

RESEARCH ARTICLE

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Study of some contemporary techniques of Glaucoma treatment in Veterinary

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Abstract

Glaucoma consists in increasing intraocular pressure in the eye. It may be acute or chronic and is a consequence of changes in the flow of water. The diagnosis of glaucoma is based on history, clinical signs, tonometry and gonocopy. Clinical signs of glaucoma include: increased watering, mucous or yellow mucus, frosted eyes, blue-looking eyes, midriatic pupils that do not respond to light sources, high sleep, animal tends to hide or suddenly wild. In general, normal intraocular pressure for most animals ranges from 15-25 mmHg. The medication includes the use of carbonic anhydrase inhibitors, osmotic agents, beta-blockers adrenergic, parasymphomimetics, alpha 2-adrenoreceptor agonists and latanoprost. Not all medicines used in human glaucoma are used for glaucoma in animals because many of them are very expensive while some others exhibit undesirable side effects. This study was made possible by taking into consideration all cases presented at the Clinic of the Faculty of Veterinary Medicine during the period October 2015 - October 2017. The further completion of the study was carried out through the data collected from some private clinics of the city and Tirana. During the study period, they all underwent medical treatment. Vision or potential for vision of the affected eye must be assessed before appropriate therapy can be employed. Eyes afflicted with chronic glaucoma are usually irreversibly blind and uncomfortable. Blind eyes with acute glaucoma may still have potential for vision provided the intraocular pressure (IOP) can be normalized in a timely manner and the disease is still in its early stages.

Keywords: Glaucoma, Veterinary, intraocular pressure, glaucoma treatment.

1. Introduction

Glaucoma consists in increasing intraocular pressure in the eye. It may be acute or chronic and is a consequence of changes in the flow of water [4, 5, 10]. Glaucoma with its various forms is a pathology often observed in animals and humans. Glaucoma occurs when elevated intraocular pressure (IOP) impairs normal function of the eye. In canine and, IOP is elevated due to the reduced or absent egress of aqueous from the anterior chamber. Glaucoma destroys vision by killing ganglion cells with the direct effects of increased pressure and the indirect effects of impaired intraocular circulation [2, 6, 11]. Unlike primary glaucoma, secondary glaucoma is associated with concurrent and identifiable ocular disease such as inflammation (uveitis), neoplasia, hemorrhage, and lens luxation. Primary glaucoma is, by definition, ultimately bilateral. Therefore, the normal fellow eye is at risk and the owner needs to be aware of this. Primary glaucoma in dogs is an incurable disorder that, at best, can be managed effectively for variable periods of time. It is also an inherited disease, and affected dogs should not be used for breeding. Secondary glaucoma is usually a unilateral disease and can sometimes be successfully treated with preservation of vision if the underlying cause can be identified and corrected. Therefore, the prognosis as well as the goal of treatment differs depending on the primary diagnosis, both for the affected eye and the fellow eye. The basic mechanism for the elevation in IOP found in the primary canine glaucomas involves progressive accumulation of biochemical substances in the aqueous outflow pathways such that aqueous humor is unable to exit the globe and the IOP levels become harmful to the intraocular structures [9, 13]. This outflow obstruction may also be associated with inherent microcirculatory disturbances to the retina and optic nerve. As this progressive iridocorneal angle closure occurs, the choice of medical, surgical, or most frequently a combination of both therapeutic modalities to maintain IOP at "safe" levels in canine glaucomas must change. Choosing the proper therapy for glaucoma treatment, depends on accurate and thorough diagnostic evaluation. It must first be

determined whether the eye is affected with primary or secondary glaucoma because primary glaucoma is, by definition, ultimately bilateral and the normal fellow eye is at risk.

2. Material and Methods

The purpose of this study was the frequency of primary/secondary Glaucoma comparing with the frequency of acute/chronic Glaucoma. Also we want to study the frequency of this disease according gender, age, and breed, to see the different predisposition of this disease according to this factors. Another important purpose of this study was the comparative medical treatment in different type of Glaucoma. This study was made possible by taking into consideration all cases presented at the Clinic of the Faculty of Veterinary Medicine during the period October 2015 - October 2017. The further completion of the study was carried out through the data collected from some private clinics of Tirana district. The total number of presented dogs were 81. All of them were examined with direct ophthalmoscopy and the IOP was evaluated through Tonopen. During the ophthalmic examination were evaluated the presence and absence of normal direct and/or consensual PLRs, normal dazzle reflex and functional vision.

Table 1. The favorable clinical signs for normal vision

FAVORABLE PROGNOSTIC SIGNS FOR VISION	No of cases
Normal direct and/or consensual PLRs	47
Normal dazzle reflex	59
Normal menace or functional vision	59

During the general and special ophthalmic examination, the presented cases were evaluated for the presence of acute blindness, ocular pain, conjunctival and episcleral vascular congestion, and diffuse corneal edema. lens luxation, cataract, uveitis etc.

Table 2. The unfavorable clinical signs for abnormal vision.

UNFAVORABLE PROGNOSTIC SIGNS FOR VISION	No of cases
Absent direct and/or consensual PLRs	34
Absent dazzle reflex	22
Lack of detectable functional vision or history of blindness for more than 3-5 days	22

A complete physical examination and routine laboratory work (CBC, serum chemistry profile, urinalysis) was performed to look for systemic illness. as infectious diseases like leptospirosis, brucellosis, ehrlichiosis and the systemic mycoses. After all examinations, the selected patients for studying purpose were divided in some groups according to gender in patient with acute or chronic Glaucoma and in patients with primary or secondary Glaucoma (Table 3)

Table 3. The frequency of Glaucoma according to gender

Gender	Type of Glaucoma			
	Primary	Secondary	Acute	Chronic
Female	11	42	7	4
Male	6	22	5	1
All	17	64	12	5

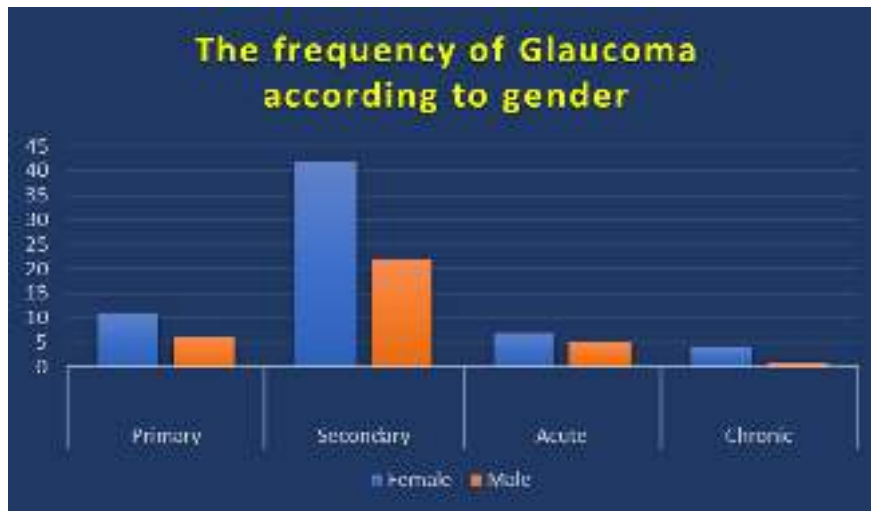


Figure 1. The frequency of Glaucoma according to gender

The patient diagnosed with primary and secondary glaucoma were divided according to their age in patient with secondary glaucoma related to underlying cause as uveitis, cataract, lens luxation, neoplasma, ocular trauma, retinal detachment Table 4

Table 4. The frequency of Glaucoma according to age

Group of Age (years old)	Primary Glaucoma		Secondary Glaucoma					
	Acute	Chronic	Uveitis	Ocular tumors	Ocular Trauma	Lens Luxation	Cataract	Retinal Detachment
1-5	2	0	1	0	2	0	0	0
5-10	5	2	7	2	6	3	7	1
10-14	5	3	11	4	5	3	9	3
All	12	5	19	6	13	6	16	4

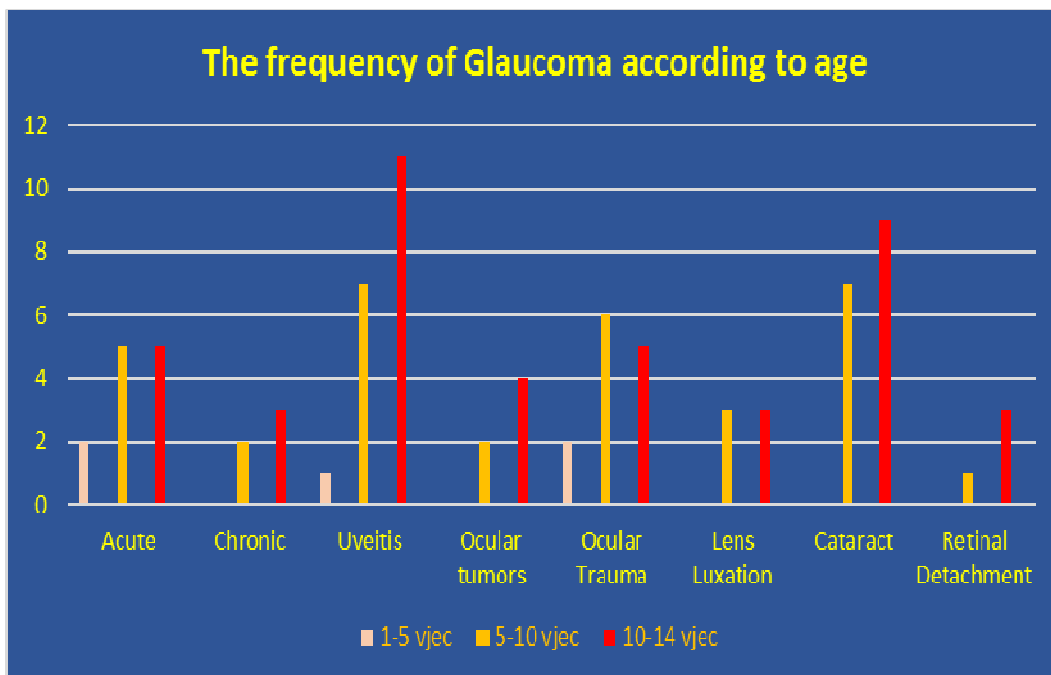
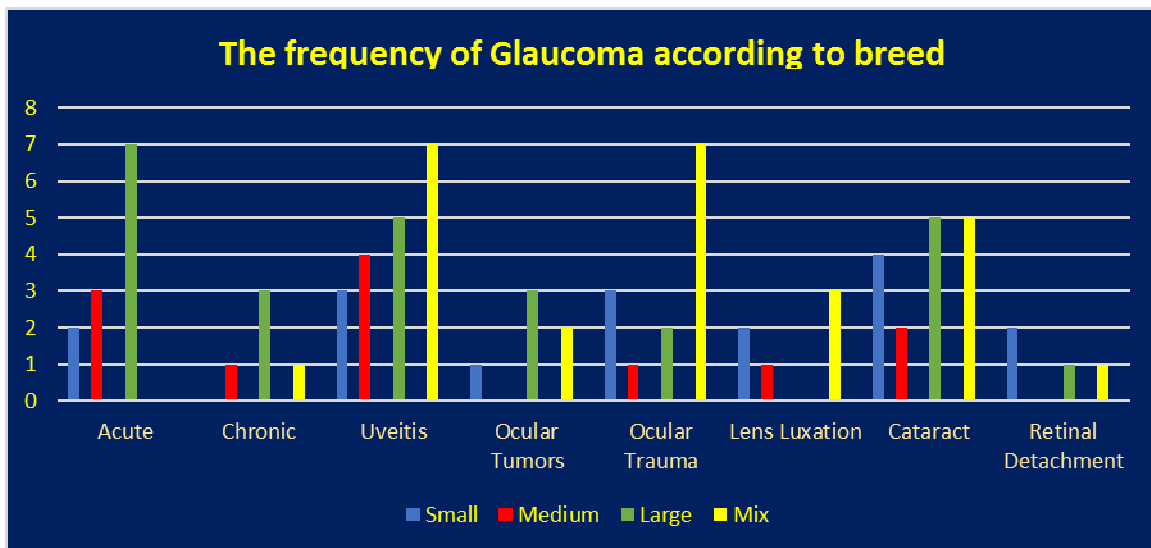


Figure 2. The frequency of Glaucoma according to age

The diagnosed patients with primary and secondary glaucoma were also divided according to breed. Table 5

Table 5 The frequency of Glaucoma according to Breed

Group of Breeds	Primary Glaucoma		Secondary Glaucoma					
	Acute	Chronic	Uveitis	Ocular Tumors	Ocular Trauma	Lens Luxation	Cataract	Retinal Detachment
Small	2	0	3	1	3	2	4	2
Medium	3	1	4	0	1	1	2	0
Large	7	3	5	3	2	0	5	1
Mix	0	1	7	2	7	3	5	1
All	12	5	19	6	13	6	16	4


Figure 3. The frequency of Glaucoma according to breed

3. Results and Discussion

Most of the diagnosed patients with glaucoma resulted with IOP (intraocular pressure) higher than 20 mmHg. [14, 18]: The goal of medical therapy for primary or secondary glaucoma was to decrease intraocular pressure by shrinking the intraocular volume, decrease aqueous production, or increase aqueous outflow. Osmotic agents were useful in the emergency treatment of acute glaucoma because they rapidly dehydrated the vitreous and decreased intraocular volume. Carbonic anhydrase inhibitors, β -blockers, and sympathomimetic agents decreased aqueous production [16, 17]. Miotics, sympathomimetic agents, and prostaglandin analogues increase aqueous outflow. The basic treatment was based on use of the drugs described below:

> Hyperosmotic Agents

Manitol Hyperosmotics are the most potent medical therapy available in terms of reducing severe IOP elevations, and they usually produce ocular hypotension lasting 2 - 5 hours within 30 minutes of administration. They are useful in emergency situations but lose their effectiveness after the second or third administration making osmotherapy ineffective for chronic therapy. Mannitol should be administered intravenously at a dosage of 1-2 gm/kg over 20 minutes.

> Carbonic Anhydrase Inhibitors

Methazolamide 2-4 mg/kg and **Acetazolamide** are readily available, because the production of dichlorphenamide has been discontinued.

➤ **Adrenergic blocking agents**

Timolol maleate (Timoptic, Merck) is the most commonly used drug is 0.5% Tim0101 is useful in both primary and secondary glaucoma and unlike topical miotic agents, does not potentiate uveitis. Because (3-blockers decrease aqueous production. The dogs diagnosed with Glaucoma have been treated in medical way. The medical treatment consisted on local, systemic and local and systemic way. The success rate was higher at the last form of treatment.

Table 6. The medical treatment and success rate of Glaucoma

Type of Glaucoma	Type of treatment					
	Local (Timolol 5%)		Systemic (Neptazane)		Local and systemic (Cosopt+ Neptazane +Manitol)	
	Successful	Recurrence	Successful	Recurrence	Successful	Recurrence
Primary	2	1	4	1	7	2
Secondary	8	7	15	7	23	4
Acute	3	2	2	0	5	0
Chronic	1	1	1	1	0	0

The patients with secondary Glaucoma have been cured treating the underlying cause. So the therapy for uveitis involved the use of topical and systemic corticosteroids and nonsteroidal antiinflammatory medications (prednisolone and dexamethasone) and antibiotics with broad spectrum by intravitreal injections and systemic injections. Comeal epithelial integrity (fluorescein dye testing) was assessed before using topical corticosteroids. The drugs selected, dosages, frequencies, and routes of administration varied with severity of the inflammation. Some drugs that have been useful for primary glaucoma were not used were uveitis was present. For example, topical pilocarpine, a directacting cholinergic miotic, echothiophate iodide (Phospholine Iodide, Wyeth-Ayerst), and demecarium bromide (Humorsol, Merck) was not used in uveitic eyes because they potentiate the breakdown of the blood aqueous barrier and can intensify concurrent uveitis. In addition, atropine, a strong mydriatic and cycloplegic agent that is generally recommended as adjunctive therapy for uveitis, should was not used in hypertensive eyes because pupillary dilation will further impair an already compromised iridocorneal angle.



Figure 4. Dog diagnosed with secondary Glaucoma due to anterior lens luxation (the dog had also bilateral cataract)

The patient with secondary glaucoma because of ocular trauma and ocular tumors were the most frequent. In these patients during the ophthalmologic examination was observed hyphema which could also be secondary to thrombocytopenia, coagulopathies, severe iritis, congenital ocular anomalies (e.g., retinal detachment, retinal dysplasia), and chronic glaucoma. Symptomatic treatment of hyphema was similar to that of anterior uveitis except that systemic nonsteroidal anti-inflammatory agents and topical ocular nonsteroidals should be avoided. As with treating uveitis with secondary glaucoma, topical mydriatic or cycloplegic agents such as atropine should not be used. Topical corticosteroids such as prednisolone acetate and dexamethasone are useful in controlling related inflammation. The blind patients with chronic glaucoma have been treated for a period of time but they have exhibited clinical disturbance of cardiac and respiratory system. Medical therapy has no place in the long-term management of blind and painful glaucomatous eyes. Most antiglaucoma medications are expensive and generally ineffective for long-term use [12, 19]. More importantly, all antiglaucoma medications, including topical drugs, have the potential for systemic toxicity and side effects. The oral carbonic anhydrase inhibitors are the most effective antiglaucoma drugs, but they also have the greatest potential for severe side effects such as polyuria/polydipsia, metabolic acidosis, depression, anorexia, vomiting, and diarrhea.

4. Conclusions

- In acute glaucoma, the fundus, when it can be seen, is usually normal.
- It is important to remember that there are no pathognomonic signs of acute glaucoma (in contrast to chronic glaucoma). Therefore, tonometry is essential for accurate diagnosis.
- The elevated IOP can cause irreversible damage to the visual potential of the eye within hours, that's why acute glaucoma, whether primary or secondary, is an ocular emergency.
- Eyes with chronic glaucoma are usually irreversibly blind and uncomfortable.
- Blind eyes with acute glaucoma may still have potential for vision provided the IOP can be normalized in a timely manner and the disease is still in its early stages.
- It should be emphasized that by the time IOP has been elevated long enough to cause buphthalmia, irreversible damage has been done to the retina and optic nerve. Therefore, the big eye is almost always a blind eye
- Glaucoma results more frequent in females than in male dogs.
- Glaucoma is relatively uncommon in young dogs.
- Symptomatic therapy to control intraocular inflammation and elevated IOP is imperative.
- Glaucoma is more frequent in medium and large breeds.
- Some drugs like topical pilocarpine, a directacting cholinergic miotic, echothiophate iodide (Phospholine Iodide, Wyeth-Ayerst), and demecarium bromide (Humorsol, Merck) should not be used in uveitic eyes because they potentiate the breakdown of the blood aqueous barrier and can intensify concurrent uveitis.
- Systemic parenteral/oral medical treatment combined with local medical treatment resulted more successful than local and systemic medical treatment alone.
- Glaucoma is more frequent in middle and advanced age.
- In some cases, glaucoma eventually become refractory to medical therapies to reduce IOP.
- Secondary glaucoma is more frequent than primary and chronic glaucoma
- Usually the secondary glaucoma by cataract are refractory of medical treatment. In these cases is recommended the surgical treatment of cataract.

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