



Amber Foote FdSc RVN

Amber Rose Foote FdSc RVN Amber qualified from Myerscough College in 2017 and aims to further her qualifications. She currently works in Referral Practice at Veterinary Vision as Lead Ophthalmic Veterinary Nurse. Although she enjoys all aspects of practice, she has a special interest in caring for wild-life, exotic species and medical nursing. Amber is particularly interested in standardising patient care across all species. Email: amberrosefoote@gmail.com

Nursing considerations for brachycephalic ocular syndrome

Amber Foote FdSc RVN 

Lancashire, UK

ABSTRACT: Brachycephalic breeds often present as first opinion patients with chronic eye problems and multiple ocular defects; they are prone to a number of conditions and often present with exophthalmos, macroblepharon and lagophthalmos. This article aims to discuss the nursing considerations for brachycephalic ocular syndrome; exploring common conditions to show how such considerations can be implemented in general practice.

Keywords: ophthalmic nursing; nursing considerations; brachycephalic ocular syndrome

Introduction

Brachycephalic breeds such as French Bulldogs, Pugs and Shih Tzus have become increasingly popular. In 2018, the UK Kennel Club reported French Bulldogs overtook the Labrador Retriever as the UK's most popular dog breed for the first time since records began (The Kennel Club, 2018). As the percentage of brachycephalic dog ownership has increased, their presentation in veterinary practice has correlated. Owners expect Veterinary Surgeons (VS) and Registered Veterinary Nurses (RVNs) to hold a high level of knowledge about the conditions which brachycephalic breeds are prone to.

Brachycephalic ocular syndrome is a disease of short-skulled breeds, where the anatomical differences of the shape and positioning of the eyes lead to ocular problems (Maggs et al., 2008). Brachycephalic ocular syndrome is characterised by one or more of the three conditions described in Table 1 (Plummer, 2015).

In many cases of brachycephalic ocular syndrome, the palpebral fissures are too long to provide adequate coverage of the prominent globes due to macroblepharon and

exophthalmos (Maggs et al., 2008). Often, if these dogs can complete an effective blink, their eyelids cannot close completely or frequently enough to lubricate the cornea (Bedford & Jones, 2001). Exophthalmos, macroblepharon and lagophthalmos will predispose the eyes to chronic exposure, resulting in a variety of corneal problems. Research from the Royal Veterinary College (RVC) has shown that Brachycephalic breeds are eleven times more susceptible to corneal ulcerative disease due to chronic exposure when compared to non-brachycephalic breeds (Woodmansey, 2017).

Ocular syndrome in brachycephalic dogs is considered to be permanent due to anatomical defects; unfortunately, surgery may not eradicate the syndrome completely. RVNs play a vital role in addressing brachycephalic ocular disease as they often provide client education and support. The RVN must understand the pathophysiological effects of brachycephalic ocular syndrome to know why and how implementing changes will benefit the patient.

Nursing any ophthalmic patient can be challenging and RVNs should understand the

Table 1. Characteristics of brachycephalic ocular syndrome.

Condition	Definition
Exophthalmos	the protrusion of the eyes beyond the normal levels
Macroblepharon	abnormal eyelid opening when compared to the size of the eyes
Lagophthalmos	the protruding condition of the eye which makes it impossible for the eyes to close completely

risk factors involved with nursing a fragile eye. This article will explore the nursing care options for brachycephalic ocular syndrome, using common diseases to demonstrate how RVNs can optimise patient care.

Ophthalmic examination

Ophthalmological examination of brachycephalic breeds requires a team approach from both the VS and RVN; those participating in patient handling must recognise ocular conditions to prevent further damage, preserve vision and ensure the patient's comfort (Busse 2012). Any ophthalmic patient should be handled with minimal restraint, by placing one hand behind the head and the other hand to steady the muzzle (Figure 1). Inadvertent pressure on the globes when retracting the eyelids and pressure around the neck when handling the patient should be avoided as this increases intraocular pressure, which could result in the rupture of a fragile eye (Brusse, 2012, Presnail, 2016). Furthermore, brachycephalic breeds should be handled with minimal restraint to prevent stress and access to oxygen therapy should be available should symptoms of brachycephalic obstructive airway syndrome (BOAS) occur.

If the patient is difficult to restrain or is in pain, it may be safer to perform the examination under sedation or general anaesthetic. Preliminary vision tests such as menace response and pupillary light reflex should ideally be performed prior to sedation or general anaesthesia, as sedative agents can alter the menace response and pupil size (Ofri, 2015). It is important to note that there are several studies that show that both sedation and general anaesthesia can lower Schirmer tear test results and alter intraocular pressure (Sanchez et al., 2006, Shepard et al., 2011, Douet et al., 2018). Under general anaesthesia, the VS may choose to use a neuromuscular blocking

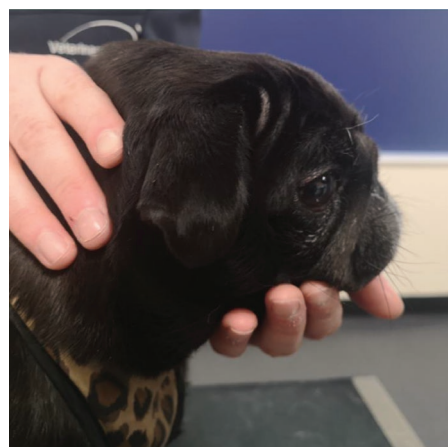


Figure 1. Restraint of ophthalmic patient.

agent (NMBA) to centrally locate the eye, relax peri-ocular muscles and reduce vitreous push. RVNs should be aware that NMBAs cause paralysis of all skeletal muscle groups including the respiratory muscles therefore ventilation is required for these patients.

During the ophthalmological examination, two procedures should be performed routinely; Schirmer tear testing and the measurement of intraocular pressure (Figure 2) When handled correctly, most dogs will tolerate both these tests however, if the eye is fragile then these tests should not be performed due to poor corneal integrity and risk of globe rupture. When examining intraocular structures, to achieve mydriasis a topical agent such as tropicamide is preferred.

Brachycephalic breeds often present as first opinion patients with chronic eye problems and multiple ocular defects. Brachycephalic facial conformation often presents as exophthalmos, macroblepharon and lagophthalmos which predisposes them to a number of conditions (Table 2). These problems, which may be combined, subsequently affect corneal clarity and can result in pain and decreased vision. Brachycephalic breeds are prone to medial canthal entropion due to the excessive skin wrinkling. Patients with severe facial abnormalities due to advanced brachycephalic airway syndrome often present with nasal fold trichiasis, excessive nasal skin folds and notably shallow orbits (Gelatt & Peterson Gelatt, 2001). Both medial canthal entropion and nasal fold trichiasis can lead to pigmentary keratitis, epiphora and ultimately corneal exposure and ulceration. Moreover, brachycephalic dogs anatomically have shallower orbits which offer less protection of the globe, combined with lagophthalmos, brachycephalic breeds are prone to traumatic proptosis. Traumatic



Figure 2. Schirmer tear testing in a pug.

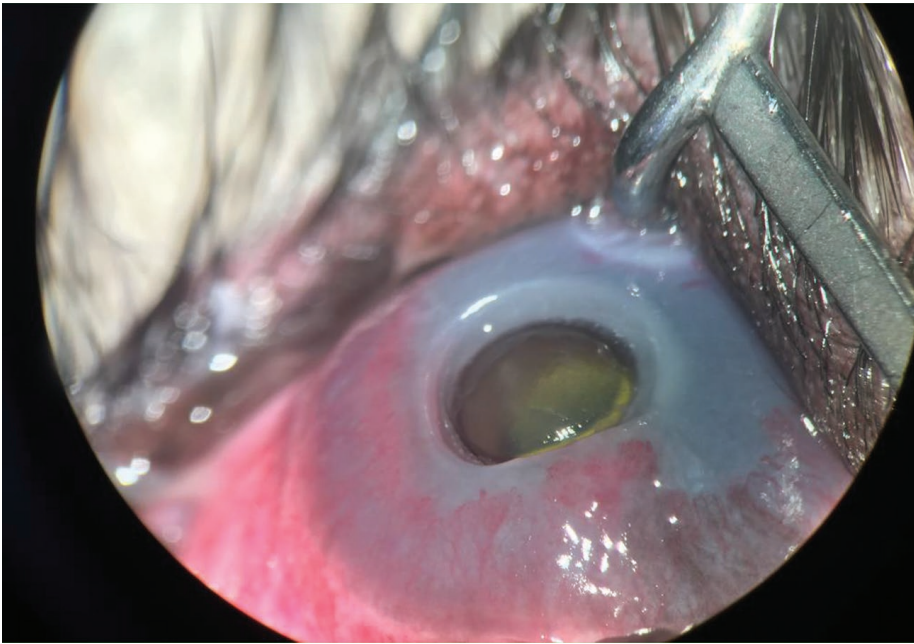
Table 2. Common conditions in brachycephalic dogs.

Condition	Definition
Medial canthal entropion	Inward rotation of the lower medial eyelid causing facial hair to contact cornea and occlusion of the lower nasolacrimal puncta
Nasal Fold Trichiasis	Hairs of the nasal skin fold have direct and often constant contact with the cornea. More common in extremely short-nosed breeds.
Pigmentary keratitis	Pigmented melanin granules deposited in the cornea due to chronic inflammation
Keratoconjunctivitis sicca (KCS)	Commonly referred to as 'Dry Eye', inadequate production of the aqueous portion of the tear film
Corneal ulceration	Ulceration is the erosion of normal tissue (e.g. following traumatic injury)

proptosis can lead to damage of the optic nerve and extraocular muscles, if the patient is not treated promptly then corneal exposure, ulceration and globe rupture could occur.

Arguably, one of the most prevalent conditions that affects brachycephalic dogs is corneal ulceration, a painful condition which can result in scarring, corneal perforation or permanent blindness (Figure 3, Fawcett et al., 2018). Recent studies have shown that brachycephalic breeds are more likely to suffer from corneal ulcerative disease than non-brachycephalic breeds (Packer et al., 2015, Woodmansey, 2017). Brachycephalic breeds often present with corneal ulceration due to secondary causes including entropion, ectopic cilia, keratoconjunctivitis sicca (KCS) (O'Neill et al., 2017). Packer et al., (2015) study also showed that brachycephalic breeds with macroblepharon, visible sclera and nasal fold trichiasis were more likely present with corneal ulceration. Surgery is recommended in all ulcers deeper than two-thirds of the corneal thickness, patients needing corneal surgery should be referred to an ophthalmic specialist. Surgical treatment aims to restore corneal stability and facilitate healing; corneal surgeries to treat ulceration include conjunctival grafts, corneo-conjunctival transposition grafts and corneal grafting (Jaksz & Busse, 2017).

With improvements in veterinary care and referral widely available, clients have the option for specialist ophthalmic surgery (Table 3). Preventative surgery



▲ **Figure 3.** Deep corneal ulceration known as a Descemetocoele.

▲ **Table 3.** Common surgery's performed on brachycephalic dogs.

Surgery	Description
Medial Canthoplasty	Usually performed on brachycephalics with macroblephron and macropalpebral apertures, shortens eyelid, corrects medial lower entropion and protects from medial and nasal trichiasis. It involves removing tissue at the medial canthus & suturing, giving the appearance of smaller eyes
Entropion correction	Surgical correction of the inward turning of the eyelids
Corneo-scleral transposition graft	Grafting the cornea with conjunctival/corneal tissue due to an ulcer or penetration
Enucleation	Removal of the eye due to trauma, glaucoma, blindness or pain

for brachycephalic breeds is becoming increasingly common, with severe causes of lagophthalmos and resultant brachycephalic ocular syndrome, a surgical procedure known as medial canthoplasty can help significantly. Although, the surgery will not correct all anatomical features; it can be effective at reducing exposure and frictional irritation which can lead to pigmentary keratitis (Plummer, 2015). Medial canthoplasty surgery consists of reducing the length of the eyelids, corrects medial lower entropion and protects from medial and nasal trichiasis (Figure 4). A tarsorrhaphy is the apposition of the upper and lower eyelid to each other, the surgeon may place a temporary tarsorrhaphy suture adjacent to the medial canthal repair to reduce tension as the site heals (Plummer, 2015). It is important that RVNs warn the client that the initial appearance of the eyelids will seem small with a temporary tarsorrhaphy in place.

Admission

Nursing care plans (NCPs) are commonly used amongst RVNs to record and assess

the patient's normal behaviours and routines to allow for patient-focussed and holistic care. NCPs can be adjusted to suit brachycephalic ophthalmic patients, it is important to ask the owner how they feel about their dogs' vision and if there have been any behaviour changes due to changes in vision prior to surgery (Table 4)

On admission, brachycephalic breeds should avoid waiting in reception areas and the time between admission and anaesthesia should be kept to a minimum to reduce stress pre-operatively. The period between admission and induction should be kept as stress-free and minimal as possible as changes in blood pressure can increase intraocular pressure (Brusse 2012). It is important that RVNs explain the risks associated with anaesthetising brachycephalic patients including airway issues, poor ventilation and regurgitation risks (Fawcett et al., 2018).

Surgical considerations

There are several problems which can arise during induction of anaesthesia which can

influence a brachycephalic dog's anaesthetic and recovery time; brachycephalic dogs can be challenging to anaesthetise due to their anatomical attributes of BOAS. A study by Packer et al., (2015) showed that there is substantial evidence that brachycephalic breed welfare is compromised by BOAS, a progressive disorder of the upper airway characterised by primary anatomical abnormalities. Prior to preventative ocular surgery, BOAS assessment and potential BOAS surgery should be recommended.

Regardless of whether the patient presents with airway issues, the general approach to anaesthesia of brachycephalic breeds is similar, however, the VS and RVN should be aware of the common conditions of these breeds such as BOAS, poor ventilation and anaesthetic uptake, regurgitation and post-operative airway inflammation (Fawcett et al., 2018).

Monitoring ophthalmic patients under general anaesthetic can be challenging for RVNs due to the limited access to the ocular reflexes, jaw tone and mucous membranes (Presnail, 2016). Patient positioning and surgical draping limit accessibility to the patient; monitoring equipment such as an oesophageal stethoscope and a multi-parameter monitor are essential. Communication between all theatre staff is essential; the use of surgical safety checklists is recommended to improve safety and reduce the incident of human error (Bradbrook, 2018). The VS should also discuss the use of topical agents prior to application with the RVN as they could affect the patient's parameters (Presnail, 2016). Although not limited too, some examples of topical agents which may be used in ophthalmic surgery that could affect the patient's parameters include; epinephrine, atropine and phenylephrine. For example, topical ophthalmic 1% atropine causes a small but significant increase in heart rate which the RVN could misinterpret without awareness of its application (Greenberg et al., 2015).

Surgical preparation

RVNs play a key role in infection control as they often take part in surgical skin preparation, when preparing for any ocular surgery, there are a number of nursing considerations to recognise due to the sensitivity and fragility of ocular structures. RVNs should wear appropriate personal protective equipment prior to surgical skin preparation to limit contamination of the surgical area, gloves will also protect the hands from constant use

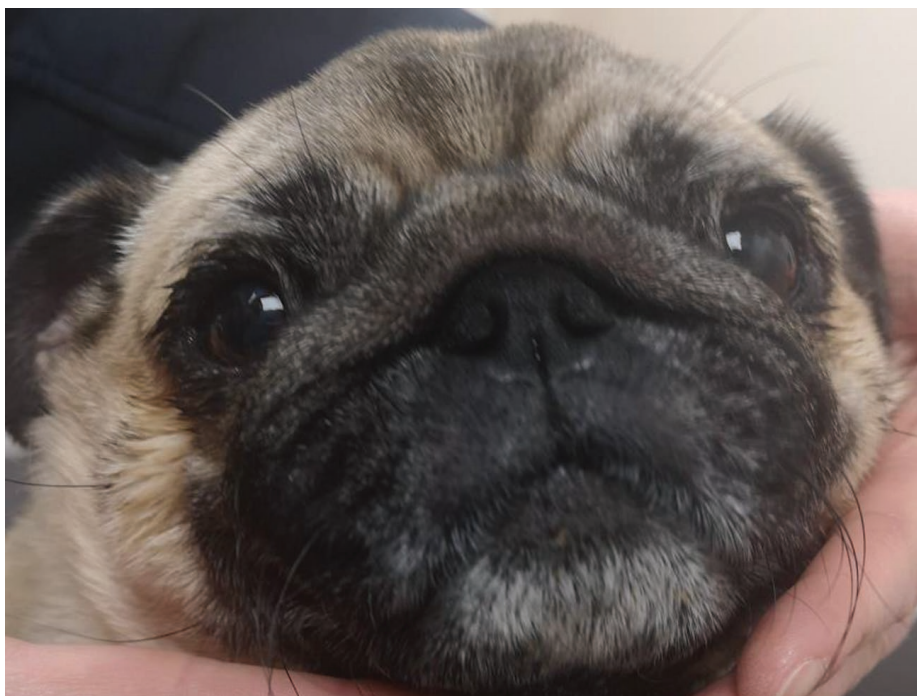


Figure 4. A pug that has had medial blepharoplasty surgery.

Table 4. Example of a nursing care plan for ophthalmic patients.

Activity of life (AOL)	Current routine	Actual problem
1. Eat adequate amounts-Type of food/bowl? Any food allergies? Time of last meal		
2. Drink adequate amounts (bottle or bowl?)		
3. Urinate normally – Substrate/grass? Litter tray?		
4. Defaecate normally		
5. Breathe normally (coughs/sneezing?)		
6. Maintain body temperature (indoor/outdoor?)		
7. Groom self (Do they get groomed?)		
8. Mobility – Normal exercise routine?		
9. Sleep/rest – where do they sleep? Hide box? Bedding?		
10. Express normal behaviour; has vision affected behaviour?		
PRE-OPERATIVE CHECKS		BLOOD GLUCOSE READINGS
T: P: R:		Time: Reading: mmol/L
Heart Murmur? Y N Grade:		Time: Reading: mmol/L
ASA: 1 2 3 4 5 E		Time: Reading: mmol/L
Pre-operative check with VS? Y N Date:		Time: Reading: mmol/L
Intraocular pressure: L: mmHg R: mmHg		Schirmer tear test: L: mm/min R: mm/min
COMMENTS/BELONGINGS/CLIENT REQUESTS		CURRENT MEDICATION

of chemicals. The ophthalmologist may prefer not to clip the surgical site as brachycephalic breeds often present with dermatological conditions which could cause further irritation and patient interference post-operation. If the surgical field is clipped, it is necessary to lubricate

the corneal surface to avoid contamination of the eye (Adshead, 2012).

When positioning in theatre the patient should be placed on the correct side with the down facing non-surgical eye lubricated. The ophthalmologist will generally

prefer to position the head with vacuum cushions to suit their needs. It may be necessary to place brachycephalic breeds in dorsal recumbency for ocular access; ventilation may be compromised and artificial ventilation may be necessary (Prisk, 2019)

For surgical preparation, povidone-iodine is the preferred solution diluted 1:50 in sterile saline for use on the conjunctival sac and cornea (Peterson & Crispin, 2002). A luer-lock syringe of the 1:50 iodine solution can be used with sterile cotton buds to clean the conjunctival sac and cornea. A higher concentration of 1:10 can be used on the external eyelid skin; lint-free swabs are preferred as linting versions or cotton wool can leave particles on the surgical site. Non-woven swabs are generally gentler on the skin and can be folded by all four corners to create a smaller contact area which is easier to control near the eye surface.

It is also important to ensure that the correct contact time and dilution is achieved for maximum antiseptics; both factors are often overlooked in busy veterinary surgery. For globe rupture or penetrating injuries, saline or balanced salt solution should be used as povidone-iodine can damage intra-ocular structures should it enter the eye (Adshead, 2012).

Discharge & home care

Effective communication is a vital part of patient discharge; RVNs must be able to communicate information efficiently while engaging with the client and understanding their needs. General ocular nursing considerations need to be communicated with the owner; including demonstrations which allow the client to be involved and gives them an opportunity to ask questions about any aftercare such as applying topical medication and cleaning the eyes post-operatively.

Conclusion

With any ocular condition, it is important to follow a logical sequence to be able to identify and address unique nursing considerations; the use of nursing care plans and questionnaires allows for patient-specific and holistic care. An awareness of why brachycephalic breeds differ from non-brachycephalic breeds and a basic understanding of the anatomical and physiological differences allows the RVN to provide a superior level of care.

The growing popularity of brachycephalic breeds calls for RVNs and VS knowledge and professional obligation to prevent and minimise negative health and welfare impacts of extreme breeding. It is the RVNs and VS duty

to address the issues surrounding extreme brachycephalic breeding at the level of the patient, client and politically (Fawcett et al., 2018, RCVS, 2020). At the level of the patient, both the VS and RVN must have an understanding of the pathophysiology of brachycephalic ocular syndrome and the treatment options. Long-term VS and RVNs should aim to educate clients, breeders and the community about extreme brachycephalic breeding in an attempt to improve health and welfare standards.

Disclosure statement

No potential conflict of interest was reported by the author(s).

ORCID

Amber Foote  <http://orcid.org/0000-0001-5670-1664>

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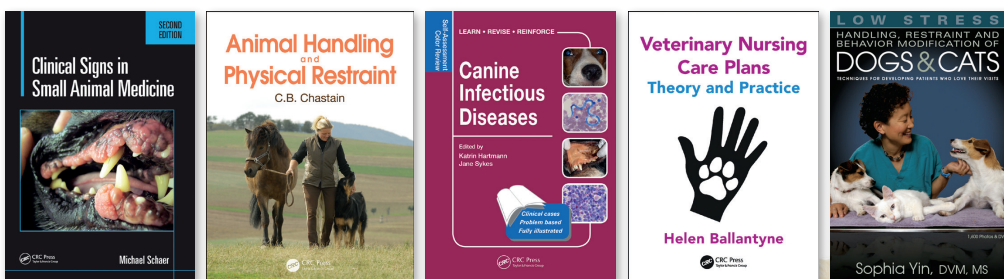
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