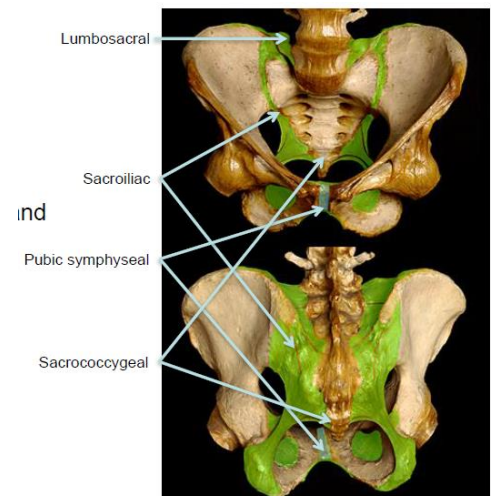


Anatomy Lecture 9.2-12.2

Pelvic and hip joints

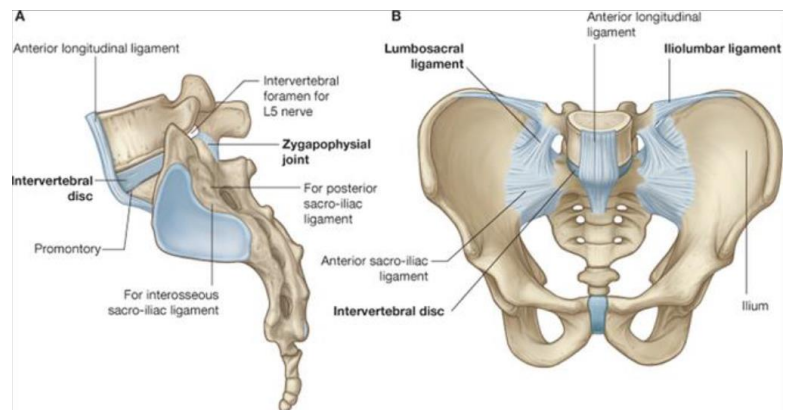
Joints of the pelvis

- Lumbosacral; secondary cartilaginous IV joint and synovial zygapophyseal joints
 - Between the L5/S1 facets
- Sacroiliac:
 - Partly synovial joint/ partly syndesmosis between articular surface of the sacrum and the ilium
 - Strong weight-bearing joint
- Pubis symphyseal (with a disc)
 - It is a secondary cartilaginous joint between the pubic bones
 - A primary cartilaginous joint is between epiphyses and growing bones, a secondary is a joint that usually does not allow much movement and there is usually a fibrocartilaginous disc between the two ends of the bone which have hyaline cartilage lining (and the disc in the middle)



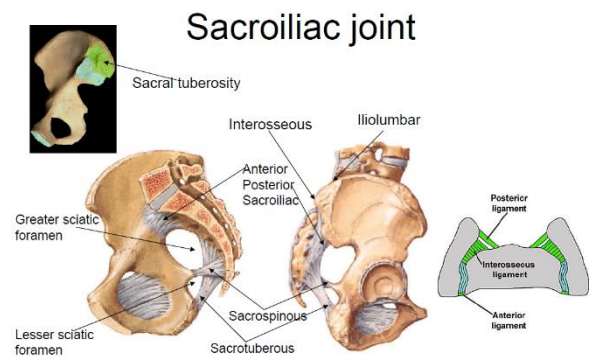
Lumbosacral joints

- There is lordotic curvature of the lumbar spine
- The body weight is slightly anterior to this joint, where it is transferred laterally to the head of the femur (slightly posterior to it) so the sacrum (because of the curvature) has much more weight-bearing on the proximal end so S1 is quite important and robust, especially in transferring weight laterally
- There is a primary kyphosis at the sacrum for this purpose
- The IV discs allow this curvature so there is deep lumbar lordosis at this joint
 - The discs are wider anteriorly and thinner posteriorly
- At the lumbar vertebrae, the superior facets are medially orientated (on the outside) and the inferior facets sit within these facing laterally
 - But at L5/S1 because this is transitional, the superior facet is facing internally (actually posteromedially) and the inferior face is anterolaterally
 - So the inferior facet of L5 stops forward movement of the whole spine because of its orientation and this is where spondylolysis occurs
- The accessory ligaments are:
 - The iliolumbar ligaments from the transverse process of L5 to the iliac
 - The anterior longitudinal ligament
 - The lumbosacral ligament from the transverse process of L5 to the sacrum



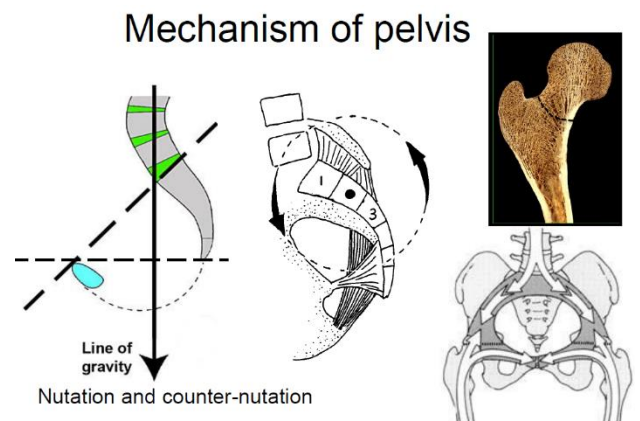
Sacroiliac joint

- The weight taken up by the promontory of S1 (the anterior tilt) is displaced laterally to the crest of the iliac blade, so the sacroiliac joint is important for this
- The sacrum sits in the sacral tuberosity in the auricular surface of the pelvis (which is similar to the one on the sacrum) which are both part of the sacroiliac joint
 - The iliac tuberosity on the sacrum interacts with the sacral tuberosity on the pelvis
- This is a true synovial joint but at the sacral tuberosity / iliac tuberosity, there is a syndesmosis; the interosseous ligament is the most important ligament at the joint and one of the strongest ligaments in the body. It stops separation and makes up the posterior aspect of the joint
 - There is syndesmosis at the tibia/fibula or radius/fibula usually to make the bones work together to take the forces on the bones and this it has the same function at the sacroiliac joint
- Accessory ligaments:
 - Sacrotuberous ligament from the anterior aspect of the sacrum to the ischial tuberosity (quite strong); the gluteus maximus originates from this region with the sacrospinous ligament from the sacrum to the ischial spin to stop the forward falling of the spine
 - Both ligaments evolved in evolution into ligaments; in primates/some apes you often find hamstrings that attach to the sacrotuberous ligament or from the sacrospinous ligament. In animals that have a tail, there is a ischiococcygeus muscle that attaches to the sacrospinous ligament but because we do not have a tail and weight bearing is important, these muscular bits have turned into strong ligaments

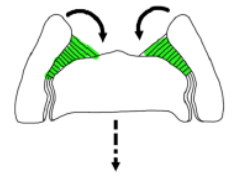


Mechanisms

- The sacrum is tilted downwards so the pubic bone forms the floor of the pelvic cavity so the angle of the sacrum is oblique relative to the line of gravity, this is particularly important when flexing hip (like going from standing to sitting), the sacrum takes a lot of weight so when the back is flexed, there is a tendency for the sacrum to rotate (centred at S2); the promontory has the tendency to tilt into the pelvic cavity and the coccyx move outwards called nutation
- The opposite movement is called counter-nutation
- The body weight is transferred to the sacroiliac joint then laterally so the sacrum and iliac blades form an arch
- There is also an arch around the pubic symphysis for the distribution of weight, particularly the compressive forces from the ground which travel up from the ground and are also shared to the sacroiliac joint
- The trabeculae are orientated vertically to take the compressive forces at the head of the femur (toward the medial cortex of the shaft of the femur)
 - More inferiorly, there are transverse trabeculae lines from the inner head of the femur to the neck of the femur / greater trochanter (for tensile force)
 - There both allow forces from the ground to be taken up by the head of the femur
 - The trabeculae are least dense and susceptible to fracture at the neck of the femur, especially in older people

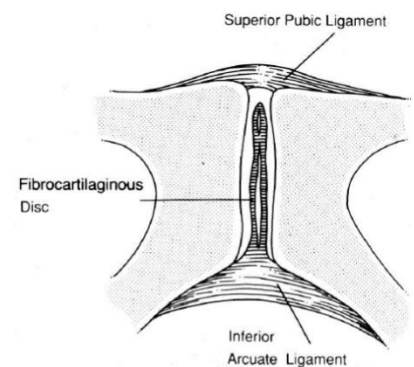


- The reverse keystone effect
 - When the weight is transferred the sacrum sinks forwards and downwards into the pelvis (causing the pelvic inlet to close and the pelvic outlet to decrease in size)
 - The posterior ligaments tighten and draw the iliac bones together. Stability is due therefore to the ligaments (particularly the interosseous ligaments) – the bones tend to open up the joint
 - The sacrum is the keystone of the arch (wider inferiorly and narrower superiorly); but there is a reverse keystone effect because there is a tendency for the keystone to fall out, but the arch (with the ligaments) that hold it in place
- The ligaments become lax during pregnancy; the L5-S2 posteriorly and the L3-S1 anteriorly
 - The baby emerges head sideways because the largest dimension is sideways; the infant baby engages the pelvic inlet, causing counter-nutation so the ligaments are lax and secrete a hormone “relaxin” which makes them lax so the head can open up the pelvic cavity
 - There is posterior presentation when the babies face is along the sacrum, but often a babies head will turn sideways, after exiting about halfway through and when it goes through the pelvic outlet, the head will cause nutation



Joint of the pubic symphysis

- Secondary cartilaginous joint
- Ligaments: superior, arcuate (inferior) and the anterior
- Reinforced by the criss-crossing fibres from the abdominal muscles (as well as adductor longus)
- Acts as a tie-beam preventing separation laterally and resisting compression forces from the femora
 - It stops the pubic bones and the rest of the iliac bones (and the rest of the pelvis) from separating from each other
- The joint allows small gliding movements
- The fibrocartilaginous disc is typically wider in females
- The sub pubic angle is usually less than 90 degrees in males and wider in females who also have a wider sciatic notch



Sacrococcygeal joint

- Not very weight-bearing
- Secondary cartilaginous
- Apex of the sacrum and the base of the coccyx (the first coccygeal vertebrae) which is vestigial in humans but there can be up to 35 in animals with a tail
- There is a very small disc or none at all
- There is an anterior and posterior sacrococcygeal ligaments

