



# Management of canine glaucoma using a combination of dorzolamide and timolol<sup>#</sup>

 Shubham W. Raut<sup>1\*</sup>,  Syam K. Venugopal<sup>2</sup>,  Laiju M. Philip<sup>3</sup>,

 K. D. John Martin<sup>4</sup>,  Arun George<sup>5</sup> and  Greeshma Joy<sup>6</sup>

Department of Veterinary Surgery and Radiology  
College of Veterinary and Animal Sciences, Mannuthy, Thrissur- 680 651  
Kerala Veterinary and Animal Sciences University  
Kerala, India

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## Abstract

A study was conducted in twelve glaucomatous dogs to assess the efficacy of the combination of dorzolamide and timolol in the treatment of glaucoma in dogs. The study included twelve dogs with glaucoma of any age, breed, or gender. On the day of presentation, the 14<sup>th</sup>, 28<sup>th</sup> and 42<sup>nd</sup> days, the intraocular pressure (IOP) was monitored with an applanation tonometer. For 42 days, all dogs received topical instillation of a combination of dorzolamide (2%) and timolol (0.5%) eye drops, one drop twice daily. In all the dogs, there was a shift in IOP towards the established normal level within two weeks of therapy. The study revealed that topical use of a combination of dorzolamide and timolol eye drops twice daily was successful in lowering IOP in dogs with glaucoma.

**Keywords:** Glaucoma, dorzolamide, timolol, dogs, IOP

Glaucoma in dogs is a serious and progressive eye disease that can lead to varying degrees of compromised vision, often irreversible, if not treated appropriately (Cassonet *et al.*, 2012). It is a complex disorder characterised by progressive optic nerve damage, visual field loss, and elevated intraocular pressure (IOP) that can lead to permanent blindness (Maggio, 2015). This

<sup>#</sup>Part of MVSc thesis submitted to Kerala Veterinary and Animal Sciences University, Pookode, Wayanad, Kerala, India

1. MVSc Scholar
2. Professor and Head, University Veterinary Hospital, Kakkakai
3. Assistant Professor
4. Professor and Head
5. Assistant Professor, Dept. of Vet. Clinical Medicine, Ethics and Jurisprudence, CVAS, Mannuthy
6. Teaching Assistant, Dept. of Statistics, CVAS, Mannuthy

\*Corresponding author: [tshubhamr@gmail.com](mailto:tshubhamr@gmail.com), Ph. 9146134816

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disorder occurs when intraocular pressure (the pressure inside the eye) rises to levels that damage the optic nerve and retina. Although various treatment options are available, managing glaucoma in dogs can be challenging due to its multiplicity of aetiology. Dorzolamide and timolol are two drugs commonly used together to treat glaucoma in dogs (Plummer *et al.*, 2006; Scardillo *et al.*, 2010). Both drugs work by lowering eye pressure in different ways. Dorzolamide is a carbonic anhydrase inhibitor that reduces the production of aqueous humour. Timolol, on the other hand, is a beta-blocker that reduces aqueous humour production and improves its outflow (Plummer *et al.*, 2006; Maślanka and Zuśka-Prot, 2017). Michaud and Friren (2001) suggested that combination therapy is available as eye drops, administered directly to the affected eye twice daily. Hence, the study was undertaken to evaluate the efficacy of a combination of dorzolamide and timolol eye drops in the management of glaucoma.

The dogs presented with ocular complaints to the University Veterinary Hospitals at Mannuthy and Kokkalai were screened for glaucoma and high IOP, and those with the signs of glaucoma were selected for the study. Twelve dogs with glaucoma were selected for the study irrespective of age, breed and sex of the animals for a period of 12 months from December 2021 to December 2022. A general physical examination and thorough clinical examination were done in all the cases to rule out any systemic illness as the eye is an indicator of many systemic illnesses. Tests for assessing the vision and neuro-ophthalmic tests including menace response and pupillary light reflex were performed on the day of presentation and the subsequent day of observation. Basal and reflex tear production values were recorded in all the cases using the Schirmer tear test. The intraocular pressure was measured using digital applanation tonometry (Tono-pen Avia® Vet) after desensitizing the cornea with topical instillation of 0.5 per cent proparacaine (Paracaine) eye drops. All the animals were placed in sternal recumbency, sitting or standing position with slight restraint to reduce the pressure on the neck and eyelids were softly retracted. Holding the tonometer

perpendicular to the eyeball the corneal surface was gently touched with the tip of Tono-pen. Three consecutive readings with 95 per cent accuracy level were noted and the average value was recorded as IOP in mm of Hg. Direct ophthalmoscopy and indirect ophthalmoscopy were done to evaluate the fundus of the eye. Ocular instillation of one drop of dorzolamide (2%) and timolol (0.5%) combination (Glutim-D™) eye drops were done in all the eyes twice daily for 42 days. The observations were recorded on 14<sup>th</sup>, 28<sup>th</sup> and 42<sup>nd</sup> day.

Glaucoma is a common ocular disease that affects both humans and animals, including dogs (Komáromy *et al.*, 2019). Among the disorders of canine globe, 7.47% were glaucoma (Antonia *et al.*, 2014). The condition is usually difficult to diagnose at an early stage because of the subtle clinical signs but clinical examinations, including measurement of intraocular pressure, can detect the disease before clinical symptoms appear (Weinreb and Khaw, 2004). Once the disease is diagnosed, regular examinations and monitoring are essential to adjust treatment and ensure that the disease is being treated appropriately.

In the present study, the clinical signs observed were episcleral congestion, blindness, buphthalmia and epiphora (Miller and Bentley, 2015). Female dogs were found to be more affected than males (Park *et al.*, 2012; Tramontinet *et al.*, 2014). Out of the experimental dogs, seven were females and five were males and the average age of the affected dogs ranged from six months to 14 years with an average age of  $4.23 \pm 4.26$  years. Menace response in the affected eyes was positive in 38 per cent and negative in 62 per cent. Pupillary light reflex (PLR) in the affected eyes was positive in 69 per cent and negative in 23 per cent. Direct ophthalmoscopy and indirect ophthalmoscopy were done to evaluate the fundic lesions associated with the glaucoma. It was not performed in five dogs as the cornea or lens was not clear due to pigmentary keratitis or cataractous changes respectively. Optic disc cupping was noticed in two dogs, retinal vessels attenuation was noticed in one dog, cataractous changes were noticed in four dogs and retinal haemorrhages were noticed in one

**Table.1** Mean±SE of tonometry for affected and non-affected eyes

	Affected eyes	Non-affected eyes
<b>Day0</b>	33.99 ± 1.79 <sup>a</sup>	18.54±1.22 <sup>ns</sup>
<b>Day14</b>	19.76 ± 1.96 <sup>b</sup>	17.12±1.33 <sup>ns</sup>
<b>Day28</b>	19.94 ± 1.73 <sup>b</sup>	17.90±0.99 <sup>ns</sup>
<b>Day42</b>	18.05 ± 0.66 <sup>b</sup>	16.24±0.97 <sup>ns</sup>

Different superscript has significant difference between days at the level of 1%<sup>ns</sup>-nonsignificant

dog, while, one dog exhibited no changes on fundus examination (Priya, 2009; Lavanya, 2021).

For the affected eye the mean ± SE of STT-1 (mm/min) was 17.69 ± 2.51 and STT-2 was 9.46 ± 1.60 on the day of presentation and it remained within the normal range throughout the period of observation (Shanthala, 2018; Blocker *et al.*, 2007). Tonometry was done in both eyes of all the animals selected for the study. Comparison of tonometry value for the affected and non-affected eyes was done between the day of presentation (0<sup>th</sup>day) and days of review *i.e.* 14<sup>th</sup>, 28<sup>th</sup> and 42<sup>nd</sup>days using repeated measures ANOVA. The mean ± SE of IOP (in mmHg) for the affected eyes were 33.99 ± 1.79, 19.76 ± 1.96, 19.94 ± 1.73 and 18.05 ± 0.66 on 0<sup>th</sup>, 14<sup>th</sup>, 28<sup>th</sup> and 42<sup>nd</sup>days respectively. The mean ± SE of IOP (in mmHg) for non-affected eyes were 18.54. ± 1.22, 17.12 ± 1.33, 17.90 ± 0.99 and 16.24 ± 0.97 on day 0, day 14, day 28 and day 42 respectively. Statistical analysis showed a significant decrease ( $p < 0.01$ ) in intraocular pressure in the case of affected eyes between the 0<sup>th</sup> and 14<sup>th</sup>, 28<sup>th</sup> and 42<sup>nd</sup> days. This finding was similar to the observation of Plummer *et al.* (2006) who had noticed a reduction in IOP after using this combination of drugs. Also, the combination of dorzolamide and timolol is more effective than either alone in lowering IOP (Plummer *et al.*, 2006). It is important to note that this treatment is not a cure for glaucoma, but rather a therapeutic strategy to slow down the progression and alleviate associated symptoms. In conclusion, the treatment of canine glaucoma with dorzolamide and timolol combination therapy is a safe and effective strategy to lower intraocular pressure and slow disease progression. Early detection and regular monitoring could be critical steps to the successful management of glaucoma in dogs.

## Summary

Glaucoma in dogs is a progressive eye disease causing optic nerve damage, visual field loss, and elevated intraocular pressure, which can cause blindness. The study evaluates the effectiveness of using dorzolamide and timolol eye drops to manage glaucoma in dogs. Twelve dogs with glaucoma were selected for the study, and their clinical signs, vision test, tear production and IOP were assessed before and after treatment. The combination therapy of dorzolamide and timolol eye drops significantly reduced IOP in affected eyes and helped manage glaucoma in dogs.

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## Conflict of interest

The authors declare that they have no conflict of interest.

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