What Is Your Diagnosis?

In cooperation with

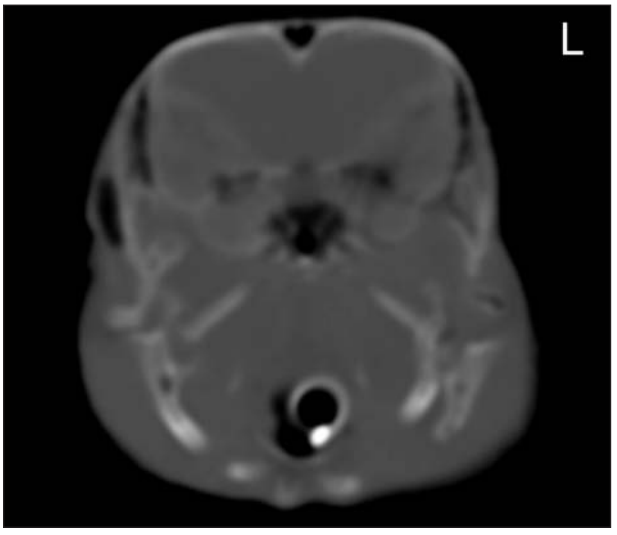

Figure 1—Computed tomographic transverse image of the skull of a > 20-year-old double-yellow headed Amazon parrot with prior trauma to the head; the image was obtained at 2-mm slice thickness and 2-mm interval with bone algorithm and is displayed in a bone window.

History

An adult (> 20 years of age) double-yellow headed Amazon parrot (*Amazona ochracephala*) was referred to the Veterinary Medical Teaching Hospital of the University of Tennessee following a cat attack 4 days prior. On the basis of radiographic findings, the referring veterinarian suspected a left mandibular fracture and referred the parrot for further imaging studies. On physical examination, the bird was anorexic, lethargic, and had a slight right deviation of the mandible. There was moderate swelling on the right side of the head associated with a puncture wound just ventral to the right auditory meatus. The bird was usually aggressive but had been reluctant to open the mouth wide enough to bite. General anesthesia was induced with 2% inhalant isoflurane in 100% oxygen and maintained between 2% to 3% during imaging. Radiographs of the skull revealed a left mandibular fracture; computed tomography of the skull was obtained to further characterize the extent of trauma (**Figure 1**).

Determine whether additional imaging studies are required, or make your diagnosis from Figure 1—then turn the page →

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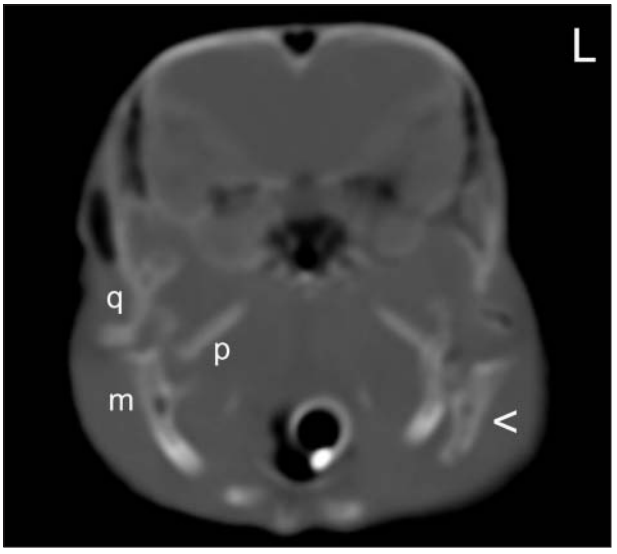

Figure 2—Same computed tomographic image as Figure 1. The right temporomandibular joint is normal (m = mandible; q = quadrate bone; p = pterygoid bone). There is a left mandibular fracture, with a large fragment (arrowhead) lateral to the normal mandible. Loss of the normal joint symmetry is evident. The normal left quadrate bone is not visible, suggesting a fracture.

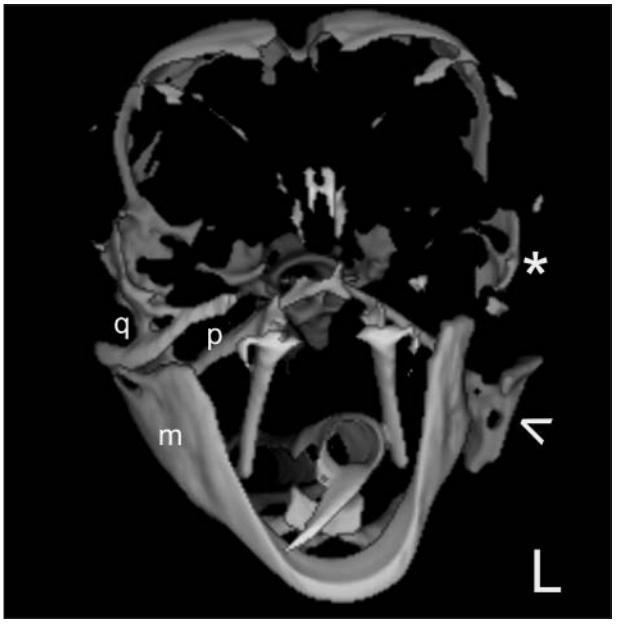

Figure 3—Three-dimensional reconstruction of the computed tomographic study. The image is viewed in a rostrocaudal direction (as if looking inside the beak). The left mandibular fracture is displaced ventrally and laterally (arrowhead). Several fracture fragments are seen in the expected location of the left quadrate and temporal bones (asterisk). *See* Figure 2 for key.

Diagnostic Imaging Findings and Interpretation

The right mandible is normal. There is normal articulation between the right hemimandible ventrally, the quadrate bone dorsally, and the pterygoid bone medially, with well-defined joint space (**Figure 2**). On the left side there is mild soft tissue swelling and asymmetry of the quadrate bone and hemimandible. A fragment of the left hemimandible is displaced laterally and ventrally, with the mandible displaced dorsally. There is disruption of the normal joint space between the left hemimandible and quadrate bone (**Figure 3**). Additionally, the normal orientation of the temporal bone and quadrate bone is disrupted, indicating a fracture of both these bones.

Comments

Anatomy of the avian skull is complex, making imaging studies difficult to interpret. The suture lines in the avian skull close early in life, making the cranium appear as a single bone. Furthermore, birds have thinner bone cortices and a greater number of bones in the skull, compared with mammals. Other factors that influence image interpretation include a high degree of pneumatization in avian bones,[1] the presence of large sinuses in the skull, the quadrate bone articulating with 4 other bones, the superimposition of multiple bones on one another, and the small size of the skull in many birds.[1,2] To our knowledge, no detailed studies of normal computed tomographic appearance of the skull in birds are available.

Unlike mammals, birds possess the ability to move the rostral maxilla (upper beak) dorsally and cranially in a process called prokinesis. This process is made possible by the coordinated movement of 4 bones: the zygomatic arch and the palatine, pterygoid, and quadrate bones. Rostral rotation of the quadrate bone pushes the pterygoid and palatine bones and zygomatic arch cranially, causing the upper beak to swing dorsally and cranially. The craniofacial joint of parrots, a true joint between the upper beak and the brain case, allows even greater mobility of the upper beak.[3] Psittacines in particular have a mobile craniofacial joint. The quadrate bone is crucial in allowing this increased mobility. It articulates with the premaxilla via the jugal arches and the pterygoid-palatine bone and with the mandible via the mandibular articular process.[3–5] If the quadrate bone is fractured, the bird will have difficulty opening the mouth. Because of its complexity, articulations of the quadrate bone are difficult to evaluate on survey radiographs. Computed tomography is optimally suited to image the avian skull as it provides cross-sectional images that permit discrete evaluation of skull anatomy and is capable of multiplanar and 3-dimensional reconstructions. In this case, the 3-dimensional reconstruction confirmed the mandibular and quadrate bone fractures and allowed identification of the temporal fracture.

Skull fracture repair is difficult because of the flat nature of skull bones. Mandibular fractures are usually stabilized and repaired, depending on their location.[1] However, in this case, because of the fracture location in close proximity to the temporomandibular joint and the quadrate and temporal bone fractures and the risk of further destabilization of fracture fragments during surgery, a conservative approach was chosen. While the bird was under general anesthesia, an esophagostomy tube was placed. The following day, the parrot was more active and attempted to eat on its own. Two weeks later, when the parrot was eating well without assistance, the esophagostomy tube was removed. Ten months later, the bird was doing well and was able to crack sunflower seeds and eat hard foods. However, it remained unable to open the beak wider than 50% of the normal aperture.

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