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WHY DO THEY LOOK WEIRD?
OPHTHALMIC PARTICULARITIES OF BRACHYCEPHALIC DOGS

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BACKGROUND

Brachycephalic dog breeds, such as Pugs, Shih Tzus, Bulldogs, French Bulldogs, and Pekingese have grown in popularity worldwide over the past few decades, largely due to their distinctive facial conformation and endearing personalities. Their short muzzle, broad skull, large eyes, and expressive facial folds have become breed-defining traits, favored by owners and reinforced through selective breeding. However, these same features are closely linked to a spectrum of ophthalmic disorders collectively referred to as **Brachycephalic Ocular Syndrome (BOS)**.[1-3] BOS represents the combined effects of anatomical, neurological, and tear film abnormalities that reduce ocular surface protection, promote chronic irritation, and predispose to severe disease.

The prevalence of ocular problems in brachycephalic breeds is striking. Population-based studies show that these breeds are dramatically overrepresented in veterinary ophthalmology caseloads compared to their general dog population proportion. Corneal ulceration risk can be over ten times higher than in mesocephalic dogs,[4] and conditions such as pigmentary keratitis, keratoconjunctivitis sicca (KCS), and prolapsed nictitans gland occur at significantly increased rates. These conditions are not only common but often chronic and progressive, leading to discomfort, visual impairment, and in severe cases, globe loss. Despite these risks, many owners and even some breeders normalize signs such as ocular discharge, pigmentation, or mild cloudiness as “typical for the breed.” This normalization delays presentation, resulting in more advanced disease at the time of diagnosis. The veterinary profession therefore has a dual role: to manage the disease effectively in individual patients, and to educate stakeholders about its preventable nature and the benefits of breeding for healthier conformation.

WHY IS OCULAR DISEASE SO COMMON?

1. Anatomical abnormalities

The primary reason for the high prevalence of ocular disease in brachycephalic dogs is the constellation of structural changes associated with their craniofacial conformation. These dogs have a **shallow bony orbit** and a relatively bulgy globe tht is positioned more rostrally than in mesocephalic breeds (**exophthalmos**). This increases the proportion of the cornea that lies outside the orbital rim, exposing it to trauma and environmental stress. The palpebral fissure is disproportionately large compared to globe size, a condition referred to as **macropalpebral fissure**, which further increases corneal exposure. **Lagophthalmos**, or incomplete eyelid closure, is common both during waking blinking and sleep. Eyelid abnormalities compound the exposure: **medial canthal entropion**, **nasal fold trichiasis**, and **distichia** are frequent findings, each contributing to constant mechanical irritation. The nasal skin fold is a particularly important source of trauma, with hairs continually rubbing the cornea during blinking or eye movements. The cumulative effect of these anatomical features is a chronically exposed and mechanically irritated ocular surface that is highly susceptible to injury.

2. Poor corneal innervation

An underappreciated factor in BOS is the **reduction in corneal sensory nerve function**. Numerous studies have demonstrated that brachycephalic breeds have significantly lower corneal tactile sensitivity compared to mesocephalic dogs, with Cochet–Bonnet esthesiometry readings sometimes reduced by 30-40%.[5] This corneal hypoesthesia diminishes reflex blinking and reflex tearing, blunting two of the eye’s primary protective mechanisms. It also delays epithelial healing and increases the likelihood that minor injuries will progress to persistent epithelial defects or stromal ulceration. In this context, the anatomical exposure described above becomes even more dangerous — the cornea not only faces more insults but also responds less effectively to them.

3. Poor nasal innervation

The trigeminal nerve innervates both the cornea and nasal mucosa, and stimulation of either can trigger a robust reflex tearing response via the nasolacrimal reflex pathway. In brachycephalic dogs, this pathway is compromised by altered nasal anatomy and reduced nasal mucosal sensitivity. The shortened nasal cavity, stenotic nares, and chronic nasal inflammation common in these breeds can all impair trigeminal input from the nasal mucosa. As a result, one of the key reflex pathways that augments tear production in response to environmental stimuli is weakened, further diminishing ocular surface protection. This reduced reflex tearing capacity is particularly problematic in situations of increased tear evaporation or environmental dryness, as the tear film cannot be replenished quickly enough.

4. Tear film deficiencies

Tear film quality and quantity are frequently abnormal in brachycephalic dogs. While some have reduced **Schirmer tear test (STT-1)** values consistent with aqueous tear deficiency, others have normal or elevated tear volume but poor tear film stability. **Tear film breakup time (TFBUT)** is often shortened to less than six seconds, reflecting deficiencies in the mucin or lipid layers. Meibomian gland dysfunction is common, with gland dropout and poor-quality lipid secretion contributing to evaporative tear loss. Conjunctival goblet cell density may also be reduced, impairing mucin production and further destabilizing the tear film. Together, these deficiencies lead to chronic ocular surface desiccation, amplifying the damaging effects of anatomical exposure and mechanical irritation.

NOT EVERY BRACHYCEPHALIC BREED IS BORN EQUAL

Although the general features of BOS are shared across brachycephalic breeds, the severity and pattern of disease vary considerably between breeds and even between individuals within the same breed. Pugs, for instance, are particularly prone to pigmentary keratitis, which may be bilateral, progressive, and vision-threatening. Bulldogs tend to have more severe medial entropion and prominent nasal folds, creating constant corneal contact with hair. French Bulldogs may exhibit less extreme exophthalmos than Pugs but have a high prevalence of tear film instability and eyelid disease. Lhasa Apsos and Pekingese often have combinations of lagophthalmos and distichiasis that contribute to chronic irritation. Even within a breed, variations in skull length, orbit depth, and eyelid conformation mean that some individuals live relatively free of ocular disease, while others require repeated surgical interventions throughout life. This variability demonstrates that BOS is not an inevitable consequence of brachycephaly and that selective breeding for healthier conformation is both possible and desirable.

AN EXAMPLE OF A PARTICULARLY PROBLEMATIC BREED – SHIH TZU

Among brachycephalic dogs, the **Shih Tzu represents a particularly challenging case from an ophthalmic perspective**.[6-7] These dogs often exhibit multiple, concurrent anatomical risk factors for ocular disease. Lagophthalmos is common, both in sleep and during waking blinks, exposing the cornea for prolonged periods. The palpebral fissure is large, and the orbits are shallow, giving rise to pronounced exophthalmos. Medial entropion is prevalent, and the nasal skin fold frequently contributes to trichiasis, with hairs continuously contacting the cornea. Distichiasis and ectopic cilia are also encountered, adding further sources of mechanical irritation.

Tear film abnormalities are frequent in Shih Tzus, with both aqueous tear deficiency and evaporative tear loss reported. Many have a reduced TBUT, reflecting mucin and lipid layer dysfunction. Corneal sensitivity may be diminished, further reducing protective blinking. Clinically, this combination of factors results in a high prevalence of chronic keratitis, pigmentary keratitis, and corneal ulceration. Recurrent or non-healing ulcers are common and may progress to stromal melting or perforation if not aggressively managed. Surgical interventions such as medial canthoplasty, nasal fold resection, and entropion repair are often necessary to restore adequate protection and reduce mechanical trauma. Even with optimal surgical and medical management, the chronic nature of these problems means that long-term monitoring and owner compliance with lubrication and ocular hygiene are essential. In practice, the Shih Tzu exemplifies how multiple moderate defects, when present in the same dog, can synergize to create severe and persistent ocular disease.

SUMMARY

Brachycephalic Ocular Syndrome is a multifactorial condition arising from the interaction of anatomical abnormalities, reduced corneal and nasal sensory input, and tear film deficiencies. The combination of these factors creates a hostile environment for the ocular surface, leading to a high incidence of chronic and progressive disease in affected breeds. While all brachycephalic breeds share certain risk factors, the severity and presentation vary, with breeds like the Shih Tzu representing some of the most challenging cases. Management of BOS requires a multimodal approach, addressing both the underlying conformation and the secondary physiological deficits. Medical therapy focuses on lubrication, anti-inflammatory treatment, and control of secondary infections, while surgical interventions such as medial canthoplasty and nasal fold resection are often necessary to reduce exposure and eliminate sources of chronic irritation.

Early recognition and intervention can significantly improve long-term outcomes, preventing irreversible corneal damage and preserving vision. Equally important is the role of veterinarians in guiding breeding practices toward healthier conformations. By selecting for individuals with reduced exophthalmos, smaller palpebral fissures, and minimal eyelid abnormalities, it is possible to maintain breed identity while greatly reducing the burden of ocular disease. Ultimately, improving the welfare of brachycephalic dogs will require both clinical excellence in individual patient care and broader efforts to influence breeding priorities toward functional health over extreme appearance.

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