

- **Head**
- **Lateral Malleolus**

The fibula is always located on the lateral side of the tibia so it is always on the lateral side of the lower leg. It is much more slender than the tibia and does not carry nearly as much body weight. The lateral malleolus completes the bony containment of the ankle joint. The two malleoli (medial and lateral malleolus) are the rounded bumps on both sides of your ankle.

### Tarsal Bones

- **Talus**
- **Calcaneus**
- **Navicular**
- **Medial Cuneiform**
- **Intermediate Cuneiform**
- **Lateral Cuneiform**
- **Cuboid**

Tarsal comes from the Greek root "Tarsus" which refers to the ankle. There are seven articulating tarsal bones. It is often easier to memorize the seven tarsal bones by coming up with a Mnemonic Device (a sentence that helps us memorize a string of words). For example, start with the Calcaneus and work your way distal to the Medial Cuneiform, then lateral the Cuboid. Take the first letter of each tarsal bone in this order and this gives you a string of letters

T-C-N-M-I-L-C

Then come up with a sentence like...

**"Thin Country Nerds Meet Incredible Lovely Cuties"**

This is the same order that the bones are listed in this list and the same order that the bones are shown in the online atlas.

### Metatarsal

- **Metatarsal 1**
- **Metatarsal 2**
- **Metatarsal 3**
- **Metatarsal 4**
- **Metatarsal 5**

"Meta-" means "between" or in the middle.

Metatarsals are bones found in the intermediate foot between the tarsal bones and the digits. There are 5 metatarsals, one for each digit of the foot. The first metatarsal is the one that underlies the digit called the "Big Toe" and the 5<sup>th</sup> is proximal to the "Little Toe".

### Digits

- **Distal Phalanx**
- **Middle Phalanx**
- **Proximal Phalanx**

Similar to the hand, the foot has digits. The digits in the foot are often referred to as toes. Like the fingers, toes are actually made up of three bones. Starting at the tips of the toes, the bones include the distal, middle and proximal phalanx. The big toe has only two phalanges, the proximal and distal phalanx. There is no middle phalanx in the big toe. Digit one is the big toe and digit 5 is the little toe.

### Joints

- **Cartilaginous Joints**
- **Fibrous Joints**
- **Synovial Joints**

A joint is where two bones join together. Some joints allow a lot of movement and other joints allow no movement. The online atlas has pictures of the different types of joints. You should be able to identify each of the examples shown in the online atlas. When you identify a joint be sure to name its category (Cartilaginous, Fibrous or Synovial) as well as its sub-type listed in the pull down menu for each category.

For example if I was asked to name the type of joint that connected the two os coxae bones anteriorly, I would say a Cartilaginous Symphysis joint.

## **Movements**

- **Abduction and Adduction**
- **Circumduction**
- **Dorsiflexion and Plantarflexion**
- **Elevation and Depression**
- **Flexion and Extension**
- **Inversion and Eversion**
- **Lateral and Medial Excursion**
- **Opposition and Reposition**
- **Protraction and Retraction**
- **Rotation**
- **Supination and Pronation**

Movement at a joint is described by the terms to the right. This is not every term used but this is a list of the most common ones.

To help you visualize what happens with each of these motions, we have inserted animations in the online atlas. If you click through the animations and they won't play, clicking again as they sometimes play on the second click.

For the exam, you would want to be prepared to recognize the animation, or a picture with arrows or a verbal description of a joint movement.