Indian J. Vet. Surg. 46(1): 57-60 June 2025

Studies on traumatic proptosis in 22 dogs

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DOI: 10.5958/0973-9726.2025.00012.2 *Received: March 2025*

The present study included 22 dogs suffering from unilateral traumatic proptosis presented during the period from January 2023 to December 2024. Among different breeds, non-descript (72.73%, n=16) breed was the most affected. More number of cases (77.27%, n=17) were chronic, with fighting (68.18% n=15) as the major cause of proptosis. Male dogs (68.18%, n=15) were more commonly affected with proptosis than females. Animals of age group 0-2 yr were the most affected (72.73%, n=16), followed by 2-5 yr (18.18%, n=4) and >10 yr age groups. All cases of traumatic proptosis divided in two groups (groups I and II) underwent surgical management. In group I (n=6), globe replacement surgery (GRS) along with tarsorrhaphy was performed in five acute and one chronic case. In group II (n=16), trans-palpebral enucleation was done in all chronic cases. Complications following GRS included dorso-lateral strabismus, corneal ulceration and phthisis bulbi. The prognosis after globe replacement surgery was favourable in three dogs, fair in two dogs and unfavourable in one dog with phthisis bulbus condition. In trans-palpebral enucleation, no complications were noticed. To conclude, globe replacement surgery along with tarsorrhaphy was found appropriate in managing acute proptosis cases with favourable to fair prognosis; whereas trans-palpebral enucleation proved suitable for managing chronic proptosis cases without any complications.

Key words: *Enucleation, Globe replacement surgery, Phthisis bulbus, Strabismus, Traumatic proptosis*

Traumatic proptosis, an ophthalmic emergency condition in dogs, is characterized by partial or complete rostral displacement of the globe in relation to the orbit. The condition may occur due to head trauma either from an accident or fight with another animal. Orbital haemorrhage and swelling due to trauma further displace the globe from orbit that might reduce the vitality of globe and cause vision loss. Predisposing factors may include breed-specific skull anatomy and the surroundings. Immediate intervention is most important to preserve the vision and lower complication incidences (Crispin, 2005). The condition of eye at the time of presentation influences surgical intervention. Enucleation is suitable option in severely damaged globe, and globe replacement with tarsorrhaphy is beneficial in less severe and acute cases (Miller, 2008). Complications following globe replacement surgery (GRS) may include phthisis bulbi, strabismus, ulcerative keratitis, keratoconjunctivitis sicca or lateral exotropia (Ali and Mostafa, 2019). Thus, initial presentation and time lapse between injury and surgical intervention influence the outcome of treatment. Keeping in view the above facts, the present study was undertaken to evaluate the hospital incidence, to develop diagnostic and prognostic indicators and surgical management of acute and chronic cases of traumatic proptosis in dogs.

Materials and Methods

The study was carried out on 22 dogs that were diagnosed with traumatic proptosis (7.94%) out of 277 dogs with ophthalmic affections reported between January 2023 and December 2024. Detailed history regarding etiology and duration of illness was collected, followed by physical examination of the affected eye. Menace response and pupillary light reflexes were evaluated as a neuro-ophthalmic assessment. On the basis of history, physical, ophthalmological and ultrasonographic examination, the condition of traumatic proptosis was diagnosed. The confirmed cases of traumatic proptosis either acute or chronic were included in the study (Fig. 1). The incidence of traumatic proptosis was recorded as per breed, age, gender and affected eye. Age-wise the animals were divided in 5 groups, i.e., 0-2 yr, 2-5 yr, 5-8 yr, 8-10 yr and > 10 yr of age.

All the cases of traumatic proptosis underwent surgical treatment under general anaesthesia. The animals were divided into two groups, i.e., group I and group II depending on the viability of eye and

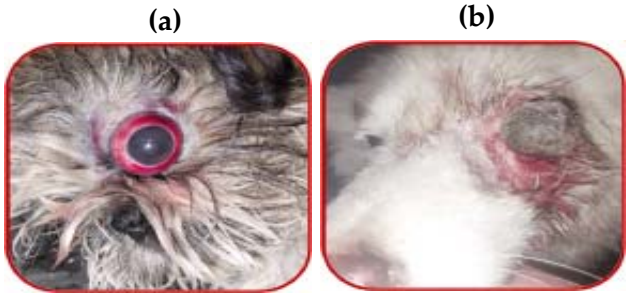

Fig. 1: Left eye traumatic proptosis: Acute in Shih Tzu (a) and chronic in Spitz (b)

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extraocular tissues. The animals of the group I (n=6) were treated by reposition, i.e., globe replacement surgery (GRS) along with tarsorrhaphy; whereas the animals of the group II (n=16) were treated by trans-palpebral enucleation. Meanwhile, in order to prevent desiccation of cornea, proptosed globes were protected with sterile lubricating 0.3% carboxy methylcellulose eye ointment.

Systemic antibiotic amoxicillin-sulbactam (10 mg/kg body wt., i.v.) and tramadol (2 mg/kg body wt., slow i.v.) were administered 60 min prior to surgery. Anaesthetic protocol included premedication with atropine sulphate (0.04 mg/kg body wt., i.m.), followed by sedation with butorphanol tartrate (0.2 mg/kg body wt., deep i.m.) and midazolam (0.2 mg/kg body wt., i.v.). Induction of anaesthesia was done with propofol (4 mg/kg body wt., i.v.) and maintained with isoflurane (1.5-2.5%). The dogs were kept in lateral recumbency with the affected eye upward and head positioned on head positioner and adjusted by soft padding in latero-oblique position. Eyelids and periocular area were rinsed with sterile normal saline solution and painted with 5% povidone-iodine solution. Ocular surface and conjunctival sacs were lavaged with 0.5% povidone iodine solution followed by flushing of eye with sterile normal saline solution. The eye was draped in triangular fashion and then covered with a single holed sterilized drape.

Globe replacement surgery along with tarsorrhaphy was performed in animals of group I as per the method described by Ali and Mostafa (2019). Initially, sterile gauze soaked in normal saline was placed on the globe in order to protect it. Further, loose suture for temporary tarsorrhaphy at middle eyelid position was placed in horizontal mattress pattern using 3-0 monofilament polyamide suture. Sterile gauze was then gently compressed with a curved mosquito haemostat while the ends of sutures were uniformly pulled upward simultaneously. Thus, the proptosed eyeball was gently repositioned in the orbit and the suture was tied along with sterile tubing. Lateral canthotomy was performed in two cases to replace the swollen eye ball. The resulting incision was subcutaneously sutured using 3-0 polygalactin 910 (Fig. 2).

Postoperatively, ophthalmic drops moxifloxacin (0.5%) for two weeks and flurbiprofen (0.03%) for one-week QID was advised after eye wash with sterile normal saline solution twice. Systemic antibiotic amoxicillin-clavulanic acid (10 mg/kg body wt., PO) b.i.d. for seven days and methylprednisolone in tapering dose (1 mg/kg body wt., PO, b.i.d. for three days followed by 1 mg/kg body wt., PO, OD for four days) was also prescribed. Elizabethan collar was advised for one month postoperatively. The temporary tarsorrhaphy sutures were removed after two weeks. The cases were followed for one month for recurrence and complication incidences.

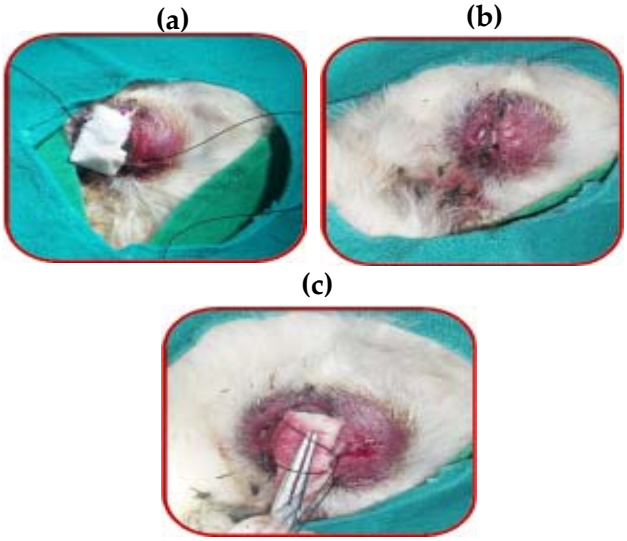

Fig. 2: Steps of globe replacement surgery along with tarsorrhaphy: (**a)** Normal saline soaked gauze along with loose tarsorrhaphy suture; (**b)** Simultaneous gentle compression over sterile gauze and upward traction at the ends of sutures; (**c)** Suture tied along with sterile tubing

In group II, trans-palpebral enucleation was performed in globe rupture and threatened globe conditions as per the method described by Eaton (2018). Initially, both upper and lower eyelids were sutured together in a simple continuous pattern followed by an encircling incision approximately 2-3 mm from the eyelid edges. Blunt dissection was carried out up to the orbital margin along with sectioning of lateral and medial canthal ligaments. Caudal dissection outside the extraocular muscles was continued, and optic nerve and associated blood vessels were clamped with a curved artery forceps followed by ligation. The globe was removed by cutting between the forceps and globe, without puncturing it. Wound closure was started at the level of tenon's capsule and conjunctival remnants, followed by subcutaneous layer in simple continuous manner using 3-0 polygalactin 910. Eyelids were closed in horizontal Mattress pattern using 3-0 monofilament polyamide suture.

Postoperatively, systemic antibiotic amoxicillin-clavulanic acid (10 mg/kg body wt., PO, b.i.d.) for five days and carprofen (2 mg/kg body wt., PO, OD) for three days were also advised. Application of Elizabethan collar and antiseptic dressing of skin sutures was done until wound healing and suture removal. The cases were followed for one month for any complications including wound dehiscence and septic conditions.

Results and Discussion

During the study period from January 2023 to December 2024, a total 277 canine ophthalmic cases were registered at Surgery OPD, VCC. Out of these, 22 dogs (7.94%) of six breeds were diagnosed with

traumatic unilateral proptosis condition. Acute cases (n=5) were presented to the clinic within 8 hr following injury, whereas chronic cases (n=17) varied from 48 hr to 1 month. Fighting was the major cause of proptosis in 68.18% (n=15) of animals, whereas in 31.82% (n=7) animals automobile accident was the cause. Out of all cases, non-descript (72.73%, n=16) was the most affected breed, followed by Shih Tzu (n=2), Spitz, GSD, Puggle (Pug and Beagle cross) and Lhasa Apso (n=1 each). Among the 22 cases, left eye proptosis was observed in 59.09% (n=13) and right eye proptosis in 40.91% (n=9) cases. Males (68.18%, n=15) were the most affected with proptosis than females (31.82%, n=7). Animals of age group 0-2 yr (72.73%, n=16) were the most affected followed by 2-5 yr (n=4) and >10-yr age group (n=2). Higher incidences of traumatic proptosis in non-descript breed might be due to the fact that majority of the dogs that were brought to the clinic were stray animals. Hence, they were subjected more to accidents and infighting. Mishra *et al*. (2021) stated that male animals due to their aggressive behaviour are at increased risk of trauma. Proptosis in young animals was more, even with slight head trauma due to the less development of supporting muscles of eye. Apart from non-descript breed, brachycephalic breeds including Shih Tzu, Puggle and Lhasa Apso were also subjected to proptosis. Prominent eye globes, large palpebral fissure and shallow orbit are the risk factors for proptosis in these breeds. Ali and Mostafa (2019) have reported mean±SD age of 15±3.87 months with highest occurrence in Pekingese (53.3%), followed by Griffon (26.7%), Maltese (13.3) and mixed breed dogs (6.7%), with left eye proptosis (80%) more than the right eye (20%).

In the present study, conjunctival hyperaemia and inflamed periorbital tissue were the common clinical findings in all the cases of proptosis. Entrapment of eyelids behind the globe was seen in 90.91% (n=20) cases, whereas movable eyelids in only 9.09% (n=2) cases. Desai (2013) stated that eyelid spasms in proptosis condition leads to entrapment of eyelids behind the globe that prevent their retraction and cause swollen periorbital tissues. Secondary to eyelid entrapment, vascular supply to the globe is potentially compromised leading to reduced globe's vitality and vision. Thus, chronic cases of proptosis in the present study were subjected to variable degree of exposure keratitis, keratoconjunctivitis sicca and exotropia on reporting. Presence of keratitis and dry cornea hampered assessment of pupillary light reflex (PLR) in all chronic cases. However, among acute cases, PLR was present in three cases, whereas it was sluggish and miotic in one animal each. Menace response was absent in all cases except one acute case of two months old male dog of non-descript breed. Globe rupture was also observed in 9.09% (n=2) cases. Miller (2008) stated that oculomotor nerve damage or even compression may lead to miotic pupil in proptosed eyes. Moreover, in severe proptosis, optic nerve may overstretch causing permanent vision loss. Hence, it is the most acute ocular emergency and therefore, an immediate surgical intervention is crucial.

In the present study, ultrasonography was also performed to assess the condition of internal structures of eyes. Acute cases depicted near to normal intraocular morphology and echogenicity of various internal structures. However, in one case, echo in vitreous chamber with motion on real-time examination, indicated vitreous haemorrhage. On the contrary, all chronic cases showed variable degree of globe disorganization (Fig. 3). Animals that depicted near to normal ultrasonographic morphology underwent GRS. On the contrary, animals with globe disorganization, were subjected to enucleation, except in one Lhasa Apso dog. The animal owner's non-compliance for enucleation affected the selection of surgical procedure in this case. Six animals of group I (27.27%), that included five acute and one chronic case were subjected to globe replacement surgery (GRS) along with tarsorrhaphy. After removal of temporary tarsorrhaphy suture, all animals underwent vision and complications assessment.

Complications accompanying proptosis may include avulsion of optic nerve, permanent strabismus, ulcerative keratitis, keratoconjunctivitis sicca and phthisis bulbus (Thomasy, 2024). Phthisis bulbi, an end-stage ocular response to severe eye damage, leads to disorganization of the globe and

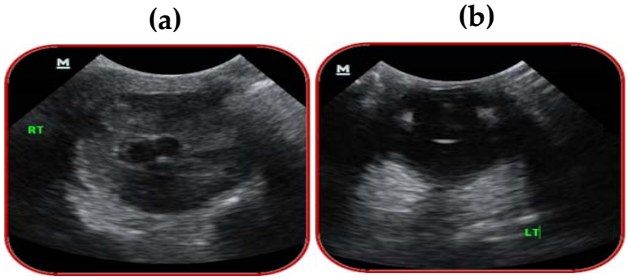

Fig. 3: B-mode ultrasonogram of traumatic proptosis cases: (**a)** Normal intraocular morphology and echogenicity in acute condition; (**b)** Globe disorganization in chronic condition.

atrophy, resulting into shrunken, collapsed and non-functional eye. Similar findings were also recorded in present study, where complications following GRS included dorso-lateral strabismus, corneal ulceration and phthisis bulbi (n=1 each). Further, one chronic case of Lhasa Apso breed that underwent GRS ended up with phthisis bulbi (Fig. 4). Findings of complications were in close agreement with Ali and Mostafa (2019) who have also reported exotropia and phthisis bulbi as complications of GRS. Proptosed eyes with associated rupture of extraocular muscles may end up with phthisis bulbi, as ciliary arteries

that enter the globe shares the path with these extraocular muscles (Miller, 2008).

Prognosis of the condition depends on reflexes, duration of exposure, severity of globe damage and associated complications. Prognosis is favourable in cases with positive pupillary light reflex, miotic pupil, normal fundus findings and absence of hyphema (Thomasy, 2024). On the contrary, invisible pupil, absence of reflexes, fixed and dilated pupil, orbital fractures, optic nerve damage and avulsion of three or more extraocular muscles may lead to less favourable prognosis. However, absence of reflexes doesnot necessitate poor prognosis, but severely proptosed eyes and associated vision impairment are expected to have an unfavourable prognosis even after successful GRS (Kennard, 2009). Additionally, ocular ultrasonographic findings also help in selection

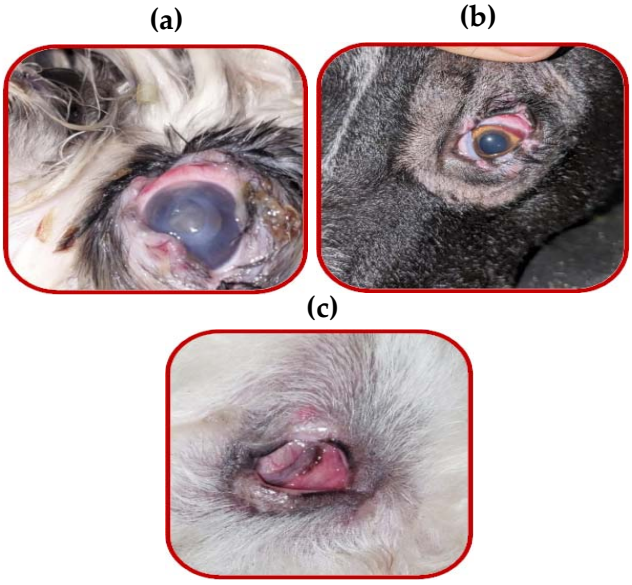

Fig. 4: Postoperative follow-up after globe replacement surgery: (**a**) Eye in normal position in non-descript dog; (**b**) Corneal ulcer in Shih Tzu dog; (**c**) Pthisis bulbus condition in Lhasa Apso dog.

of surgical treatment and its prognosis (Malik and Pandey, 2021). In the present study, the animals depicting near to normal ultrasonographic morphology underwent GRS. On the contrary, the animals with ultrasonographic globe disorganization picture were subjected to enucleation, except in one Lhasa Apso dog. GRS in that eye was ended with phthisis bulbus condition. Thus, ocular ultrasonography plays a very important role in disease prognosis. In the present study, prognosis after globe replacement surgery was favourable in three dogs (50%) showing menace response and PLR, fair in two dogs (33.33%) having menace response but sluggish and absent PLR, respectively. However, one Lhasa Apso dog with phthisis bulbus with no menace response and PLR had unfavourable prognosis. Similar prognosis assessment was reported by Ali and Mostafa (2019), who have observed favourable prognosis in animals having positive reflexes, even with strabismus conditions and unfavourable prognosis in phthisis bulbi conditions.Thus, globe replacement surgery should only be performed in acute cases with near to normal eye anatomy and physiology.

Trans-palpebral enucleation was performed in 16 animals of group II (72.73%) due to threatened globe conditions. During follow-up period for one month, no complications were noticed. Similarly, Gilger *et al*. (1995) successfully managed 21 cases of traumatic proptosis in dogs by enucleation with no complications. Thus, chronic cases should only be managed by enucleation method to prevent further ocular related complications.

To conclude, traumatic proptosis in canines is the most acute ocular emergency and therefore, owner's compliance and an immediate surgical intervention is critical in order to preserve vision and avoid additional damage to proptosed globe. In the present study, globe replacement surgery along with tarsorrhaphy was found appropriate in managing acute proptosis cases with favourable to fair prognosis, whereas trans-palpebral enucleation proved suitable for managing chronic proptosis cases without any complications.

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