Lecture Overview

- Axial Skeleton
  - Hyoid bone
  - Bones of the orbit
  - Paranasal sinuses
  - Infantile skull
  - Vertebral column
    - Curves
    - Intervertebral disks
  - Ribs

The Axial Skeleton – Hyoid Bone

Suspended from the styloid processes of the temporal bones by ligaments and muscles

The hyoid bone supports the larynx and is the site of attachment for the muscles of the larynx, pharynx, and tongue.

Figure from: Saladin, Anatomy & Physiology, McGraw Hill, 2007
Axial Skeleton – the Orbit

**Optic canal – Optic nerve; ophthalmic artery**

**Superior orbital fissure –**
- Oculomotor nerve
- Trochlear nerve
- Ophtalmic branch of trigeminal nerve
- Abducens nerve
- Ophthalmic vein

**Inferior orbital fissure** –
- Maxillary branch of trigeminal nerve
- Infraorbital groove –
  - Infraorbital nerve
  - Maxillary branch of trigeminal nerve
  - Infraorbital artery

*Be able to label a diagram of the orbit for lecture exam*

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Nasal Cavities and Sinuses

**Paranasal sinuses** are air-filled, mucous membrane-lined chambers connected to the nasal cavity.

**Superior wall** of nasal cavities is formed by frontal, ethmoid, and sphenoid bones

**Lateral wall** of nasal cavities formed by maxillary and lacrimal bones and the conchae

Functions of conchae are to create swirls, turbulence, and eddies that:
- direct particles against mucus
- slow air movement so it can be warmed and humidified
- direct air to superior nasal cavity to olfactory receptors

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Axial Skeleton - Sinuses

Sinuses are lined with mucus membranes.

Inflammation of these membranes is called sinusitis.

Know the locations of the sinuses
**Infantile Skull**

Fontanel – fibrous membranes in the fetal/infant skull to allow 1) movement of the skull bones and 2) brain growth.

Figure from: Martini’s Visual A&P, 1st edition, 2011

Anterior fontanel (soft spot) is largest and last to close (by about two years of age). Other fontanels disappear or begin to close within one to three months after birth.

**Axial Skeleton - Vertebral Column**

- cervical vertebrae (7)
- thoracic vertebrae (12)
- lumbar vertebrae (5)
- sacrum
- coccyx

Primary curves are present at birth. These are also called ‘accommodation’ curves since they accommodate the organs of the thorax and pelvis.

Secondary curves do not develop until several months after birth as infants begin to hold their head up and stand. These are also called compensation curves because they shift the weight of the trunk over the lower limbs.

Primary curves appear FIRST = Sacral, Thoracic

**Spinal Curvature of Newborn Infant**

Figure from: Saladin, Anatomy & Physiology, McGraw-Hill, 2007
Abnormal Curvature of the Spine

Scoliosis (a) – abnormal lateral curve

Kyphosis (b) – exaggerated thoracic curve

Lordosis (c) – exaggerated lumbar curve

Figure from: Saladin, Anatomy & Physiology, McGraw Hill, 2007

Intervertebral Discs

Figure from: Hole's Human A&P, 12th edition, 2010

Intervertebral Discs

Figure: © 1998 A.D.A.M. Software, Inc.

Figure: Martini, Anatomy & Physiology, Prentice Hall, 2001
Axial Skeleton - Thoracic Cage

- Ribs
- Sternum
- Thoracic vertebrae
- Costal cartilages
- Supports shoulder girdle
- Protects viscera
- Role in breathing

Lecture Overview

- Appendicular Skeleton
  - Review of pectoral girdle
  - Shoulder joint; dislocations
  - Review of bones of upper limb and hand
  - Review of the pectoral girdle
    - Divisions of the pelvis
    - Male-female pelvic differences
  - Comparison of the pectoral and pelvic girdles
  - Review of bones of the leg and foot
  - Arches of the foot

Review of Upper Limb

Figure from: Moore & Agur, Essential Clinical Anatomy, Lippincott, Williams & Wilkins, 2002
Joints of the Pectoral Girdle

Clavicle is one of the most frequently fractured bones in the body. Clavicular midregion is the weakest point of clavicle and most frequent fracture site.

Lateral View of Pectoral Girdle

* = Part of Rotator Cuff (SITS)
Review of the Bones of the Upper Arm

Typical site of fractures

Review of Bones of Forearm

• lateral forearm bone
• head
• radial tuberosity
• styloid process

Review of Bones of Forearm

• olecranon process
• coronoid process
• radial notch
• ulnar notch

Review of Bones of Forearm

• olecranon process
• coronoid process
• radial notch
• ulnar notch

• lateral forearm bone
• head
• radial tuberosity
• styloid process
Bones of the Elbow Joint


Lateral view, right arm
Medial view, right arm

Colles’ Fracture

One of the most common types of fractures.
Involves the radius, but may involve a fracture of the ulna as well.
Treatment is reduction followed by splinting.

Review of the Bones of the Wrist and Hand

Figure from: Tortora and Grabowski, Principles of Anatomy & Physiology, Wiley Press, 2003

Figure from: Martini’s Visual A&P, 1st edition, 2011
Review of the Pelvic Girdle

- hip (coxae) bones
- ilium
- iliac crest
- greater sciatic notch
- ischium
- ischial spine
- lesser sciatic notch
- ischial tuberosity
- pubis
- obturator foramen
- acetabulum
- ilium
- ischium
- pubis

Figure from: Hole's Human A&P, 12th edition, 2010

Review of the Bones of the Pelvis

- hip (coxae) bones
- ilium
- anterior iliac crest
- posterior superior iliac spine
- posterior iliac spine
- greater sciatic notch
- ischial spine
- lesser sciatic notch
- ischial tuberosity
- obturator foramen
- acetabulum
- ilium
- ischium
- pubis

(Medial view, right coxa)  (Lateral view, right coxa)

Figure from: Hole's Human A&P, 12th edition, 2010

Review of the Divisions of the Pelvis

Pelvic brim = (sacral promontory, sacral ala, arcuate line, pectineal line, pubic crest) x 2

Figure from: Martini’s Visual A&P, 1st edition, 2011
Male-Female Pelvic Differences

1. Iliac bones are more flared in the female; hips are broader
2. Pubic angle is greater in the female pelvis
3. Greater distance between the ischial spines in the female pelvis
4. Broader, flatter pelvis in females; wider, more circular pelvic inlet
5. Less projection of sacrum and coccyx into the pelvic outlet in the female pelvis

Comparison of Pectoral and Pelvic Girdles

<table>
<thead>
<tr>
<th></th>
<th>Pectoral Girdle (Clavicle, Scapula)</th>
<th>Pelvic Girdle (Ossa coxae, sacrum, coccyx)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Articulation with vertebral column</td>
<td>None</td>
<td>Direct (sacroiliac joint)</td>
</tr>
<tr>
<td>Joint sockets for limbs</td>
<td>Shallow – maximize movement</td>
<td>Deep – maximize strength</td>
</tr>
<tr>
<td>Overall characteristic</td>
<td>Maximum movement, reduced strength</td>
<td>Maximum strength, reduced movement</td>
</tr>
</tbody>
</table>

Review of Bones of Lower Limb

- Femur
- Patella
- Tibia
- Fibula
- Tarsals
- Metatarsals
- Phalanges
Femur

Bones of Lower Leg: Tibia, Fibula

Potts’ Fracture

Fracture of distal end of the fibula with significant damage to the distal tibial articulation. Usually caused by forcible eversion of the foot.
Bones of the Foot

- Tall Californian Navy
- Medical Interns Like Cuban cigars (Medial to lateral)

Don’t like this mnemonic?...

Hallux (hallucis) = great toe

Appendicular Skeleton – Ankle and Foot

- Tarsals (14)
  - calcaneus
  - talus
  - navicular
  - cuboid
  - lateral cuneiform
  - intermediate cuneiform
  - medial cuneiform

- Metatarsals (10)
- Phalanges (28)
  - proximal
  - middle
  - distal

Tarsus

Ball of foot

Ankle and Foot
Arches of the foot
- enable it to support the body weight
- ideally distribute body weight over hard and soft tissues
- provide leverage when walking

Flatfoot – Height of medial longitudinal arch is decreased
Clawfoot – Medial longitudinal arch is abnormally elevated

You should know the names and positions of each of the arches
Review

• The paranasal sinuses
  - Air-filled chambers that connect with the nasal cavity
  - Formed by the frontal, sphenoid, ethmoid, and maxillary bones
  - Produce mucus and serve as resonating chambers

• The infantile skull
  - Contains soft spots
    • Fibrous CT membranes
    • Called fontanels
  - The anterior fontanel
    • Largest
    • Last to close (about 18-24 months after birth)

Review

• The vertebral column
  - Primary curves (accommodation)
    • Thoracic and sacral
    • Present at birth
  - Secondary curves (compensation)
    • Cervical and lumbar
    • Develop as head is held up and weight-bearing begins
  - Intervertebral disks
    • Shock absorbers between vertebral bones
    • Permit movement
    • Outer fibrocartilage – annulus fibrosus
    • Inner soft, pulpy core – nucleus pulposus

Review

• The thoracic cage
  - Protects the heart, lungs, thymus, and other structures in the thoracic cavity
  - Serves as an attachment point for muscles involved in respiration, positioning the vertebral column, and moving the pectoral girdle and upper limbs
• The thoracic cage consists of the
  - Thoracic vertebrae
  - The ribs
  - The sternum (breastbone)
• True, or vertebrosternal, ribs (7 pairs) are attached to the sternum by costal cartilages
• There are 5 pairs of false ribs
  - Ribs 8-10 are vertebrochondral ribs
  - Ribs 11 and 12 are floating, or vertebral, ribs
Review

• The pectoral girdle consists of the clavicle and scapula
  – Does not articulate with vertebral column
  – Designed for movement rather than strength

• The pelvic girdle consists of the paired hip bones, or coxae
  – Each coxa is formed by fusion of three bones:
    • Ilium
    • Ischium
    • Pubis
  – Articulates with vertebral column via the sacroiliac joint
  – Designed for strength rather than range of movement

Review

• The divisions of the pelvis include
  – True (lesser) pelvis
    • Encloses the pelvic cavity
    • Bony edge of the true pelvis is the pelvic brim and the enclosed space is called the pelvic inlet
  – False (greater) pelvis
    • Area above the pelvic brim
  – The pelvic outlet is bounded by the coccyx, ischial tuberosities, and the inferior border of the pubic symphysis

Review

• The arches of the foot
  – Function of arches
    • Enable it to support the body weight
    • Ideally distribute body weight over hard and soft tissues
    • Provide leverage when walking
  – Longitudinal arches
    • Lateral
    • Medial (fallen arches; clawfoot)
  – Transverse arch