THE ABC'S OF VETERINARY DENTISTRY: A IS FOR ANAESTHESIA MONITORING, ATTRITION AND ABRASION

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THE START OF AN ALPHABETIC JOURNEY THROUGH THE MANAGEMENT OF OUR VETERINARY PATIENTS' ORAL PROBLEMS BEGINS WITH AN 'A'. OUR ALPHABET CONSISTS OF 26 LETTERS, FROM A TO Z, AND FORMS THE FOUNDATION FOR MILLIONS OF WORDS. I'VE NARROWED THE LIST DOWN TO 26 THAT RELATE TO DENTAL CARE IN PETS. IN THIS SERIES OF ARTICLES, WE BEGIN WITH 'A' FOR ANAESTHESIA MONITORING, ATTRITION AND ABRASION AND FINISH WITH 'Z' FOR DENTAL ZEBRAS. I INVITE YOU ON THE JOURNEY THROUGH THE ALPHABET ON OUR QUEST TO DO THE BEST DENTISTRY FOR OUR VETERINARY PATIENTS.

Last week, I was fortunate enough to visit the dentist and have my teeth cleaned. Like most people, I reclined in the dental chair, chatted to the dental hygienist, opened my mouth as wide as I could and stared vacantly at the posters on the roof, almost falling asleep; except she tried to engage in conversation whilst probing my sulci, charting my mouth, scaling and polishing my teeth, and suctioning under my tongue. Not to mention pushing a digital sensor into my delicate vestibule and asking to stay still and motionless while they zapped a radiograph on a previous restoration. Phew - no cavities. I was free to escape. On my way back to the veterinary clinic to see my afternoon patients, I pondered anaesthesia-free dentistry and thought 'How could I implement this technique into my daily routine?' If only my patients didn't need general anaesthesia. Well that thought was brief, as my first referral consult for the afternoon was a cat that came with teeth and claws, ready for a fight. I didn't get to chart, probe, take a radiograph or even have a look in the mouth. So I recommended a COHA (Comprehensive Oral Health Assessment) under general anaesthesia, as it wasn't worth the fight. General anaesthesia in our patients is needed to thoroughly clean, polish and examine the teeth and oral cavities in our patients.

Unfortunately, this is a common scenario in our daily practices, and even if the pet is compliant, who wants to battle a moving target, especially one that can damage your equipment and fingers in a second. A second issue is that many of our clients are so worried about anaesthetising their pets that proper care is often declined. How can we allay our clients' fears? Well, the best way is to share with them the efforts you take to make anaesthesia as safe as possible. This is done by choosing the right patient for anaesthesia through a complete physical examination, taking a complete history, performing preoperative blood/urine testing, using intravenous fluids at the correct rate, tailoring the anaesthetic protocol to the individual patient and using the appropriate anaesthetic agents along with monitoring the anaesthesia before, during and after the procedure.

ANAESTHETIC MONITORING

Consistent and close patient monitoring is paramount during and after anaesthesia.

The American College of Veterinary Anesthesiologists (ACVA) recommends monitoring for:

- Circulation - Ensure that blood flow to tissues is adequate; measured via blood pressure.
- Oxygenation - Ensure adequate oxygen concentration in the patient's arterial blood; measured via pulse oximetry.
- Ventilation - Ensure that the patient's ventilation is adequately maintained; measured via capnography.
- Temperature - Ensure avoidance of hyper- and hypothermia, which is common in anesthetised dental patients and a source of trouble for perfusion and ventilation.

The ACVA recommends hiring a trained veterinary technician to be constantly at the patient's side. The technician monitors the physiological parameters from the patient, as well as, reading and recording the data from the electronic monitors, including significant events and trends as they occur, and their clinical expertise to manage the patient's proper anaesthetic depth. In our dental procedures, the technician records the patient's data and records its condition at least every five minutes throughout the procedure *(Figure 1)*.

Figure 1. A dental technician monitoring and recording anaesthesia monitor findings whilst the dental COHA is performed.

How to monitor

Monitoring is accomplished using subjective (e.g. clinical appearance - lack of jaw tone, pink gum colour and <2 sec perfusion time, regular femoral pulse, even and regular breathing, no eye palpebral reflex) and objective methods (e.g. electronic systems).

Electronic monitors detect non-invasive blood pressure measurement, capnography, pulse oximetry, electrocardiography and temperature. They may also detect anaesthetic complications before being recognised by a trained technician. Often, the advanced warning systems can head off problems before they become critical but as importantly they give data when recorded, which can alert the technician to changes on trends and avoid complications. Electronic monitoring systems help to provide positive patient outcomes and reduce stress during the procedure. A monitor is affordable and available through many distributors *(Figure 2)*.

Figure 2. An example of our electronic monitor used during dental anaesthesia.

ATTRITION AND ABRASION.

The mechanism of tooth development, whereby enamel formation is completed before tooth eruption, and following death of the ameloblast, ensures that there is no ability for post-eruption repair of worn or damaged enamel. In contrast, dentine production continues in vital teeth throughout the pet's life and the odontoblast has the ability to respond to external trauma, thereby providing some protection to the underlying pulpal tissues. The wear of teeth is an inevitable consequence of their evolutionary designated purpose of food acquisition, prehension and mastication, highlighted in wild animals that consume harsh and fibrous foods. Wear is also observed in domestic pets that chew inappropriate hard objects including bones, sticks, hooves and antlers, as well as, pets with behavioural or dermatologic problems that eat dirt, sand or chew their own hair and feet. Wear is also common in many domesticated breeds, when malocclusions are evident and there is tooth to tooth contact.

Dental attrition is the progressive loss of the hard structures of the teeth (enamel and dentine) caused by tooth to tooth contact between opposing teeth. The extent of the attrition depends on the type of contact and the position in the mouth (e.g. maxillary incisors contacting mandibular incisors; and the distal edge of the maxillary 3rd incisor tooth against the mesial aspect of the mandibular canine tooth) *(Figures 3 - 10)*.

Figure 3. Attrition of the maxillary and mandibular incisor and canine teeth.

Figure 4. Attrition of the maxillary left 3rd incisor tooth and mandibular left canine tooth.

Figure 5. Attrition of the maxillary right 3rd incisor tooth and mesial surface of the mandibular right canine tooth.

Figure 6. Radiograph demonstrating advanced attrition of 302, 303 and 304. Note open pulp canals and loss of alveolar bone height..

Figure 7. Radiograph demonstrating advanced attrition of 303, 302, 402 and 403 with resulting periodontal disease and loss of alveolar bone height.

Figure 8. Radiograph demonstrating attrition of 404.

Figure 9. Radiograph demonstrating attrition of 101, 201, 202 and 203 with resulting periodontal disease and loss of alveolar bone height.

Figure 10. Radiograph demonstrating attrition of 101, 102, 103 and 201.

Dental abrasion is the progressive loss of the hard structures of the teeth (enamel and dentine) caused by mechanical actions of food and foreign body contact (e.g., tooth brushing, bones, sticks, chew toys, antlers and cow hooves) *(Figures 11 - 12)*. An analysis of the cause and history of damaged enamel needs to be undertaken in identifying its initial origin.

As previously discussed, enamel does not have the capacity to repair itself once the tooth has erupted, in contrast to the dentine, which is produced continuously during the life of a vital tooth. Dentine production provides the tooth with the ability to respond to wear, and as such, when the tooth is under wear, additional dentine is produced to protect the underlying pulp tissues and prevent pulp exposure. Unfortunately, if the wear occurs quickly, adequate dentine cannot be produced, and the pulp becomes exposed. In this case, pulpitis occurs and eventually a periapical infection, osteomyelitis and tooth loss may result.

Treatment of pets' teeth with tooth wear is directly related to the cause of the attrition or abrasion and the condition of the pulp tissue.

Attrition should be treated as it relates to the degree of wear. When the teeth are significantly worn and there is no further

Figure 11. Abrasion of the left mandibular 1st and 2nd molar teeth. Note a crown-root (slab) fracture is also present on the buccal surface of the 1st molar.

Figure 12. Radiograph demonstrating abrasion of 309.

contact, the tooth should be radiographed and can be monitored if no dentine is exposed and the tooth is radiographically healthy. Repeat radiographs will ensure the pulp remains vital over the long term. When there is dentine or pulp exposure, radiographs are recommended to determine the condition of the tooth root and surrounding tissues followed by dentine bonding, a root canal procedure *(Figure 13)* or extraction *(Figures 14 - 16)*. A malocclusion found in the early stages of wear or prior to dental trauma should be treated by orthodontics or extraction of the teeth.

Abrasion should initially be treated by diagnosis of the cause, a complete oral health assessment including radiographs, followed by behavioural modification or dental treatment. Dental treatment primarily depends on whether the pulp canal is exposed and the radiographic health of the root and surrounding tissues. Treatment may include dentinal bonding or restoration, when no pulp exposure is present and the tooth root has no pathology associated with it; or root canal therapy and extraction, when there is pulp exposure and periapical pathology present.

Figure 13. Radigraph demonstrating the obturation of a root canal procedure on 404 due to severe attrition and pulp canal exposure, which resulted in irreversible pulpitis and necrosis.

Figure 14. Radiograph demonstrating extraction of the maxillary right incisor teeth.

Figure 15. Radiograph demonstrating extraction of the maxillary left incisor teeth.

Figure 16. Radiograph demonstrating extraction of mandibular incisor teeth.