Integument

- 2 layers: Dermis and epidermis
- Epidermis thin except for certain areas
- Keratinization produces special structures: beak, nails, scales, feathers
- Lacks glands
Feathers-7 types

- Contour
  - wing & tail (flight)
- Semiplume
- Down
  - fluffy, no barbules
- Bristle
  - “eyelashes”
- Powder down
- Hypopenna
- Filoplume
Uropygial Gland

- “Preen gland”
- Bilobed holocrine gland
- Conditions feathers
- Not all species have one
Purpose of Feathers

- Flight
- Courtship
- Defense
- Insulation
- Waterproofing
Contour Feathers

- Rows (pterylae) in most species
- Apteryla=feather-less tracts
- Remigies=Wing flight feathers
- Retrices=Tail flight feathers
Primaries attach to metacarpals
Secondaries attach to ulna
Waterproofing

- Preen gland secretions are not necessary
- Interlocking of feather barbules creates watertight barrier
Musculoskeletal System

Notarium

Synsacrum

Coccygeal
Avian wings

- Unique structure
- Flight feathers attached to ulna and metacarpals
- Ulna > radius
FIGURE 13-22. Left pectoral girdle and wing skeleton, elevated to show the ventral surface.
Pectoral girdle
Clinical skeletal anatomy

- Spinal fractures at juncture of notarium and synsacrum
- See with birds who flew into a window
Fractures

- Bones are more brittle compared to mammals
- Bones heal more rapidly
  - 4 weeks
- Fibrocartilagenous healing first
  - may not be visible radiographically
Pectoral Muscle

- Highly vascularized muscle
- IM injections here are absorbed rapidly
- Nonflighted birds have soft, “flabby” pectoral muscles
Lower limbs

- Femur
- Tibiotarsus
- Tarsometatarsus
  - “Hock” is the tibiotarsal-tarsometatarsal joint
Each digit has +1 phalanx
- Digit one has 2 phalanges
- Digit two has 3, etc

Parrots are zygodactylus
- Digits 1 & 4 face back
- Digits 2 & 3 face forward
- 4 chambered heart
- Encircled by liver
- Right jugular vein larger than left (which may be absent)
Lymphatic System

- No lymph nodes
- Lymph vessels follow veins
- Lymph plexuses (rete)
- Bursa of Fabricius
  - B-cells
Kidneys

- Adhered to dorsal body wall
- Retroperitoneal
- 3 lobes
- Excrete uric acid and some urine
Renal Portal System

- Posterior vena cava (caudal)
- Coccygeomesenteric vein (caudal mesenteric vein)
- Vertebral venous sinuses
- L. cranial renal portal vein
- L. external iliac vein
- L. caudal renal portal vein
- L. renal vein
- Intrarenal vein
- Sciatic vein

Cranial lobe
Middle lobe
Caudal lobe
Nervous System

- Brain: 3 meninges & 12 CN as in mammals
- In contrast, birds have no neocortex
- Surface of cerebrum almost smooth
- Olfactory bulb relatively small
Eyes

- Most birds have excellent vision
- More cones than rods (in general)
- No blind spot (no optic disk)
  - Pecten, unique to birds, provides nutrients
- Iris contains striated muscle—can’t use atropine to dilate
  - Need curariform drugs
Horizontal section of the head. Note the position of the pecten in the fundus. B. A sagittal section of the eyeball.
Coelomic Cavities

- 16 separate cavities within body
- 8 air sacs
- 5 peritoneal
- 2 pleural
- 1 pericardial
Upper Respiratory Tract

- Nares
  - Cere
- Operculum
- Sinuses
- Conchae
- Choana
- Oropharynx
Upper respiratory tract

- Nasal cavity
  - Communicates with oral cavity
- Choana
  - exceptions
- No soft palate
Respiratory anatomy

- **Trachea**
  - Relatively large
  - Glottis at base of tongue
  - Complete rings
- **No diaphragm**
- **Syrinx**
  (no larynx)
Clinical anatomy

- Choanal swabs
  - *Chlamydiophila* testing
  - Bacterial culture
- Sinusitis

- Complete tracheal rings
  - Use extreme care with intubated birds
Infraorbital sinus

- Access: between medial canthus and oral commissure
  - Diagnostic samples
  - Therapeutic flushing
- Easier than trephining a horse!
Infraorbital sinus
Air sacs

- No gas exchange
- 9 air sacs in parrots
- Can ventilate via air sac cannula
- Poorly vascularized
  - Bad place for infection
  - Air sacculitis difficult to treat
Air sacs

- Pneumatic bones
  - humerus, femur
  - Don’t put intraosseous catheters here
- Must move sternum to breathe
  - Don’t smush little birds during restraint
  - Don’t lean on chests of anesthetized birds
Avian lungs

- Unidirectional air flow
- Extremely efficient compared to mammals
- Gas exchange occurs in air capillaries of parabronchi
- Rigid lung
The Oropharynx

GI Tract

- Opening Maxillary Salivary Gland
- Laryngeal Mound
- Sphenopterygoid Salivary Gland
- Glottis
- Mandibular Salivary Gland
- Tongue
- Lateral Palatine Salivary Gland
- Choanal Opening
- Medial Palatine Salivary Glands
- Infundibular Cleft
Oral cavity

- Ramphotheca-upper sheath
- Gnathotheca-lower sheath
The Gastrointestinal Tract

Cervical Esophagus

- Precrop Esophagus
- Crop
- Postcrop Esophagus

Thoracic Esophagus

- Ventriculus
- Mesenteric artery

No gallbladder in parrots or pigeons
Upper GI Tract

- Crop not present in all species
- Proventriculus is glandular stomach
- Ventriculus (gizzard) is muscular
  - Lined with koilin
Intestines

- Paired cecae mark the junction between small and large intestine
- Duodenum, jejunum, ileum as in mammals
Cloaca and Vent

- GI and Urogenital tracts end in cloaca
- Coprodeum
- Urodeum
- Proctodeum
- Vent is opening into cloaca
Male Reproductive Tract

- 2 testis
- Rudimentary phallus (may or may not be intromittant)
- Parrots non-intromittant
Female Reproductive Tract

- Left ovary
- Infundibulum
- Magnum
- Isthmus
- Uterus (shell gland or oviduct)
Adrenal Glands

- Paired
- Medial and cranial to kidneys and gonads
- Function similar to mammalian adrenals
Thyroid, Parathyroid & Thymus
