Intraoral radiology is an essential tool in the diagnosis and treatment of dental problems. It is perhaps the tool that separates mere “cleaning and pulling” from more comprehensive veterinary dentistry. There is no better way of visualizing the usually hidden roots of teeth and the intricate bones of the mandible and maxilla. It is only through the proper visualization of these orodental structures that accurate diagnosis, treatment plan, and prognosis can be determined.

There are two main positioning techniques for intraoral radiography. The first is the parallel technique and it is the easier of the two. It can only be employed when the long axis of the object to be radiographed (the tooth root) and the film are parallel to one another. This occurs primarily with mandibular premolar and molar teeth. The film or digital sensor is placed as close to the object as possible and the x-ray beam is directed perpendicularly to the dental film. With minimal practice this technique can be mastered.

The second technique is the bisecting angle technique and requires more practice to become proficient. This technique is employed when the object to be radiographed (the tooth root) and the film are not parallel to one another, such as maxillary teeth and mandibular canine and incisor teeth or maxillary premolar and molar teeth. The dental film or digital sensor is placed as close to the object as possible, however, because the film and the long axis of the object are not parallel, an angle exists between film and tooth root. This angle is bisected with an imaginary line and the x-ray beam is directed perpendicularly to this line of bisection. With practice and a proper understanding of the underlying anatomy, this technique becomes much easier.

A helpful auxiliary positioning technique is the tube head shift technique. This is employed in conjunction with the bisecting angle technique in multirouted teeth, such as the maxillary fourth premolar tooth. Because the maxillary fourth premolar tooth has three roots, it is common for the mesiobuccal and palatal roots to be superimposed upon one another. The purpose of the tube head shift technique is to separate these superimposed roots to allow for individual assessment. When using a dental radiographic unit the tube head is merely angled in a more mesial or more distal position, with all other settings the same. This technique can also be accomplished with a standard radiographic machine, but it may be easier to move the patient instead of the tube head.

By making this slight shift in angle, the previously superimposed roots will be separated. To determine which root has moved into which new orientation, the SLOB rule is employed. The SLOB (Same Lingual – Opposite Buccal) rule helps to remind the dental operator that when the tube head is shifted mesially, the lingual or palatal root
will also be shifted mesially (in the same direction as the shifted tube head) on the developed film and the buccal or mesiobuccal root will be shifted distally (in the opposite direction as the shifted tube head). Should the tube be shifted distally, the converse is true. A useful demonstration is to imagine this technique on the legs of a table. Position yourself with the table legs at eyelevel and the front and rear legs in line or “superimposed.” Move slightly to the right and observe the relative change in the position of the legs. The rear legs should appear to have moved to the right, compared with the front legs, just as your line of vision did.

The first step of intraoral radiographic interpretation is to determine if the correct positioning has been achieved. If you cannot fully assess the image or if a critical portion of a structure is cut off with this view, another intraoral radiograph should be taken to improve readability. A radiograph taken to assess the endodontic health of a tooth that does not include all of that tooth’s roots and their apices with at least 3-5 mm of periapical bone is not a complete radiograph and should be retaken. Likewise, a radiograph of a multirooted tooth with superimposed roots may need to be retaken with the tube head shift technique.

The next step of intraoral film interpretation is accurate orientation of the film and imaged structures. Orient the image of maxillary teeth with their roots pointing upward, just as in the standing patient. Likewise, orient the image of mandibular teeth with their roots pointing downward, as in the standing animal.

It is helpful to understand the normal radiographic appearance of the oral cavity so that pathology can be readily appreciated when it exists. The enamel of the tooth crown is usually the greatest radiographic density, except when metallic restorations or orthodontic appliances are present. The dentin is also fairly dense and makes up the majority of the tooth’s crown and root. The pulp cavity is the radiolucency inside of each tooth and decreases in diameter as the vital tooth matures, making the root walls thicker.

The bony walls of the alveoli are normally represented radiographically by a dense line of bone known as the lamina dura. The alveolar crestal bone should normally be at the level of the neck of the tooth, the junction of the crown and root. The periodontal ligament joins the root of a tooth to its alveolus and this appears as a radiolucent line sandwiched between the lamina dura of the alveolus and the radiodense root structure.

One of the most important radiographic signs of advancing periodontal disease is bone loss. Crestal bone may be lost between two teeth or bone may be lost from the furcation of a multirooted tooth. When bone is lost around a particular root it is characterized by either horizontal bone loss or vertical bone loss. Horizontal bone loss is associated with suprabony periodontal pocketing and is an even drop in the height if alveolar crestal bone. Vertical bone loss, associated with infrabony periodontal pocketing, is an uneven drop in the level of alveolar crestal bone resulting in a walled bony defect. Radiographic signs of bone loss should be correlated with clinical probing depth findings.

Intraoral radiography is commonly used to assess teeth for endodontic compromise. The diameter of the pulp cavity of a suspect tooth should be compared to the same tooth type on the opposite side of the mouth. If, for example, a radiograph of a discolored maxillary right canine tooth in a five-year-old dog revealed a large diameter pulp cavity as compared with the maxillary left canine tooth, this would indicate pulpal death of the maxillary right canine tooth.
Other radiographic signs of endodontic compromise include: widening of the apical periodontal ligament space, periapical lucency, and internal or external root resorption.

Endodontic disease is impossible to accurately diagnose and appropriately treat without intraoral radiography. Although clinical appearance and clinical judgment are very important in comprehensive dental care, they should always be exercised in association with appropriate diagnostic imaging modalities. A fractured tooth with obvious pulpal exposure is always a significant finding, but those suspicious and perhaps less obviously affected teeth demand the kind of further investigation that only quality intraoral films can provide. Standard films taken with a standard radiographic unit cannot offer the clarity and detail that is needed to make individual tooth decisions.

It is also extremely important to radiograph all teeth to be extracted, especially feline teeth with tooth resorption. Radiography can provide valuable information about the root or roots of a tooth, such as root fracture, ankylosis, or root replacement resorption. Root ankylosis appears radiographically as a loss of the periodontal ligament space and a loss of distinction between the root and surrounding alveolar bone. Root replacement resorption takes on a moth-eaten appearance radiographically. In cases of tooth resorption radiography can be exceptionally helpful to determine the proper treatment for the cat. If one or more roots are resorbing, then they may be intentionally retained, thus avoiding undue and unnecessary trauma to the patient.

This technique of intentionally retaining resorbing roots is only intended for teeth with tooth resorption that have resorbing roots which have been radiographically documented. If a root shows no sign of resorption or ankylosis, it still should be removed entirely, especially if endodontically diseased. That is the only way of being certain that it will not be a problem in the future.

Intraoral radiography should always be considered for any extraction. Preoperative films will provide the clinician with valuable warning signs of any potential pitfalls to the procedure so that they can be deftly avoided. This preoperative film also serves as a baseline to compare to should any complications occur during the extraction, such as root fracture or jaw fracture. If a root is suspected of having fractured, rather than digging wildly to retrieve it and causing a worse problem, the clinician should first get an intraoperative film and compare it to the preoperative film. This allows the root tip to be properly located and provides a map for getting the fragment out with the least amount of trauma. In some cases the root fragment may be found in the nasal cavity or the mandibular canal and an intraoral radiograph may help in making the decision of whether to continue the procedure or to refer the case to a dental specialist for further treatment. There is perhaps no better assurance of complete tooth extraction than a postoperative radiograph and it is always strongly encouraged.

Another great use of intraoral radiography is in the assessment of oral masses. Bony proliferation and/or destruction can be helpful in determining staging, treatment plan, and prognosis of oral neoplasia. All unexplainable areas of intraoral or facial swelling should be radiographed, especially edentulous areas. It is always safest to assume that an edentulous region of the mouth conceals an unerupted tooth and a potential problem until it can be proven otherwise. Many of these unerupted teeth will go on to become dentigerous cysts or odontomas.
Periodontal disease is a complex and sometimes confusing disease to treat appropriately. Treatment decisions such as whether a tooth should be extracted or if it can be saved need to be done on a case-by-case and tooth-by-tooth basis. Indicators such as clinical appearance, mobility, probing depths and client willingness and ability to comply with ongoing homecare recommendations all play a role in the decision making process. However, intraoral radiography is a necessary tool for investigating the extent of bone loss is periodontal disease.

Without intraoral radiography the clinician is unable to make informed decisions regarding the full scope of disease present. It is possible that teeth that could be saved will be needlessly extracted due to over exaggeration of the destruction present. However, more probable and even more detrimental to the patient’s health is the scenario where horribly infected teeth are left within the mouth, without proper treatment, because they are still fairly solid. Many times a two-rooted tooth will have one root more affected that the other. One root may be so diseased as to have the apex consumed by infection, causing a secondary infection of the pulp cavity. If the other root is still fairly solid, the clinician may feel that this is a tooth that needs to further treatment that the routine cleaning, based on clinical inspection and palpation alone. It is only through intraoral radiography that the true scope of periodontal destruction can be appreciated.

It has been suggested by some that every animal should have full mouth radiographs, because so many oral problems evade gross clinical inspection. Many problems are only full discovered when the patient has received the necessary intraoral radiographs. The oral exam is not complete without radiographs, especially when it comes to the detection of tooth resorption in cats. It takes training and practice to master the full mouth series on the dog and cat, but it can be performed consistently on veterinary patients receiving routine dental cleanings without adding significant anesthetic time for the patient.

It is only through the consistent and frequent use of this tool that the veterinary dental team becomes proficient in the taking and interpreting of intraoral radiographs. The more films that are taken in a practice, the more understanding of dental disease that is gained, and the more patients benefit from accurate diagnosis and timely treatment. This is a tool that no veterinary practice should be without and fortunately, with the relatively low cost of equipment and supplies it truly is a tool that can pay for itself in a short period of use.