CHELONIAN NECROPSY: ANATOMY AND COMMON FINDINGS

Charles Innis, VMD
New England Aquarium
Boston, MA

Excellent clinical reviews of chelonian anatomy, necropsy, and common pathologic conditions have been recently published. Necropsy is a critical diagnostic tool for the chelonian practitioner. The chelonian necropsy begins with a thorough external examination, including the shell, limbs, cloaca, skin, and structures of the head. The shell of the turtle is made of bone covered by keratin plates, or scutes. The number of scutes varies somewhat among species, and there are anatomic names for each scute. These names should be used to specify the location and extent of any shell pathology. The weight of the patient is recorded, and a variety of measurements (eg, straight carapace length, curved carapace length) are recorded if desired. Due to the high incidence of gross pathology of the oral mucosa, tongue, and nasal cavity, these areas should be specifically evaluated. Samples such as choanal cultures, nasal flushes, and so forth should be obtained before proceeding with the internal examination. In some cases, other diagnostics, such as radiography and computed tomography, may be desired. These techniques can help to direct the internal examination, and help to correlate clinical findings with necropsy results.

Exposure of the coelomic viscera is generally accomplished by removing the plastron, or ventral shell, of the turtle. In most cases, this is most easily accomplished using a bone saw or cast cutter to produce two longitudinal full-thickness incisions along each side, or bridge, of the shell. Take care to avoid lacerating the deeper viscera. In addition, a scalpel or scissors are used to incise the skin attachments to the plastron. Dissection then continues deep to the plastron, to separate the pectoral and pelvic girdles and associated musculature from the inner surface of the plastron. When the plastron is removed, the coelomic membrane should be visible. The large pectoral muscles will be evident, attached to the flat, triangular coracoid, and the elongated acromion process of the scapula.

Prior to entering the coelom, consider the general layout of the viscera to determine an appropriate point of entry. If obvious coelomic fluid is visible, collect this by centesis prior to entering the coelom. There are two bilateral paramedian veins that run longitudinally within the caudal coelomic membrane. These vessels can be avoided or ligated if desired, but this is not essential. When incising the coelomic membrane it is best to elevate it away from the underlying viscera. Since the urinary bladder of chelonia may be very large, it is easy to unintentionally lacerate the bladder during coelomic entry. This will immediately fill the coelom with non-sterile fluid. The coelomic membrane incision is extended anteriorly to the pectoral girdle. The pericardium is generally attached to the coelomic membrane just anterior to the liver, just deep to the the coracoid. Consider pericardiocentesis if desired. A moderate amount of clear, colorless pericardial fluid may be normal in turtles (eg, 1–2 mL for a 1-kg turtle). Incision of the pericardium will expose the two atria and single ventricle of the heart. The incision is continued cranially along the skin of the ventral neck to expose the trachea and esophagus. In larger turtles, careful dissection will allow exposure of the thyroid at the base of the heart, and thymus along the ventral neck. If possible, the heart and great vessels should be dissected to evaluate the endocardium, valves, and any intravascular parasites.

Initially, the most obvious ventral coelomic viscera will be the liver, urinary bladder, and heart. The bladder is bilobed in most cases, and may be extremely large. It can be reflected caudally or removed at the discretion of the clinician. The sequence of visceral examination, and timing of organ removal is a matter of preference, but should generally follow methods used for other vertebrates. The gallbladder will be found on the right caudal dorsal surface of the liver. The liver may be removed to permit better visualization of the gastrointestinal tract. The esophagus generally courses along the ventral medial or ventral right side of the neck, before coursing left toward the stomach. In sea turtles, the esophagus is lined with numerous, conical papillae. The stomach is similar to that of the dog or cat, beginning on the left, and exiting at the pylorus on the right. The duodenum and associated pancreas are also similar to dogs and cats. The spleen is a red to purple globoid structure found on the right side, deep to the duodenum, suspended within the mesentery. The large intestine has the typical ascending (right), transverse, and descending (left or midline) components, and is often gas filled.

After removal of the digestive tract, liver, and bladder, the major remaining organs will be the gonads, kidneys, and lungs. The paired, dorsal, caudal gonads are identified easily in sexually mature turtles. Ovaries will generally contain numerous yellow follicles, while testes are elongated to ovoid and have a smooth tan to yellow surface. The gray to black epididymis is found attached to the posterior pole of the testicle. The kidneys are located in the most caudal, dorsal aspect of the coelom, and are actually retrocoelomic in most species. They can often be palpated just lateral to the colon, caudal to the gonads. Incision of the coelomic membrane will expose the roughly triangular kidney. The lungs are tightly adhered to the carapace and extend virtually the entire length of the carapace. They are relatively thin, membranous structures with relatively little parenchyma. The cut surface of the lung has a pink, honeycomb-like appearance. In large turtles, the adrenal glands may be identified along the cranial aspect of the kidney.

If clinical signs or diagnostic imaging results demonstrate other locations of interest, those sites should also be dissected (eg, osteolytic lesions of joints, caudal paralysis) Specific bones, shell, joints, muscle, spinal cord, etc. may warrant investigation. Bone marrow may be evaluated by submitting long bones, the bridge of the shell, or the jaw. The head of the turtle must be
thoroughly examined. In small turtles, the entire head may be submitted intact for histopathology. In larger turtles, a variety of tissues, including the brain, eyes, ears, nasal cavity, tongue, and oral mucosa should be harvested.

Common gross pathology findings in chelonia include hepatic lipidosis, cachexia, granulomata, abscesses, oral or lingual plaques, cystic calculi, retained eggs, egg-yolk coelomitis, gout, gastroenteritis, and parasites. However, in many cases, no gross lesions are seen. Histopathology, microbiology, virology, parasitology, and molecular techniques should be used to obtain a thorough diagnosis. Complete investigation often results in documentation of previously undescribed disease entities. To allow for such investigations, clinicians should develop a good relationship with colleagues that provide such services. Consultation with these individuals prior to the necropsy will ensure proper tissue collection, fixation, and storage. At a minimum, representative tissue samples should be fixed in formalin and also frozen. Frozen tissues can be used for microbiology, virology, or molecular diagnostic techniques if histopathology indicates that this is warranted.

REFERENCES