NASOLACRIMAL DISEASE IN DOGS AND CATS: CAUSES AND DIAGNOSIS

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CLAUDIA HARTLEY provides an introduction to the various ophthalmic problems encountered in companion animals with suggestions for treatment

THE upper and lower eyelid lacrimal punctae are present approximately 5mm from the medial canthus, at the junction between the eyelid margin and palpebral conjunctiva, and approximately where the meibomian gland openings end.

The punctae are oval to slit-like in appearance. The punctae lead to canaliculi that are 4mm to 7mm in length and join together at the lacrimal sac, which is normally very small in the dog and cat.

The lacrimal sac lies in a small depression in the lacrimal bone on the medial orbital rim, called the lacrimal fossa. From the lacrimal sac, the nasolacrimal duct passes through the lacrimal bone where it is slightly constricted, and this is an important location of foreign body retention. The nasolacrimal duct then runs through a canal in the maxilla, below the nasal mucosa on the medial aspect of the maxilla. The nasolacrimal duct terminates at the nasal punctum located on the ventrolateral floor of the nasal vestibule, approximately 1cm caudal to the external nares. Approximately 50 per cent of dogs have an accessory opening in the oral mucosa of the hard palate at the level of the upper canine teeth.

Normal tear drainage occurs via the nasolacrimal system, although tear evaporation also plays a part in tear loss. Tears collect into a shallow tear meniscus (or tear lake). The height of the tear lake in dogs varies with breed, with brachycephalic breeds tending to have very shallow lakes due

to their shallow orbits and tight eyelids. For the same reason, the tear lake in cats also tends to be shallow.

From the tear meniscus, the tears largely drain medially to the lower lacrimal punctum, encouraged by eyelid blinks. Tears are drawn into the punctum and canaliculus by a combination of capillary action and siphon effect. Eyelid blinks compress the lacrimal sac pushing tears into the nasolacrimal duct, and creating a negative pressure as the sac reopens, which draws tears into the canaliculus and lacrimal sac. Pseudo-peristalsis within the nasolacrimal duct also moves tears to the nasal punctum.

Nasolacrimal disease

If the nasolacrimal system is obstructed, clinical signs include an ocular discharge varying from simple tear overflow (epiphora) to a profuse mucopurulent discharge. Signs of conjunctivitis with hyperaemia can also be present. Massaging pressure at the medial canthus over the lacrimal sac may cause purulent material to be expelled from the lower lacrimal punctum, and is diagnostic for dacryocystitis. Secondary blepharitis can also occur secondary to dacryocystitis, with clinical signs of eyelid swelling and erythema. Chronic dacryocystitis may result in draining fistula formation ventral to the medial canthus.

Cytology, and bacterial culture and sensitivity testing of ocular discharges are recommended. Cytology provides a quick assessment of any bacterial population (rods, cocci or mixed) and allows a more educated initial antibacterial drug choice. Culture and sensitivity testing may take a few days, but can identify if resistant microbial strains are present.

Investigating nasolacrimal disease

Patency of the nasolacrimal system can be assessed with the Jones’ test. Fluorescein is applied to the tear film and the external nares on the same side is watched for fluorescein to appear, which can be up to 10 minutes later. Approximately 50 per cent of brachycephalic dogs, and most cats, have accessory nasolacrimal openings, so false negatives to this test can occur. It is worthwhile looking at the nasopharynx/ tongue for signs of fluorescein passage, and the use of a cobalt blue light can improve perception of fluorescein.

The patency of the system can also be tested by cannulation and flushing with saline (referred to as Jones II test in some texts). Under topical anaesthesia (for example, proxymetacaine) the upper lacrimal punctum and canaliculus can be cannulated using a nasolacrimal cannula (22 to 24 gauge) or 22 to 24 gauge intravenous catheter (with stylet removed), and flushed with saline. In most dogs and cats this can be achieved with a bit of practice while they are conscious.

Saline should be flushed from the upper punctum to the lower punctum initially (and can help with capture of material for culture and cytology). Occlusion of the lower punctum with a fingertip should

result in fluid passage through the nasolacrimal duct to the nasal punctum. Tipping the nose of the patient downwards will encourage fluid flow out through the nares rather than posteriorly into the nasal cavity. Some patients with accessory openings may be observed swallowing when fluid passes into the mouth or nasopharynx. If flushing is undertaken under general anaesthesia, the nasopharynx should be packed to avoid aspiration of flushing saline.

Radiography can also be used to assess the nasolacrimal system. Plain skull radiographs (lateral, intraoral and dorsoventral) are undertaken under general anaesthesia first, and assessed for abnormalities within the surrounding tissues (for example, paranasal sinuses, maxillary dental arcades, nasal cavity). Plain radiographs are followed by packing of the pharynx, lower lacrimal punctum cannulation and infiltration of iodinated contrast solution into the nasolacrimal system (contrast dacryocystorhinography).

Placing a swab just into the external nares is helpful to collect any contrast material that exits from the nasal punctum, rather than allowing this contrast material to run back into the nasal cavity or on to the x-ray plate obscuring detail on the radiograph. Those dogs and cats with accessory openings in the mouth or nasopharynx may show contrast material in these areas. Ideally, only sufficient contrast material to fill the nasolacrimal system should be used, to avoid pooling of contrast material into the nasal cavity or pharynx that might obscure detail on the radiograph (usually approximately 1.0ml in most dogs).

Retrograde flushing (or injection of contrast medium) can be attempted via the nasal punctum, but will require general anaesthesia. Magnification and good lighting is essential, and grasping the alar cartilage and pulling laterally may assist visualisation of the nasal punctum. A nasolacrimal cannula or intravenous catheter can be used, but the metal needle of an IV catheter should be removed to avoid traumatising the duct.

Obstructions of the nasolacrimal system will prevent contrast material passing normally through the system and this can be identified on the radiograph, and therefore identify the site of obstruction.

Cysts connected to the nasolacrimal system will be outlined by pooled contrast material and this may also occur in dilations of the lacrimal sac secondary to obstruction of the nasolacrimal duct. Injection of contrast material percutaneously into cysts that are isolated from the nasolacrimal system but are causing secondary obstruction (such as separated canaliculops, or dacryops), has been described to identify the extent of the cyst and confirm their separation.

Bony lysis can be identified radiographically and might suggest osteomyelitis or neoplastic erosion of the maxilla or lacrimal bones (most commonly neoplasia originating from the nasal cavity and secondarily involving the nasolacrimal system).

The whole system can also be cannulated with silastic tubing or suture material, either anterograde or retrograde, if required (for example obstruction or narrowing of contrast material in nasolacrimal

system on dacryocystorhinography).

Computed tomography (CT) is increasingly being used to assess the nasolacrimal system (CT-dacryocystorhinography; CT-DCG) in veterinary patients, as it is in humans. Iodinated contrast material can also be used in CT-DCG to outline the nasolacrimal system more clearly. In humans, an axial scan (equivalent to the dorsal plane in dogs) is usually chosen to assess the whole nasolacrimal system in one plane. Unfortunately, this is not possible in veterinary patients without continuous contrast injection. However, 3D reconstructions can be achieved using serial transverse images.

CT is generally more useful than magnetic resonance imaging (MRI) due to enhanced bony resolution (MRI is superior for soft tissue resolution). Technical difficulties are associated with overfilling of the nasolacrimal system with contrast material, and subsequent contrast leakage into the nasal cavity causing reduced quality images. Dilation of the lacrimal sac or cystic dilations confluent with the nasolacrimal system causes pooling of contrast material. Obstruction of the nasolacrimal system causes contrast material to be impeded (partially or completely) from reaching the distal system. Osteolysis identified on CT adjacent to the nasolacrimal system might suggest neoplasia or infection.

Dacryocystitis

Causes of dacryocystitis include obstruction, or trauma of the nasolacrimal system (for example, caused by a road traffic accident, cat fight laceration or surgical incision). Obstructions of the lacrimal excretory system can include congenital agenesis of part or all of the nasolacrimal system, foreign material or inflammatory material within the canaliculi, lacrimal sac or nasolacrimal duct, cystic expansions adjacent to or within the nasolacrimal system, or adjacent neoplastic expansions or abscesses (for example, tooth root) causing compression of the system.

Dacryocystitis is rare in cats but has been described in conjunction with rhinitis and dental disease. Destructive bony changes associated with rhinitis, dental disease or neoplastic processes may result in a florid ocular discharge via the nasolacrimal system.

Atresia of the nasolacrimal system

Failure of the system to fully canalise during development results in obstruction of tear drainage, and ocular discharge in the first few months of life. The most common congenital abnormality in the dog is punctal atresia. Absence of the upper punctum is usually asymptomatic, whereas absence of the lower punctum usually results in epiphora in affected puppies. Flushing of saline from the upper punctum may result in bulging of the conjunctiva overlying the lower canaliculus, which can subsequently be incised, and a punctum reformed. The mucosal site of the punctum is usually thin walled and devoid of blood vessels making any surgery bloodless, and less prone to secondary stricture formation. A topical antibiotic-corticosteroid preparation is usually employed for a week

postoperatively.

Absence of a canaliculus, or part of the nasolacrimal duct, is less common, and more difficult to correct. Creation of communication between the nasolacrimal system that is present and the nasal cavity (conjunctival rhinostomy), maxillary sinus (conjunctival maxillary sinusotomy) or oral cavity (conjunctival buccostomy) has been described. Placement of an indwelling silastic catheter is recommended for three to six weeks to promote continued patency and reduce postoperative stricture formation. Topical antibiotic and corticosteroid treatment is recommended until after the silastic tubing is removed.

Atresia of the nasolacrimal system is uncommon in the cat with imperforate lacrimal punctum the most commonly reported defect. In cats the upper punctum is more commonly absent (compared to dogs where the lower punctum is more commonly affected). Treatment, if clinical signs indicate, is as described for dogs.

Micropunctum

Abnormally small lacrimal punctae may occur as part of the spectrum of congenital nasolacrimal defects causing epiphora or a mucopurulent ocular discharge. Enlargement of small punctae can be achieved using the “1-2-3 snip” technique. A small triangle of conjunctiva is removed to enlarge the micropunctum. In the absence of surgical haemorrhage an indwelling catheter in the canaliculus can often be avoided, however many authors recommend a catheter is placed for three weeks postoperatively (with topical antibiotic and corticosteroid medication three to four times daily).

Malpositioned lower lacrimal punctum

The lower lacrimal punctum can be malpositioned within the conjunctiva as a congenital abnormality, resulting in epiphora. Malpositioning of the upper punctum is usually asymptomatic. Malpositioning may also occur due to conformational issues, particularly in brachycephalic breeds. Lower medial canthal entropion can position the lower punctum ventrally and limit normal tear drainage. Caruncular trichiasis is often encountered in the same breeds, and promotes wicking of tears onto the medial canthus compounding the epiphora. Lastly, tight medial canthal ligaments can compress the punctum and canaliculus, further limiting tear drainage.

Conformation of some cat breeds (such as Persian, Burmese, Burmilla, exotic shorthair) can result in epiphora, in a similar manner to brachycephalic dogs due to lacrimal punctal malpositioning by medial entropion, trichiasis from medial entropion wicking tears on to the lower eyelid, and tight medial canthal ligaments compressing the lower canaliculus.

Surgical treatment of the medial entropion (modified Hotz-Celsus procedure) and caruncular trichiasis (excision) can help to reduce or eliminate the epiphora. Medial canthoplasty as a

treatment for medial entropion and caruncular trichiasis may also address the tight medial canthal ligaments.

Cysts of the nasolacrimal system

Canaliculops are cysts of the canaliculi that can become separated from the canaliculus or retain communication with the nasolacrimal system. Both can cause a secondary obstruction to tear drainage. Cystic expansions may cause distinct swellings palpable over the facial bones.

Surgical excision is curative, but requires careful reconstruction of the canaliculus with catheterisation for a period of three to four weeks (and topical antibiotic-corticosteroid treatment) to prevent stricture formation.

Cysts of the nasolacrimal duct are rare, but may cause recurrent inflammation of the system characterised by epiphora or mucoid to mucopurulent ocular discharge emanating from the nasolacrimal punctae, and adjacent conjunctival hyperaemia. Surgical excision usually requires removal of a section of the maxilla bone to reach the duct, although endoscopic surgery via the nasal cavity or maxillary sinus has also been described. The entire cyst should be removed or marsupialised to the nasal cavity (dacryocystorhinostomy), or maxillary sinus (dacryocysto maxillary sinusotomy).

Secondary obstruction of the nasolacrimal duct has been reported with the presence of a maxillary bone epithelial cyst in a Labrador. These cysts are a rare cause of epiphora as a result of obstruction of the nasolacrimal apparatus.

Dacryops may also cause secondary obstruction of the nasolacrimal system, although these are cysts of ectopic lacrimal secretary ductal tissue.

Obstruction of the nasolacrimal system

Obstructions secondary to foreign bodies within the nasolacrimal system are relatively common in dogs, with plant material the most commonly identified foreign body. Grass seed awns can migrate into the lacrimal punctae with barbs preventing backward movement (**Figures 2** and **3**). These may become lodged within the canaliculus with the tip visible at the punctum, or are more commonly retained within the lacrimal sac. Another site of foreign body retention is at the entrance of the nasolacrimal bony canal, where the duct is at its narrowest.

Obstruction of the system may also occur secondary to granuloma formation within the lacrimal sac or canaliculi. Stricture formation following granulation tissue healing of nasolacrimal laceration (canaliculi, lacrimal sac or nasolacrimal duct) may occur if close apposition of tissues is not achieved, or if sutures are placed into the nasolacrimal system mucosa. Closure of a nasolacrimal duct defect (after surgical removal of a foreign body) has been described using an overlay of

porcine small intestinal submucosa material to promote re-epithelialisation.

Simple flushing may dislodge a foreign body to the punctum allowing its removal, however incision into the lacrimal sac or nasolacrimal duct may be required. Once a foreign body reaches the bony nasolacrimal canal removal becomes technically more difficult, requiring maxillary bone removal. Postoperative stent placement is required to allow healing of an incised canaliculus or nasolacrimal duct without stricture formation. Stent removal is usually undertaken after three to four weeks and topical antibiotic-corticosteroid treatment is maintained until stent removal.

Symblepharon (due to FHV-1 infection) can cause obstruction of the lacrimal punctae or canaliculi and result in epiphora, and probably represents the most common cause of nasolacrimal obstruction in cats.

Lacerations of the nasolacrimal system

Lacerations or traumas of the nasolacrimal system, such as those sustained in road traffic accidents or cat fights, require careful attention to prevent long-term obstruction and epiphora.

Lacerations of the upper punctum or canaliculus will often heal without long-term clinical implications, whereas lower canaliculus or punctal damage usually results in epiphora. Lacerations of the canaliculi should be repaired meticulously by apposing the surrounding tissues accurately, but avoiding direct suturing of the canaliculus, to avoid postoperative stricture formation. This should be performed under an operating microscope for adequate magnification. Flushing of the opposite punctum and canaliculus with saline or air bubbles can help identify the lacerated margin of a canaliculus. Damage of the nasolacrimal duct within the lacrimal or maxilla bones requires apposition of bony fragments, and removal of small fragments that might form sequestra. Placement of an indwelling catheter for four to six weeks is recommended to encourage re-epithelialisation of the duct and maintenance of patency.

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