Abdomen

Posterior Abdominal Wall

The walls that circumscribe the abdominal cavity can be divided into two subregions, the posterior abdominal wall and the anterolateral abdominal wall. The two subregions are constructed differently to reflect their different functions.

Posterior Abdominal Wall

1) constructed to be rigid and stable with bulky muscles
2) functions
   a) movement of the vertebral column, thoracic cage, and hip joints
   b) protect underlying viscera
   c) support for the erect posture of humans
   d) accessory muscles of respiration

Bony Pelvis (as pertains to the abdomen)

1) bony pelvis (syn. pelvic girdle) - the articulated sacrum, coccyx, and two hip bones.
2) sacrum
   a) five sacral vertebrae fused into a solid, wedge-shaped mass
   b) superior surface of S1 articulates with L5
   c) sacral promontory - upper anterior margin of S1
3) pelvic apertures
   a) pelvic brim - a bony rim that runs from the sacral promontory, along the iliopectineal line of a hip bone to the superior aspect of the pubic symphysis, and then up the opposite iliopectineal line and back to the sacral promontory
   b) pelvic inlet – oblique plane that passes through the pelvic brim; demarcates abdomen from pelvis
   c) true pelvis, i.e. “the pelvis” - region below the pelvic brim
   d) false pelvis - region above the pelvic brim and between the ala (wings) of the two hip bones; part of the abdomen

Lumbar Vertebrae

1) five in number (L1 to L5)
2) characteristically large and strong
3) laminae – broad and stout (materially strong, sturdy) with distinct gaps between those of adjacent vertebrae (in contrast laminae of cervical and thoracic vertebrae slightly overlap)
4) spines – broad and stout; quadrangular in shape
5) articular processes - large with most facet joints oriented in the sagittal plane; allows flexion, extension, and lateral bending but very little rotation between vertebrae
6) L5 vertebra
   a) largest of all vertebrae
   b) height of L5 body greater anteriorly than posteriorly – contributes to the lumbosacral angle (junction) with the sacrum where the change in curvature begins between abdominal (lumbar) and pelvic (sacral) regions
   c) pars interarticularis (the part [pars] between [inter] the articular processes [articularis]) – the part of the vertebral arch between the superior and inferior articular process of a vertebra; that of L5 plays a major role in the weight-bearing function of L5.

Intervertebral Discs

1) a symphysis (secondary cartilaginous joint) between adjacent vertebral bodies
2) named (numbered) according to the vertebra above, e.g. L4 disc is between L4 and L5 vertebrae
3) account for about ¼ of the height of the vertebral column above the sacrum
4) thickest in the lumbar region
5) parts
   a) annulus fibrosus – outer tough fibrocartilaginous ring
   b) nucleus pulposus – inner pliable gelatinous mass
6) functions
   a) absorb and dissipate forces
   b) allow movement between adjacent vertebrae
7) intervertebral discs permit movement in any direction and as such the types of movements occurring between adjacent vertebrae are dictated by the orientation of their facet joints

Clinical Notes: 1) Lumbar puncture – insertion of a needle through the gap between adjacent laminae of lumbar vertebrae (typically performed between L3 & L4 or L4 & L5) in order to access the vertebral canal and its contents for diagnostic purposes (e.g. analysis of a CSF sample from the subarachnoid space) or therapeutic purposes (e.g. injection of anesthesia into the subarachnoid space [spinal block]). Flexion of the lumbar spine exaggerates the gap between adjacent laminae and facilitates insertion of the needle. 2) Low back pain – the most common musculoskeletal disorder in the U.S.; estimated that 85% of all adult chronic low back pain is the result of changes in the intervertebral discs between lumbar vertebrae, changes resulting from either trauma and/or degeneration. Degenerative changes in intervertebral discs reflect mechanical stress, in part a natural consequence of aging; most marked in the L4 and L5 discs. Another 10% to 15% of chronic low back pain is attributed to degenerative changes in the facet joints of lumbar vertebrae. The source of the low back pain may be the disc or facet joints themselves or secondary pain caused by spinal nerve root compression, nerve root involvement in the neighboring disc or facet joint inflammatory response, or muscle spasms that are a defensive response designed to protect the spine from further injury. 3) "Slipped disc" – herniation of the nucleus pulposus; a major source of low back pain and potentially lumbar nerve root compression leading to sciatica. 4) Spondylolysis – a defect, either a developmental abnormality or acquired (e.g. a fracture from a sports injury), in the pars interarticularis of a vertebra. The defect may, particularly if bilateral, allow one vertebra to slide relative to a neighboring vertebrae, a condition called spondylolisthesis. Spondylolisthesis is more common in females than males and most common (80%) at the L5 vertebra, resulting in L5 slipping forward on the sacrum; often results in nerve root compression. Spondylolysis is the most common cause of chronic low back pain in children and adolescents.

Muscles

1) psoas major – attached to lumbar part of vertebral column (origin) and femur (insertion); flex thigh and body trunk
2) iliacus – attached to iliac fossa (origin) and femur (insertion); flex thigh and body trunk
3) in thigh 1) and 2) combine to create iliopsoas muscle; powerful flexor of thigh at hip joint
4) quadratus lumborum – attached to iliac crest (origin) and 12th rib (insertion) and transverse processes of lumbar vertebrae (insertion); depresses and stabilizes the 12th ribs (important in respiration) and laterally bends the vertebral column
5) diaphragm – contributes to the superiormost aspect of the posterior abdominal wall by virtue of its lumbar part

Lumbar Plexus

1) formed from the anterior rami of L1 to L4 spinal nerves
2) forms within the substance of the psoas major muscle
3) major branches
    a) motor and sensory to the lower limb
        i) femoral nerve
        ii) obturator nerve
        iii) lateral cutaneous nerve of the thigh
        iv) femoral branch of genitofemoral nerve
    b) motor and sensory to the lower abdominal wall
        i) iliohypogastric nerve (L1)
        ii) ilioinguinal nerve (L1)
    c) motor and sensory to the perineum
        i) genital branch of genitofemoral nerve (motor to cremaster muscle, sensory to the scrotum or labia majora)
    d) lumbosacral trunk – combined L4 and L5 contribution to the sacral plexus

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