IMAGING THE ORBIT: PROS AND CONS
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While radiography offers limited usefulness in assessing orbital and periorbital abnormalities, tomographic imaging such as ultrasound, CT and MRI produce images in thin slices - eliminating tissue superimposition - and are more accurate for soft tissue lesion detection and characterization. The rational use of these modalities requires an understanding of their advantages and limitations.

Ultrasound (US)
1. Technique: The orbit is generally examined with a high frequency (>8MHz), convex or linear probe, gently placed over the cornea, desensitized with topical anesthetic. Transpalpebral examination can also be performed, especially if corneal ulceration is present, but is associated with more artifacts. The contralateral orbit is routinely examined for comparison.

2. Pros: US is readily available and cost-effective when compared to CT and MRI. US is performed without anesthesia most of the time, which represents another important advantage over CT and MRI. US performs well for assessing ocular trauma and determining the integrity of the lens (shape and position), vitreous body, retina and sclera. It is the technique of choice for detection of retinal detachment and is sensitive for detection of intraocular soft tissue infiltrations. US can also be used to investigate the presence of a retroorbital mass, abscess and/or foreign body. Abnormalities of the optic disc and nerve, such as optic neuritis (Fig. 1) can also be detected with US. Periorbital lesions, such as bone tumors and salivary gland disease can also be assessed, at least partially. Finally, US allows fine-needle aspiration of suspected lesions.

3. Cons: US is operator dependent. Familiarity with the technique of examination and anatomy is primordial. Pitfalls exist, particularly when evaluating the retroorbital space, potentially leading to erroneous diagnoses. US transmission is also limited by the presence of bone. Thus, the extent of retroorbital masses is not adequately assessed with this modality.

Computed tomography (CT)
1. Technique: Thin collimations (1-3mm) are typically used, unless a large mass is suspected. Bone and soft tissue algorithm permit adequate assessment of bone implication and soft tissue characteristics, respectively. Post-contrast images are acquired and images are viewed in bone and soft tissue window/level settings. Dorsal, sagittal and oblique plane reformat are useful in better defining the extent of lesions.
2. *Pros:* CT has become available in most referral centers. While it typically requires general anesthesia, sedation can also be sufficient with fast multi-detector row scanners, particularly if only the head is examined and if contrast medium is not administered. This can be beneficial for a traumatized animal. Nonetheless, anesthesia for CT is much quicker than for MRI. CT is also recognized for its great capacity to assess bone, but can also evaluate soft tissues efficiently, especially when post-contrast images are acquired. The extent of peri- and retroorbital masses can be determined, and the involvement of regional bony structures is clearly depicted (Fig. 2 - chondrosarcoma). Ocular hemorrhage and rupture can usually be detected. Finally, complete body scanning may be performed at the same time when neoplasia is suspected, and CT can be used to guide fine-needle aspirations or biopsies.

3. *Cons:* Soft tissues details are not assessed as well as with US and MRI. While ocular trauma can be detected, it may be difficult to detect retinal detachment unless retroretinal hemorrhage is present. Abscesses can be detected, but some foreign bodies may not be recognized as easily as with US and MRI. The optic nerve and disc are not easily recognized, unless enlarged and contrast enhancing.

*Magnetic resonance imaging (MRI)*

1. *Technique:* 3-5mm slices obtained in transverse, dorsal, sagittal +/- oblique planes are required for proper examination of all orbital and periorbital structures, including the optic nerve and chiasm. Several sequences are performed and fat saturation techniques are recommended, particularly when optic nerve abnormality is suspected.

2. *Pros:* MRI is the modality of choice for accurate detection and characterization of soft tissue abnormalities. Using appropriate imaging sequences and planes, the orbit as well as retroorbital and periorbital structures are well assessed (Fig. 3 - meningioma). Foreign bodies and the associated inflammatory reaction are more easily detected than with US and CT. Intraocular and intracranial invasion is also more easily recognized in case of neoplasia or infectious processes. MRI is the modality of choice for evaluating the optic nerve and chiasm.

3. *Cons:* MRI is mainly limited by its cost, its availability and the necessity for longer anesthesia time. Subtle bone involvement may also be missed, depending on the image spatial resolution and type of imaging sequences. Complete body imaging is more difficult to perform as opposed to CT.