Dental diagnostics: Equine dental radiograph techniques

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Radiographs are critical to the diagnosis and treatment of many dental abnormalities and diseases. There are a variety of imaging techniques which are important to understand when considering diagnosis of equine dental disease. This presentation will focus on the common modalities utilized when diagnosing and treating dental disorders in the horse. When performing the oral examination it is important to either use a mirror or an oral endoscope to better examine the dental and soft tissue structures of the oral cavity. The oral endoscope allows for significant advantages over the dental mirror when examining the occlusal surface of the teeth and will also allow images to be saved and stored in the patient files. Dental radiographs, when performed correctly can be helpful to making a definitive diagnosis as well as ensuring resolution of disease or ensuring dental extraction is complete when performed. Nuclear scintigraphy can be used when diagnosing dental disease and is sensitive, although not specific. Computed Tomography (CT) can be very helpful in making a diagnosis of dental disease, as well as developing a plan for treatment. CT will allow for a 3 dimensional construct which aids in overall understanding of the pathology.

We have to be cognizant of radiation safety anytime we work with radiation. It is imperative that lead gowns, thyroid shield and gloves are worn, that no one is standing in the direct beam and that the generator is collimated appropriately. The portable unit utilized for dental radiography provide low exposure, but radiation safety is of primary importance.

When taking equine dental radiographs, five different regions must be considered. The incisors and canine teeth can be captured in one region and to obtain quality radiographs these films should be intraoral radiographs. The other regions include the maxillary cheek (right and left) teeth and the mandibular cheek teeth (right and left). When considering cheek teeth radiographs the focus can either be on the apical aspect of the tooth to examine the root system or on the occlusal surface with an open mouth view. The other area of interest are the sinuses, which are important, as sinusitis secondary to dental disease is not uncommon.

The indications for dental radiography include a nasal discharge, either unilateral or bilateral, foul odor from the nose or mouth, fascial swelling, quidding, a draining tract, crown abnormalities, infundibular caries or pulp exposure. In order to obtain the highest quality radiographs it is important to take the time to properly prepare the patient. Sedation will facilitate the best radiographs in most patients, allowing high quality images, with the least motion and most efficiency. Removing the halter will reduce artifact on the radiographic images. Using a headstand can reduce the patient movement. It is important to place a dental speculum for dental radiographs when working to obtain images of the occlusal surface of the cheek teeth.

When taking incisor or canine radiographs the optimal technique is obtained by placing the cassette in the mouth. This obviously puts the radiograph plate at risk for damage so extreme care must be taken. It is best to heavily sedate the horse to avoid chewing and there are mouth guards designed to protect the plate during intraoral radiographs, which are recommended. The mouth guard can be as simple as a small piece of PVC pipe or a block of wood. The technique utilized for intraoral incisor or canine radiographs is low exposure and the plate is pushed as far distal into the mouth as is possible. It can sometimes be best to place the corner of the plate in the center of the mouth allowing the film to...
be placed slightly more distal. The radiograph beam is then angled approximately 60° to 80° from the dorsal plane and centered on the Triadan 01s, unless an oblique film is desired.

Cheek teeth projections are important to equine dental radiography. It is important to be complete and accurate when taking these radiographs as they will often determine the treatment plan. The complete dental series would include the lateral projections, a 30° Left Lateral Oblique, 30° Right Lateral Oblique, 35°-45° Right Mandibular Oblique, 35°-45° Right Mandibular Oblique, and a dorso-ventral view. When taking a lateral projection the beam must be focused dorsal to the facial crest at approximately the level of the first molar tooth. This image will allow visualization of fluid lines and abnormalities of maxillary and frontal bones and sinuses. Position the horse with the lesion to the cassette. The cassette is held in vertical plane, parallel with the dorsal aspect of the head with zero film subject distance. The primary beam should be horizontal and perpendicular to the long axis of the head. For maxillary cheek teeth center the beam dorsal to the rostral aspect of the facial crest. The lateral view will be taken with the plate and generator shooting directly across the skull and must include all cheek teeth as well as the sinuses. In this view all of the roots will be superimposed over one another making it impossible to distinguish one side from the other. This is the best view to images the sinuses, most notably the maxillary and frontal sinuses, and if a sinusitis is present the fluid line will be obvious on this view. It is important to remember there should be zero film subject distance. The beam should be centered just dorsal to the facial crest.

Right lateral

When evaluating the individual cheek teeth it is important to be proficient with the oblique images of both the maxillary and mandibular arcades. The oblique images will separate the structures and allow evaluation of the right side separate from the left side. This technique alleviates the issue of superimposition, especially of the root structures. The oblique view provide the best views of the apices of the cheek teeth as well as assisting in localizing sinus lesions.
This is an image of the 30° left lateral oblique. In this image the generator is located on the right side of the horse and the plate is flat against the left side of the horse's head. The generator beam is angled 30° from the lateral plane, and the back of the generator is angled slight toward the tail of the horse for best alignment. The person holding the horse and the person holding the plate are not standing in the direct beam and don the appropriate protective gear.

The mandibular oblique images can be technically more difficult to obtain due to the differing angles. Higher exposure is needed on the caudal mandibular cheek teeth as it is harder to penetrate the overlying thick masseter and pterygoid muscles. A greater angle is used for the caudal cheek teeth apices because these are positioned more dorsally within the mandibular bone.

The dorsoventral projection will allow evaluation of maxillary and mandibular fractures, sinuses, nasal cavity, nasal septum, bony distortion can be noted, from fractures, inflammatory conditions or periapical infections, sinus masses can be evaluated as well as displaced or fractured teeth.
The open mouth film, which will better allow the veterinarian to evaluate the occlusal surface is taken with a speculum in place with significantly less angle. Instead of the 30° angle necessary for the lateral oblique, on a 10°-15° angle is necessary to highlight the occlusal surface.

The open mouth view allows better evaluation of the erupted crowns, alveolar crest, diastema which may be present, and any abnormalities of wear, such as wave mouth. This image can also be useful after extraction to ensure all dental fragments have been removed.

Intra-oral oblique projections can provide a higher quality image, with no superimposition and greater detail of both the alveolar bone as well as the interdental space, but there are also multiple disadvantages. The main disadvantage is that intraoral cheek teeth projections require a specific and separate radiograph plate and is currently not available with the digital radiograph systems. The intraoral films are difficult to place, and if not heavily sedated the horse will often chew while the plate is in place, making it difficult to acquire the image without motion.

Computed Tomography, or CT will provide the best imaging when evaluating dental disease. There is excellent cross sectional detail, no superimposition, treat bone/soft tissue contrast and the three dimensional constructs can be extremely helpful when planning treatment. CT is becoming
increasingly available and is very helpful when diagnosing dental fractures, apical infections, neoplasia, sinus disease and other conditions effecting the equine dentition.

References:
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