VETERINARY ENDODONTICS

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Sophisticated dental care for dogs and cats has been a growing trend in the United States and other countries since the mid-1970s. Treatment of the dental pulp, broadly termed endodontic therapy, is being performed by a rapidly growing number of general practitioners.

Injuries of the dental pulp

Endodontic therapy is the treatment of the dental pulp. Dental pulp consists of blood vessels, nerves, and connective tissue that support odontoblastic cells and provide internal sensory and metabolic function to the interior of the teeth. The pulp is the innermost part of the tooth. It fits snugly within and is protected by the strong dentinal layer of the tooth, just as the brain fits snugly within and is protected by the calvarium of the skull. The functional cells of the pulp are the odontoblasts, which produce dentin throughout the life of the tooth, creating a progressively thickened dentinal wall. Common injuries of the dental pulp include traumatic injuries due to concussive shock, thermal injuries, and infectious injuries.

Indications for performing endodontics

Endodontic treatment is indicated to preserve a tooth when: A fracture of the crown exposes the pulp chamber or the root canal. A carious erosion has perforated either the pulp chamber or the root canal. A pulpal injury is present that results in hemorrhage or necrosis either in an open or a closed pulp canal. A pulpal or periapical abscess of the tooth is present. An iatrogenic insult to the pulp has occurred during a restorative or dental procedure. Periodontal disease extends to the apex, resulting in an ascending pulpal infection. A tooth root experiences an interrupted and incomplete development.

Rationale for endodontic treatment

Optimum health for a dog or cat requires the proper functioning of every system in the body. The mouth is the beginning of the alimentary system. If there is pain or infection in one or more teeth, the dog or cat may be irritable, it can potentially endanger people and other animals. If the dog or cat is not eating well, its health will
be compromised. Moreover, a pet with an infected mouth poses a potential public health problem because pathogenic bacteria can be transmitted to family members who are licked on the face or sneezed on. Of lesser but still significant importance, a dog or cat may be shunned or banished from contact with family members because it has halitosis secondary to infection.

Endodontic therapy is much less invasive than surgical extraction of a large canine or carnassial tooth, and so it is an easier and quicker procedure to perform. Standard root canal therapy is less traumatic for the patient and more aesthetically pleasing to the owner than surgical extraction. The cost of root canal therapy is similar to that of surgical extraction. Another advantage of small animal endodontics is that because the patient has a relatively short life span, a well-done procedure is less likely to fail in the pet’s lifetime.

Though a general anesthetic is required for patients undergoing endodontic therapy, pretreatment laboratory testing and the new, individualized, safer anesthetic protocols using various preanesthetic agents in combination with isoflurane or sevoflurane have reduced tremendously the risk of anesthesia. If a tooth is dead or fractured with an open pulp chamber, the practitioner’s alternatives listed in order of desirability, are endodontic treatment, and tooth extraction. If a clinic is unable to provide needed treatment, clients appreciate their practitioner’s referral to a practice that can. This shows concern beyond standard veterinary care.

If the client cannot afford endodontic therapy for the patient or does not perceive that the patient is in pain or in need of medical help, the client may decline therapy. In such a case, renewed efforts for more effective communications should be made on the behalf of the patient for therapeutic action.

**Endodontic techniques**

Because the primary teeth of dogs and cats are exfoliated early in life, almost all endodontic treatment is performed on adult teeth. The methodology of treatment varies according to the duration and the severity of the injury or infection, the stage of the tooth’s development, the intended oral function of the tooth, the wishes of the client, and the ability of the clinician. The following sections are brief descriptions of the endodontic procedures for infected, fractured, or endodontically dead teeth.

**Vital pulpotomy** is indicated for recent fractures to preserve the dental pulp in a healthy state. This procedure is indicated within 48 hours of the fracture of a mature tooth. This time period can be extended to two or three weeks after the fracture of an incompletely developed adult tooth. In such a case, the young tooth will, it is hoped, develop a thicker and stronger dentinal wall during the extended time period, even if persistent infection later necessitates standard root canal therapy. A vital pulpotomy is performed by removing the exposed, contaminated pulp and gently disinfecting the remaining pulp and access site, calcium hydroxide or mineral trioxide aggregate (MTA) is placed to stimulate the formation of a dentinal bridge, and a composite restoration is placed.

**Indirect pulp-capping** is a restorative procedure performed when the preparation of a carious lesion does not penetrate the pulp, but is perilously close (0.5 mm) to it. For such incidences, a therapeutic and insulating base layer of quick-setting calcium hydroxide paste is installed to protect the pulp. It is followed by the preparation for and the installation of an appropriate surface restoration.

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**Standard root canal therapy** (formerly called conventional root canal therapy) is also known as a pulpectomy. In this procedure, the pulp canal is approached in a normograde direction (from the crown to the apex). The entire pulp is removed through either the fracture site or one or more drilled access holes. Standard root canal therapy is indicated for adult teeth that are discolored and endodontically dead or that have been contaminated with long-standing infection. In a mature tooth, a long-standing infection is one in which the pulp
has been contaminated for more than 48 hours. In an immature tooth, long-standing infection means that the pulp has been contaminated for over two weeks. Briefly, the essence of a standard root canal procedure is to make an appropriate access to the pulp through the crown, remove all the pulp in the tooth, and debride and shape the root canal to remove any overhangs. The root canal is then disinfected, dried, and obturated (filled) with a disinfectant root canal sealer (zinc oxide and eugenol cement). It is then filled with material (e.g. gutta-percha points) to seal the apex and the walls of the canal. Finally, the access site is filled with a quick-setting, hard restorative material.

Apicoectomy (retrograde or surgical) root canal therapy is indicated for peracute pulpal infections. Additionally, it is indicated as a treatment following the failure of standard root canal therapy. It is also indicated when anatomic or mechanical problems that prevent the completion of an adequate seal of the apical one-third of the root canal are encountered during standard treatment.

Apicoectomy is performed on adult teeth in dogs and cats following standard root canal therapy by approaching the apex of the root surgically through the alveolus. This procedure is required infrequently in small animals, but it has a high rate of success in treating difficult cases where greater access and visibility are required.

Tooth extraction is performed as an alternative to endodontic therapy. Tooth extraction removes infection and relieves pain at the same time. Teeth can also be extracted in cases of combined periodontal/endodontic involvement when the extent of periodontal involvement is such that the tooth cannot be stabilized in its socket.

**Simplified Steps for Conventional Endodontics**

1. Radiograph to evaluate appropriateness of therapy
2. Access the canal
3. Place small file and radiograph to evaluate length
4. File the canal with successively larger endodontic files
5. Clean and disinfect the canal while filing
6. Radiograph to make sure
7. Dry the canal
8. Place endodontic sealer in canal
9. Obturate canal with gutta percha
10. Prepare the access site(s) for restoration
11. Restore the access site
12. Optional: crown therapy

**Conclusion**

In most cases, endodontic therapy is a less invasive, more satisfactory solution than extraction from the viewpoints of the client, the patient, and the clinician.