Surgical Conditions of the Nictitans

The third eyelid or nictitating membrane has a simple structure and small number of components, including the leading edge, gland and a cartilaginous support. During surgery, preservation of these structures is important to maintain function including the production and spread of tears. Pocketing techniques are the most commonly used for replacement of gland prolapse and a step by step guide is given here for an effective pocketing technique. Additional surgeries including methods of correcting everted or scrolled cartilage and nictitans excision, which is indicated in cases with neoplastic disease, are also described.

Key words: Nictitans, pocketing technique, third eyelid

Introduction

Lurking behind the medial canthus of the upper and lower eyelids of our veterinary species is that secretive, occasional visitor - the third eyelid or nictitating membrane. This is a simple fold of conjunctiva, often pigmented at the leading edge, wrapped around a T-shaped arm of cartilage and connective tissue. This eyelid acts much as it’s more complex, skinned companions; a sweep across the cornea will dislodge debris, protect the cornea and moisten the ocular surface by spreading tears. The gland located at the base of the nictitating membrane contributes substantially to the tear film. The most common third eyelid problem encountered in dogs is a prolapse of this gland, or ‘cherry eye’. This article will discuss the range of surgeries of the third eyelid but not the conditions that manifest as third eyelid pathology due to ocular or systemic disease.

Anatomy

The anatomy is simple but important to consider, when preparing for surgery (Figure 1). The conjunctiva is continuous with that of the inner part of the eyelids and bulbar conjunctiva. It is generally

Figure 1: Anatomy of the nictitans.
thin and mobile, other than at the leading edge, where it is more tightly bound to the underlying, predominantly collagen based, fibrous connective tissue. The canine T-shaped hyaline cartilage is made up of a shaft originating in the periorbital connective tissue which runs the length of the nictitans. Distally there is a crossbar or arm, which is slightly crescent shaped, and maintains structural integrity allowing it to sweep across the cornea, much like a wiper on a windscreen. In the dog there is no inherent musculature, but the base is intimately associated with that of the ocular muscles. Retraction of the globe displaces orbital fat and allows passive movement of the third eyelid across the cornea.

The base of the cartilage shaft is enveloped in a tubuloacinar gland, responsible for producing predominantly aqueous tear production, although mucus and a small amount of lipid are also secreted from the acini. The exact percentage of tear production from this gland, relative to that from the orbital lacrimal gland, is unknown as removal of one of these glands leads to an initial compensatory increase in the other. It is, however, known that removal of both glands leads to cessation of aqueous tear production but removal of just the gland of the nictitating membrane reduces tear production by 29-57%. This is, in fact, more than the decrease seen when only the orbital lacrimal gland was removed in the same study (a mean of just 23% when compared to the contralateral, unaffected eye, or 15% reduction compared to the same eye prior to the surgery (Helper et al. 1974)). The contribution from each gland also appears to vary between individuals. Numerous ductules pass from the seromucoid units to the central, posterior surface of the third eyelid, where they exit between lymphoid follicles.

Vascular supply is from a branch of the malar artery, which supplies the base of the nictitans and forms a vascular axis running straight to the leading edge, with little ramifications; at the free edge it then gives rise to a microvascular plexus of arterioles and capillaries which run deeper.

**Surgical implications and primary principles:**

Conjunctiva heals readily so small wounds do not need to be closed and indeed even very fine gauge absorbable suture material may cause more fibrosis, inflammation and discomfort than allowing a simple conjunctival wound to heal by secondary intention. Due to the vascular anatomy, placement of sutures that encircle the mid third eyelid, particularly around the cartilage shaft, should be avoided. The structure, form and function of the third eyelid should always be maintained. Much as the margin must be preserved with any eyelid surgery, the leading edge should also be maintained and not traumatised. Wounds of the leading edge are difficult to correct surgically as breakdown occurs readily. Function of the third eyelid gland should be maintained too. Long gone are the days of it being acceptable to surgically remove the gland in a dog affected by ‘cherry eye’. Morgan et al. (1993) published follow-up of 89 cases (125 eyes) with nictitans gland prolapse, treated by either excision, replacement or without surgical management and reported a 94% success rate for ‘pocketing’. Thirty-three dogs were also followed for development of keratoconjunctivitis sicca (KCS) for a minimum of two years:

- KCS developed in 5.6% of the unaffected eyes at a mean of 3 years (median 4.5 years) post presentation, whilst for those affected with gland prolapse:
- 14% of eyes which underwent successful surgical replacement developed KCS.

**Prolapse of the gland of the third eyelid**

Prolapse of the gland of the third eyelid, or ‘cherry eye’, is the most common condition of the third eyelid seen in practice. The appearance is of a reddened mass, situated between the nictitans leading edge and the cornea (Figures 2 and 3).

Eighty percent of dogs with cherry eye present at less than one year of age, as indicated in various studies, based on referral caseloads (Mazzucchelli et al. 2012, Multari et al. 2015, Premont et al. 2012). Around 60% exhibit unilateral prolapse at presentation, with the remainder being either bilateral at the time of presentation or generally occurring in the contralateral eye within three months. The pathogenesis is not fully understood but theories include a laxity in the connective tissue which anchors the gland to the periorbital tissues and an increased predisposition in animals exhibiting lymphoid hyperplasia/allergic conjunctivitis. A number of breeds are considered predisposed. All studies suggest English Bulldogs are over-represented, while additional breeds cited include the French Bulldog, American Cocker Spaniel, Boston Terrier, Shih Tzu, Lhasa Apso and Shar Pei (although these studies are not based on a UK caseload). The literature also suggests large and giant breeds are predisposed, including the Neapolitan Mastiff, Cane Corso and Great Dane. According to one survey, all affected English and French Bulldogs presented at <1 year of age, while only 40% of Boxers and 20% of Lhasa Apsos presented at this age (Mazzucchelli et al. 2012). In the same study, French and English Bulldogs, Shar Peis, Great Danes and Cane Corsos were all typically affected bilaterally, with only a short interval of time between the two prolapses.

**Surgical Procedure**

Around a dozen different techniques have been reported for surgical replacement of the gland of the third eyelid but they can be broadly categorised as either pocketing or anchoring techniques. The anchoring techniques were developed first, initially tying the gland to the episclera or sclera ventrally although with poor success.