

The pelvis

Structure

The pelvic region is the lower part of the trunk, between the abdomen and the thighs. It includes several structures:

the **bony pelvis** (or pelvic skeleton) is the skeleton embedded in the pelvic region of the trunk, subdivided into: the pelvic girdle (i.e., the two hip bones, which are part of the appendicular skeleton), which connects the spine to the lower limbs, and the pelvic region of the spine (i.e., sacrum, and coccyx, which are part of the axial skeleton) the **pelvic cavity**, is defined as the whole space enclosed by the pelvic skeleton, subdivided into: the greater (or false) pelvis, above the pelvic brim, the lesser (or true) pelvis, below the pelvic brim delimited inferiorly by the **pelvic floor** (or pelvic diaphragm), which is composed of muscle fibers of the levator ani, the coccygeus muscle, and associated connective tissue which span the area underneath the pelvis. Pelvic floor separate the pelvic cavity above from the **perineum** below.

The pelvic skeleton is formed posteriorly (in the area of the back), by the sacrum and the coccyx and laterally and anteriorly (forward and to the sides), by a pair of hip bones. Each hip bone consists of 3 sections, ilium, ischium, and pubis. During childhood, these sections are separate bones, joined by the triradiate hyaline cartilage.

They join each other in a Y-shaped portion of cartilage in the acetabulum. By the end of puberty the three bones will have fused together, and by the age of 25 they will have ossified. The two hip bones join each other at the pubic symphysis. Together with the sacrum and coccyx, the hip bones form the pelvis.

Ilium

Ilium (plural *ilia*) is the uppermost and largest bone. It makes up two fifths of the acetabulum. It is divisible into two parts: the body and the ala or wing of ilium; the separation is indicated on internal surface by a curved line, the arcuate line, and on the external surface by the margin of the acetabulum ilium forms the sacroiliac joint (synovial joint) with the sacrum (by auricular surfaces of both ilium and sacrum). The edge of the wing of ilium forms the S-shaped iliac crest which is easily located through the skin. The iliac crest shows clear marks of the attachment of the three abdominal wall muscles. The iliac tubercle locates in its anterior third of the crest.

Anteriorly the crest ends anterior with formation of superior iliac spine, and below it few distance away is the anterior inferior iliac spine.

The crest ends posteriorly by formation the posterior iliac spine, its surface anatomy represents by two dimples on inferior of the back, whereas the inferior posterior iliac spine is buried and couldn't be palpated, marking the upper end of the greater sciatica notch.

Posteriorly between the superior and inferior iliac spines locates the iliac tuberosity.

External surface of ala is the gluteal surface, whereas the medial surface show depressed region is the iliac fossa.

Ischium

The ischium forms the lower and back part of the hip bone and is located below the ilium and behind the pubis. The ischium is the strongest of the three bones that form the hip bone. It is divisible into three portions: the ischial spine, the lower border of greater sciatic notch, and upper border of lesser sciatic notch, an indentation at posterior border of ischium, the ischial tuberosity a large rough swelling, and the third portion is the ischial ramus continuous with the inferior pubic ramus to form the ischiopubic rami, half of pubic arch, and the body forms approximately two-fifth of the acetabulum.

The tuberosity of the ischium, also referred to colloquially as the "sit bone", when sitting, body weight is frequently placed upon the ischial tuberosity. The gluteus maximus covers it in the upright posture, but leaves it free in the seated position.

Pubis

The pubic bone or pubis is the ventral and anterior of the three bones forming the hip bone. It is divisible into a body, a superior ramus, and an inferior ramus. The body forms one-fifth of the acetabulum. The body forms the wide, strong, medial and flat portion of the pubic bone which unites with the other pubic bone in the pubic symphysis (cartilaginous joint), the fibrocartilaginous pad which lies between the symphyseal surfaces of the pubic bones, that secures the pubic symphysis, is called the inter pubic disc.

Body carries pubic tubercle for medial attachment of the inguinal ligament.

Medially from tubercle extends pubic crest on superior of pubic body.

The superior pubic ramus is a part of the pubic bone which forms a portion of the obturator foramen. It extends from the body to the median plane where it articulates with its fellow of the opposite side. It is conveniently described in two portions: a medial flattened part and a narrow lateral prismoid portion.

The inferior pubic ramus is thin and flat. It passes laterally and downward from the medial end of the superior ramus. It becomes narrower as it descends and joins with the ramus of the ischium below the obturator foramen.

The sacrum is a complex structure providing support for the spine and accommodation for the spinal nerves. It also articulates with the hip bones. The sacrum has a base, an apex, and surfaces (pelvic, dorsal and lateral). The base of the sacrum, which is broad and expanded, is directed upward and forward. (In anatomy, the broadest part of a structure is known as the base). Extensions on either side of the sacrum are known as the ala (*plural alae*). The apex is directed downward, and presents an oval facet for articulation with the coccyx. The sacral canal as a continuation of the vertebral canal runs throughout the greater part of the sacrum, its inferior portion shows roof deficit to form sacral hiatus, bordered laterally by sacral cornu which facing coccygeal cornu, sacral anterior and posterior surfaces carry five foramina, its spines attached and forms sacral crest.

Promontory

The sacral promontory marks part of the border of the pelvic inlet, and comprises the iliopectineal line and the linea terminalis. The sacral promontory articulates with the last lumbar vertebra to form the sacrovertebral angle, an angle of 30

degrees from the horizontal plane that provides a useful marker for a sling implant procedure.

The **coccyx**

It is formed of three, four or five rudimentary vertebrae. It articulates superiorly with the sacrum. In each of the first three segments may be traced a rudimentary body and articular and transverse processes; the last piece (sometimes the third) is a mere nodule of bone. The transverse processes are most prominent and noticeable on the first coccygeal segment. All the segments lack pedicles, laminae and spinous processes. The first is the largest; it resembles the lowest sacral vertebra, and often exists as a separate piece; the remaining ones diminish in size from above downward.

Most anatomy books incorrectly state that the coccyx is normally fused in adults. In fact it has been shown that the coccyx may consist of up to five separate bony segments, the most common configuration being two or three segments

The **pelvic brim** is the edge of the pelvic inlet. It is an approximately apple-shaped line passing through the prominence of the sacrum, the arcuate and pectineal lines, and the upper margin of the pubic symphysis. The pelvic brim is somewhat apple-shaped, obtusely pointed in front, diverging on either side, and encroached upon behind by the projection forward of the promontory of the sacrum.

The oblique plane passing approximately through the pelvic brim divides the internal part of the pelvis (pelvic cavity) into the false or greater pelvis and the true or lesser pelvis. The false pelvis, which is above that plane, is sometimes considered to be a part of the abdominal cavity, rather than a part of the pelvic cavity. In this case, the pelvic cavity coincides with the true pelvis, which is below the above-mentioned plane.

Acetabulum

Acetabulum (cup). (unit of measure)

- ☐ The **acetabulum (cotyloid cavity)** is a concave surface of a pelvis. The head of the femur meets with the pelvis at the acetabulum, forming the hip joint

Structure

There are three bones of the os coxae (hip bone) that come together to form the acetabulum. Contributing a little more than two-fifths of the structure is the ischium, which provides lower and side boundaries to the acetabulum. The ilium forms the upper boundary, providing a little less than two-fifths of the structure of the acetabulum. The rest is formed by the pubis, near the midline.

It is bounded by a prominent uneven rim, which is thick and strong above, and serves for the attachment of the acetabular labrum, which reduces its opening, and deepens the surface for formation of the hip joint. At the lower part of the acetabulum is the acetabular notch, which is continuous with a circular depression, the acetabular fossa, at the bottom of the cavity of the acetabulum. The rest of the acetabulum is formed by a curved, crescent-moon shaped surface, the lunate surface, where the joint is made with the head of the femur. Its counterpart in the pectoral girdle is the glenoid fossa.

The acetabulum is also home to the acetabular fossa, an attachment site for the ligamentum teres, a triangular, somewhat flattened band implanted by its apex into the antero-superior part of the fovea capitis femoris. The notch is converted into a foramen by the transverse acetabular ligament; through the foramen nutrient vessels and nerves enter the joint. This is what holds the head of the femur securely in the acetabulum.^[1]

The well-fitting surfaces of the femoral head and acetabulum, which face each other, are lined with a layer of slippery tissue called articular cartilage, which is lubricated by a thin film of synovial fluid. Friction inside a normal hip is less than one-tenth that of ice gliding on ice.

Blood supply

The acetabular branch of the obturator artery supplies the acetabulum through the acetabular notch. The pubic branches supply the pelvic surface of the acetabulum. Deep branches of the superior gluteal artery supply the superior region and the inferior gluteal artery supplies the postero-inferior region.

In reptiles and birds, the acetabula are deep sockets. Organisms in the dinosauria clade are defined by a perforate acetabulum, which can be thought of as a "hip-socket". The perforate acetabulum is a cup-shaped opening on each side of the pelvic girdle formed where the ischium, ilium, and pubis all meet, and into which the head of the femur inserts. The orientation and position of the acetabulum is one of the main morphological traits that caused dinosaurs to walk in an upright posture with their legs directly underneath their bodies. In a relatively small number of dinosaurs, particularly ankylosaurians (e.g. *Texasetes pleurohalio*), an **imperforate** acetabulum is present, which is not an opening, but instead resembles a shallow concave depression on each side of the pelvic girdle.

Development

In infants and children, a 'Y'-shaped epiphyseal plate called the triradiate cartilage joins the ilium, ischium, and pubis. This cartilage ossifies as the child grows.