





## OPHTHALMOLOGY

# Diagnosis and Treatment of Ocular Proptosis

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Proptosis, or traumatic forward displacement of the globe out of the orbit, is a serious ocular emergency that requires immediate attention to minimize discomfort and damage to the eye (**FIGURE 1**).<sup>1</sup> With proptosis, the eyelid margins are trapped behind the equator of the globe and, together with profound tissue swelling in the orbit, prevent the eyeball from returning to a normal position.<sup>2</sup>

### ETIOLOGY

Proptosis is caused by a traumatic event such as a dog-on-dog fight (e.g., a big dog that injures a little dog), blunt force injury (e.g., when a dog is hit by car or struck by a ball), or iatrogenic trauma from excessive physical restraint. The latter is particularly true in brachycephalic dogs; excessive pressure around the eyelids or neck (e.g., scruffing) may suffice to displace the globe in these dogs given their shallow orbits and macropalpebral fissure.<sup>3</sup>

### DIAGNOSIS

Proptosis is diagnosed based on a traumatic

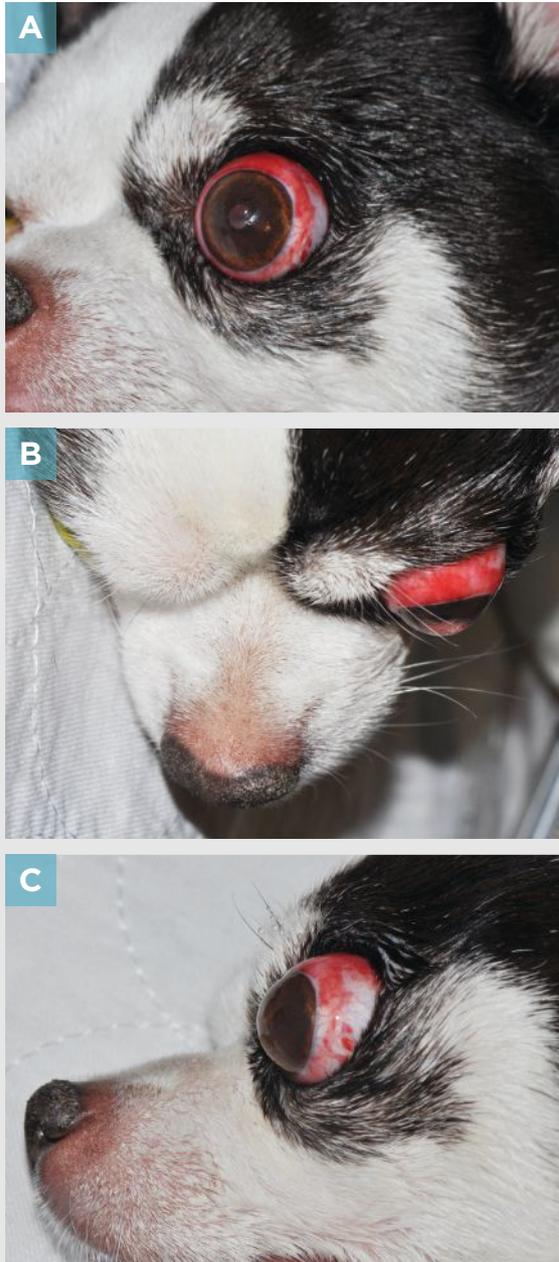
history, an acute onset, and a characteristic clinical appearance: rostral protrusion of the globe, clinician's inability to see the eyelid margins (rolled inward, trapped behind the equator of the globe), and patient's inability to blink the eyelids over the cornea. Other potential signs include pain, periocular swelling, hemorrhage, and strabismus.<sup>4</sup>

Proptosis is easily differentiated from exophthalmos and buphthalmos, which also cause a "bulging eye" appearance. In both exophthalmos and buphthalmos, the eyelid margins are visible (i.e., not trapped behind the globe) and the patient is able to blink, although eyelid closure may be incomplete (lagophthalmia). With exophthalmos, the globe is displaced rostrally due to pathology in the retrobulbar space (e.g., abscess, tumor). With buphthalmos, the globe position is unchanged; rather, the eyeball is enlarged due to chronic elevation in intraocular pressure (glaucoma) and subsequent stretching of the globe.<sup>4</sup>

Interestingly, the terminology used in human medicine is different. The terms *proptosis* and

### STATE OF EMERGENCY

Proptosis is serious; the best chance for salvaging the eye and preserving vision is to perform surgery to reposition the globe as quickly as possible.



**FIGURE 1.** Proptosis in an 8-year-old Chihuahua viewed from different angles. Note the forward protrusion with entrapment of the eyelid margins behind the equator of the globe, subconjunctival hemorrhage, and corneal desiccation. The patient was managed with globe replacement and temporary tarsorrhaphy.

*exophthalmos* are used interchangeably in humans,<sup>5</sup> while a traumatic displacement of the globe is called *globe luxation*.<sup>6</sup>

## PROGNOSIS

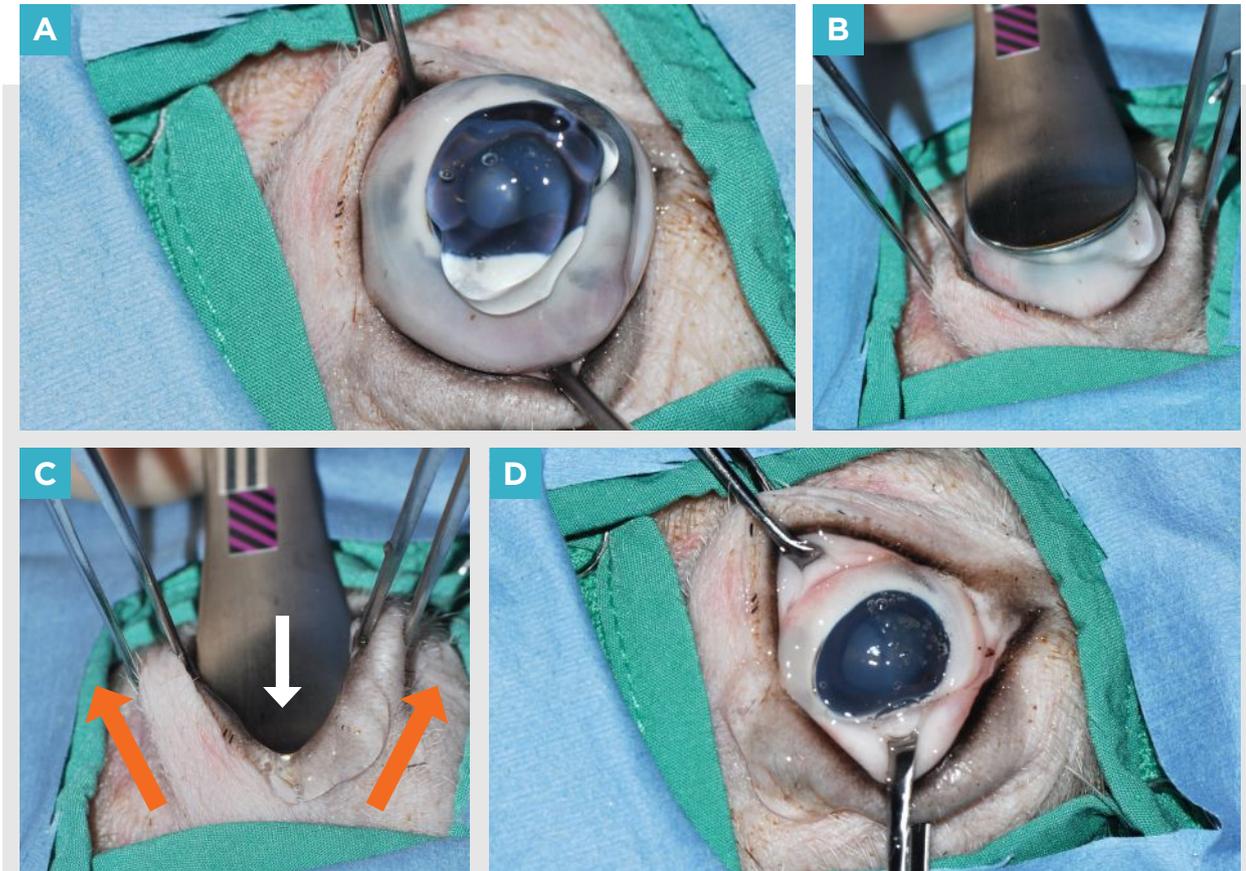
Prognosis for vision is generally guarded to poor, with vision retention described in ≤28% of patients at



**FIGURE 2.** Proptosis in a 3-year-old miniature Australian shepherd viewed from different angles. Note the severe globe protrusion, periocular hemorrhage, and avulsion of multiple extraocular muscles (medial/ventral/lateral recti muscles, ventral oblique muscle). The patient was managed with enucleation given the poor prognosis for globe salvage.

follow-up visits.<sup>1,7-9</sup> Visual prognosis is better in eyes with intact direct or consensual pupillary light reflex at admission but is not affected by the resting pupil size.<sup>1,9</sup> Further, visual prognosis may be improved in brachycephalic dogs<sup>1</sup> and cases managed promptly after the inciting trauma,<sup>7,8</sup> although these findings were not confirmed in a recent study.<sup>9</sup>

Prognosis for maintaining a comfortable eye in place (globe salvage), regardless of visual outcome, depends on several factors. Negative prognostic indicators include globe rupture, intraocular hemorrhage, avulsion of 3 or more extraocular muscles, optic nerve avulsion, and orbit/skull fractures.<sup>1</sup> Prognosis is also poor in cats and non-brachycephalic dogs, as the substantial force needed to displace a globe that is deep-set in the orbit often results in concurrent orbital fractures and/or severe damage to the eye (e.g., globe rupture, avulsed muscles or optic nerve).<sup>2,10</sup>



**FIGURE 3.** Proptosis reduction demonstrated in a cadaver pig eye. **(A)** Apply generous lubrication to the eye, and grasp each eyelid centrally and “full-thickness” (i.e., one tooth in contact with the palpebral conjunctiva, the other with the dermal portion of the skin) with atraumatic forceps (Allis tissue or Von Graefe). **(B)** Place a Jaeger lid plate or other smooth, flat instrument (e.g., blade handle or sterile tongue depressor) in contact with the globe. **(C)** Lift the forceps “up and out” (i.e., away from the orbit; **orange arrows**) while an assistant provides gentle counterpressure on the globe (**white arrow**). **(D)** The globe is returned to its normal position behind the eyelids. If resistance to globe replacement is encountered, follow the steps detailed in **FIGURE 4** to relieve tension.

## TREATMENT

### Globe Replacement Versus Enucleation

Globe replacement and temporary tarsorrhaphy is generally preferred, as the globe can be removed at a later visit if needed. Cosmetic outcome is often satisfactory,<sup>11</sup> owners’ satisfaction is generally high (unless chronic medications are required),<sup>9</sup> and a handful of cases may retain/regain vision.<sup>1,3,7</sup> However, proper case selection is critical, as salvaged globes must be comfortable and cosmetically acceptable to the owner.<sup>2,12</sup> Alternatively, enucleation should be considered as the initial therapy if the patient presents with one or several of the aforementioned negative prognostic indicators (**FIGURE 2**) or if the owner is unable or reluctant to provide potential long-term care.<sup>13</sup>

### Globe Replacement

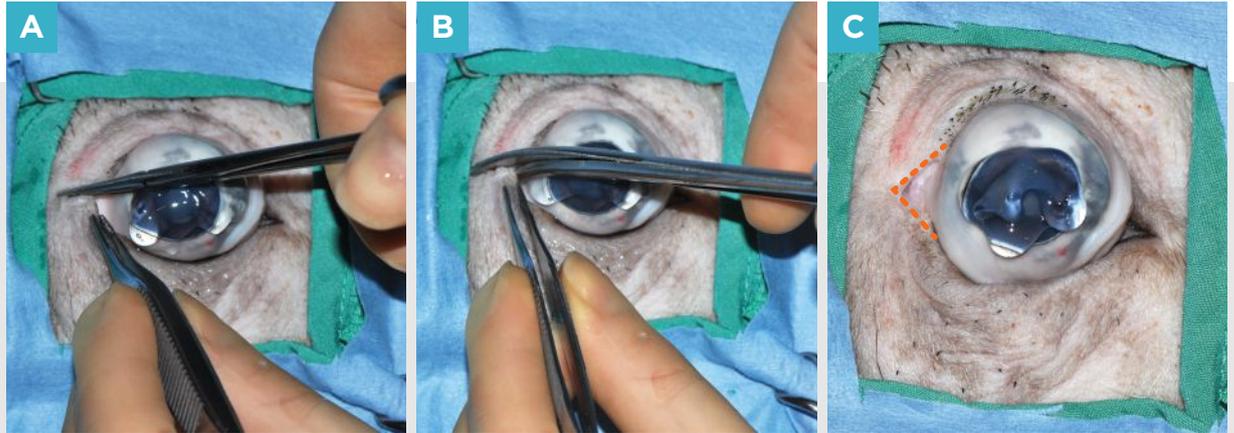
Following an ophthalmic examination, generous lubrication is applied to the eye (artificial tears gel or ointment) to protect the corneal surface from desiccation. A thorough physical and neurologic examination is performed to ensure the patient is stable. With the patient under general anesthesia or heavy sedation, long periocular hair is clipped or trimmed, the ocular surface and periocular skin are rinsed and prepped with saline and 0.5% povidone-iodine solution, and the surgical site is draped in a sterile manner.

Traditionally, globe replacement is achieved by preplacing tarsorrhaphy sutures, with or without lateral canthotomy, then bringing the eyelid margins forward by lifting the sutures and applying gentle counterpressure on the globe.<sup>2,9,13,14</sup> **FIGURE 3** and

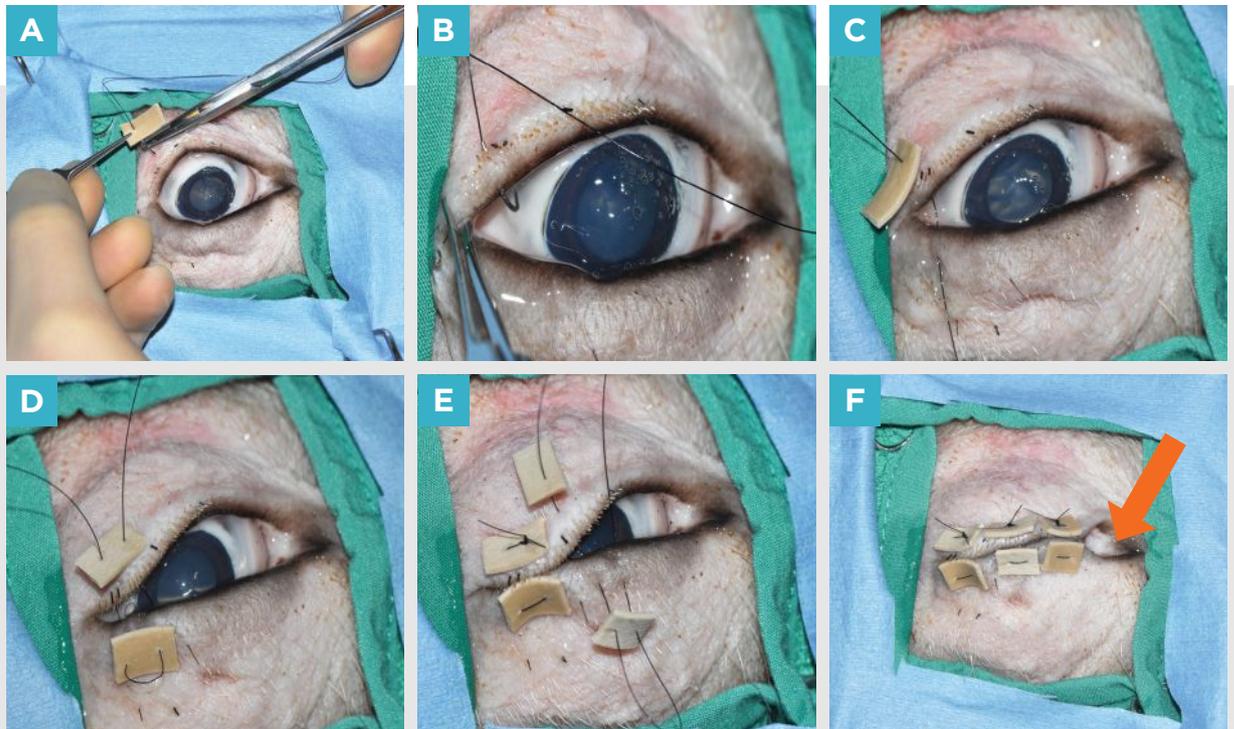


Video 1 ([todaysveterinarypractice.com/ocular-proptosis](https://todaysveterinarypractice.com/ocular-proptosis)) show the steps of an alternative maneuver the authors use to replace the globe prior to suture placement, making it easier to pass the sutures through the lid margins and reducing the risk of inadvertent

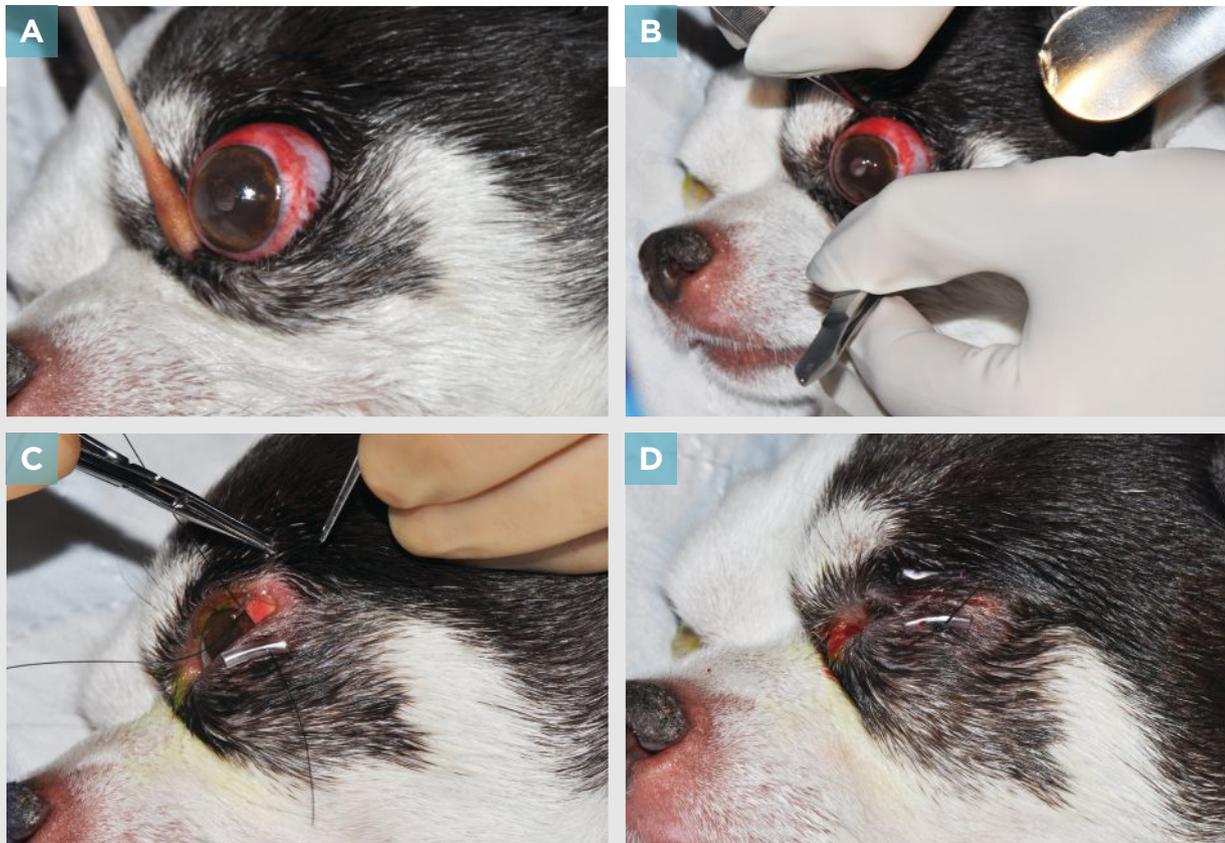
trauma to the globe with the needle. In the authors' experience, and according to variants of this technique described by others, this method alone is often sufficient to replace the globe.<sup>3,8</sup> However, some patients may require a lateral canthotomy to relieve



**FIGURE 4.** Lateral canthotomy demonstrated in a cadaver pig eye. **(A)** Crush the skin (-1 cm) at the lateral canthus with straight hemostat clamp. **(B)** Cut the crushed tissue with Metzenbaum scissors. **(C)** The lateral canthotomy (**dashed orange lines**) relieves tension to ease reduction.



**FIGURE 5.** Temporary tarsorrhaphy demonstrated in a cadaver pig eye. **(A)** Pass the nonabsorbable suture through the stent material. **(B)** Enter the skin -5 mm from the eyelid margin and exit the needle through a meibomian gland orifice, staying partial thickness. **(C)** Pass the needle through the opposite eyelid margin and exit the skin equidistant to the first bite. **(D)** Pass the needle through another stent and complete the horizontal mattress suture. **(E)** Place a second mattress suture adjacent to the first. **(F)** A third mattress suture may be needed in some patients. Leave a small opening at the medial canthus to allow administration of postoperative topical medications (**orange arrow**).



**FIGURE 6.** Globe replacement and temporary tarsorrhaphy demonstrated in the same patient as in **FIGURE 1.** **(A)** Eyelids and conjunctiva prepped with dilute povidone-iodine. **(B)** Central upper and lower eyelids fixated with atraumatic forceps and well-lubricated Jaeger lid plate to be placed against the globe for counterpressure. **(C)** Temporary tarsorrhaphy sutures initiated laterally following globe replacement. **(D)** Postoperative appearance.

excessive tension and facilitate globe replacement (**FIGURE 4**).

Once the globe is repositioned, 2 or 3 partial-thickness horizontal mattress sutures are placed with nonabsorbable material (4-0 or 5-0 nylon or silk) and stents to bring the upper and lower lids together, leaving a small opening at the medial canthus to allow for postoperative application of topical medications (**FIGURE 5**). Stents (IV tubing, rubber band, or buttons) help prevent pressure necrosis of the skin by reducing tension from the suture material.<sup>10,13</sup> Care must be taken to ensure proper suture placement (i.e., needle through the meibomian gland openings, not the palpebral conjunctiva)<sup>2,10</sup> and to close each suture tight enough to avoid any space between the upper and lower eyelids. A gap between the eyelids, whether noted intraoperatively or postoperatively when the periocular swelling subsides, should be addressed promptly to avoid corneal irritation or ulceration from suture material contacting the ocular surface. If performed, the lateral canthotomy is corrected with a two-layered

closure, using a figure-of-eight suture to properly align the lateral canthus.<sup>2</sup> The main surgical steps for proptosis correction in a clinical patient are described in **FIGURE 6** and Video 1 (available in online article).

## POSTOPERATIVE CARE

Postoperative therapy includes a topical broad-spectrum antibiotic every 6 hours, topical 1% atropine every 12 hours (controls pain, stabilizes the blood-aqueous barrier, and prevents synechia formation), a systemic anti-inflammatory (steroidal or nonsteroidal), a systemic antibiotic, and analgesics.<sup>3,10</sup> A topical nonsteroidal anti-inflammatory may also be considered if significant intraocular inflammation is present, but topical steroids should be avoided.<sup>1</sup> Weekly monitoring is advised, as the tarsorrhaphy sutures often loosen when the periocular swelling decreases. Additionally, owners should be educated to look for gapping between the upper and lower eyelids, as suture material rubbing the ocular surface can cause serious corneal ulceration.



Long-term complications of proptosis are common, as the traumatic displacement of the globe can damage the optic nerve, extraocular muscles, and vascular and nervous supply to the eye.<sup>1,7,8,11</sup>

Sutures should remain in place for 2 to 3 weeks and can be removed all at once;<sup>13</sup> alternatively, sutures can be removed one at a time on a weekly basis.<sup>12</sup> Premature removal could predispose the patient to globe re-prolapse, corneal desiccation, or ulceration. If residual lagophthalmia (inability to fully blink) or orbital swelling is present after suture removal, new sutures should be placed for an additional 2 to 3 weeks.<sup>13</sup>

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Activity restriction and Elizabethan collar are imperative until all sutures are removed.

Long-term complications of proptosis are common, as the traumatic displacement of the globe can damage the optic nerve, extraocular muscles, and vascular and nervous supply to the eye.<sup>1,7,8,11</sup> Hence, owners should be warned that long-term medications may be necessary and that enucleation may be recommended in future visits if the globe is nonvisual and painful.<sup>12</sup>

Keratoconjunctivitis sicca and corneal ulceration are common postoperative sequelae;<sup>1,7-9</sup> therefore, Schirmer tear test and fluorescein staining should be performed at suture removal and again 1 to 2 months later, or as indicated for the individual patient. Other complications include strabismus (i.e., deviation of the visual axis, most often laterally due to medial rectus muscle avulsion), exposure keratitis, retinal degeneration, and phthisis bulbi.<sup>1,7,8</sup> Prophylactic surgery to prevent occurrence or recurrence of proptosis, through shortening the palpebral fissure with either a medial canthoplasty or a permanent lateral tarsorrhaphy, should be considered in predisposed brachycephalic breeds.<sup>12</sup> **TVP**

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