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Study of Occurrence of Cataract and their Surgical Management in Dogs

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ABSTRACT

Background: Present study investigated the occurrence of cataract in dogs presented to the Teaching Veterinary Clinical Complex (TVCC) and Department of Veterinary Surgery and Radiology under Odisha University of Agriculture and Technology, Bhubaneswar during a period of four months. During the study period, a total number of 3847 canine cases were registered at TVCC, out of which 23 cases registered under the RKVY project for different types of ophthalmic affections. There were only eight canine cataract cases with overall prevalence of 0.2% among total canines presented to TVCC and 34.78% of total canines presented with some sorts of ophthalmic affections.

Methods: Menace reflex, pupillary light reflex, maze test, obstacle test, catoptrics test, Schirmer's tear test (STT), Schiotz tonometry, Slit lamp bio microscopy and fundus examination -using indirect ophthalmoscope (IO) and fundus camera, were carried out in all the cases studied.

Result: Occurrence of cataract was higher in Spitz (50%). Males had more incidences (62.5%) of cataract. The ages of the dogs were less than 10 years. B mode ultra-sonographic (USG) examination revealed increased echogenecity of lens in all cataract affected dogs while corneal opacification was found in two cases. Cataract was extracted by phaco-emulsification in three dogs and by small incision cataract surgery (SICS) technique in one dog.

Key words: Cataract, Dogs, Occurrence, Surgical management.

INTRODUCTION

Cataract is defined as a focal or diffuse opacity of crystalline lens or its capsule, resulting in disruption of normal light transmission that scatters light and looks grey or white. It may take on various forms and densities seen through pupil of eye, ranging from small white dots to entirely white cloudy opaque lens. It can cause blurred vision and eventually entire lens become cloudy with loss of all functional vision (Raghuvanshi *et al*., 2013). The different stages of cataract are often defined by percentage of lens volume involved and presence or absence of secondary degenerative changes. Incipient cataracts are estimated to occupy less than 10-15% of lens volume, immature occupy 15-95% and cataracts considered mature when 100% of the lens fibers are abnormal. This obliterates all fundic reflections. A cataract is termed as hyper mature when there is evidence of significant proteolysis and subsequent loss of lens volume. Along with this, the dystrophic mineralization results in refractile foci within the lens or its capsule (Lim *et al*., 2011). The time period required for development of lens opacity, varies from case to case and ranging from few months to a few years (Kopala, 2008). Phaco-emulsification lens extraction and artificial intraocular lens (IOL) implantation offer a favorable success rate and is considered as the most appropriate technique for treatment of cataract (Bras *et al*., 2006). The present investigation was undertaken to study the occurrence along with haemato-biochemical alterations and ultrasonographic changes seen in dogs affected with cataract and their surgical corrections.

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MATERIALS AND METHODS

A study was conducted regarding occurrence and management of cataract in dogs presented to the Teaching Veterinary Clinical Complex (TVCC) and Department of Veterinary Surgery and Radiology under Odisha University of Agriculture and Technology (OUAT), Bhubaneswar during a period of four months. During the period, a total number of 3847 canine cases were registered at TVCC; out of which 23 cases were registered under RKVY project entitled, "Strengthening of infrastructure for diagnosis, therapeutics and surgical interventions of ophthalmic affections in animals" for different types of ophthalmic affections. From 23 dogs only 8 cases were diagnosed as cataract. These 8 clinical canine cases (from different geographical and topographical locations of the state maintained by different

owners) were both unilateral and bilateral cataract of different breeds, body weight, health status and various etiological factors of having cataract were recorded. Animals of either sex aged between 4 years to 11 years were studied. Routine physical, clinical, haemato-biochemical tests were conducted. Gross examinations of eye *viz.* examining under sunlight and inside dark room with penlight, obstacle test, maze test, menace test, catoptrics tests were also studied. Along with these, other different diagnostic aids like hand held slit lamp bio microscope, Indirect Ophthalmoscope, Fundus camera, digital tonometry, B- scan ultrasound were used for correct diagnosis of cataract (Fig 1-4). The haemato-biochemical parameters were also studied in apparently normal and healthy animals presented to the TVCC for normal health check up as control group and compared with the test group animals. Cataract extraction surgery was conducted in 3 dogs by phaco-emulsification method and in one dog by small incision cataract surgery (SICS) technique. Flubriprofen eye drops t.i.d. was advised to instill in the eye to be operated one day before the operation date. Tropicamide (Auromide, Aurolab, India) and Ofloxacin were used as preoperative pupil dilator and antibiotic respectively in the form of eye drops at 20 minutes interval 3/4 times. The animals were preanaesthesized by using Glycopyrolate (Pyrolate, Neon Laboratories Limited) subcutaneously @ 0.01 mg/kg body weight (bwt), injection Butorphanol (Butodol, Neon Laboratories Limited) @ 0.2 mg/kg bwt and Midazolam (Mezolam, Neon Laboratories Limited) @ 0.3 mg/kg bwt were given intravenously as preanaesthetics followed by injection Propofol (Neorof, Neon Laboratories Limited) @ 4 mg/kg bwt I/V for induction. General anesthesia was maintained by Isoflurane with endotracheal intubation. The animal was kept on lateral recumbency with head resting over sand bag to the position of operation. The site around eye ball was applied with povidone iodine five times on different directions. The fornices were cleaned with povidone iodine dipped sterile buds. The sterile drape having window was covered over the head and body parts keeping window slit at eye ball. Then another disposable sterile drape was covered over the first drape. Both the eye lids were opened and fixed using appropriate sterile eye speculum (Fig 5). Topical anesthetic eye drop of proparacaine (Aurocaine, Aurolab, India) was instilled on eye.



Fig 1: Showing fundus examination by fundus camera.

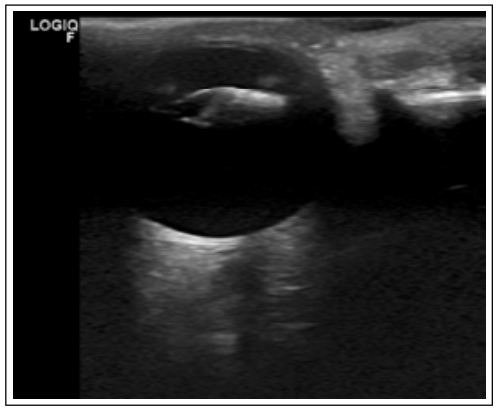


Fig 2: Showing B-mode ultrasono graphy of matured cataractous lens of dog.

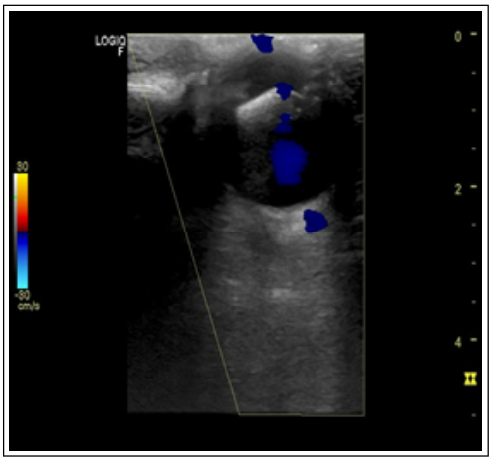


Fig 3: Showing color doppler ultrasonography of cataract affected dog.

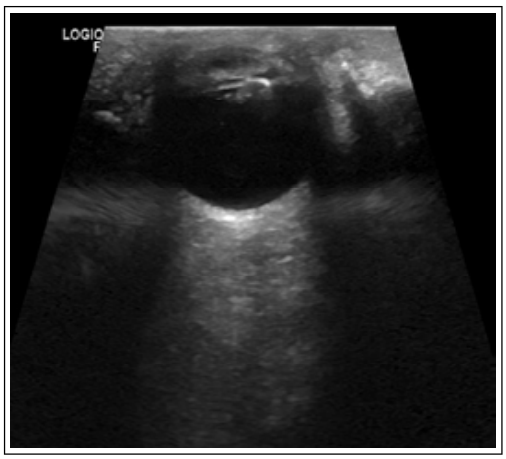


Fig 4: Showing B-mode ultrasonography of immature cataractous lens of dog.

Phaco-emulsification technique

Keeping the head in position, under standard operative procedure (SOP) two numbers of ports were made at 3 and 9 O'clock position of limbus using keratome. Then at 11 O'clock position another port was made using MVR (Myringovitreoretinal) blade and keratome. The bulbar bleeding was controlled by using bipolar electrocautery attached to Phaco-emulsification equipment. Through the 3 O'clock port, Simcoe's 2 way cannula was attached to the anterior chamber (AC) and irrigated using Ringer's Lactate solution (RL). Throughout the surgical procedure RL was sprinkled continuously over cornea to keep moist. At 9 O'clock port one air bubble was injected below cornea and at the same time Trypan blue solution was sprinkled over anterior capsule of lens by a cannulated syringe and withdrawn. Then the previously prepared 26 gauge capsule-rhexis needle was introduced and the anterior capsule was wounded and reflected. Through flushing, the excised capsular material was removed using flushing syringe and forceps. The site was thoroughly flushed using hydro-dissection cannula fitted with 10 ml syringe having RL so as to dislodge the lens from capsular bag. Then the phaco probe was introduced through 9 O'clock port and the matured cataract lens broken into pieces, dissolution done and sucked out by aspiration probe. Visco-elastic substance was pushed into AC and flushed using RL. Then the foldable Polymethylmethacrylate (PMMA) intra ocular lens (IOL); (Aurolens, Aurolab, India) of 41 Diopter (D) was loaded into the IOL Injector and pushed into the capsular bag. Using Dialer, the haptic of IOL was adjusted inside the lens capsular bag properly so as to remain in position. The AC was thoroughly irrigated and flushed to remove the remnants of visco-elastic substance. Then one large air bubble was pushed to AC so as to keep elevating the cornea in normal shape. The 3, 9 and 11 O'clock ports were sealed by hydration method using RL in pressure through cannulated syringe. The injured conjunctiva was dragged and covered at the incised site and plugged using bipolar electro-cautery. Dexamethasone (Dexona, Zydus-Cadila, India) 0.2 ml was injected sub-conjunctively at lower bulbar conjunctiva. Povidone iodine eye drops were instilled. Both the eyelids were closed and padding was applied.

Small incision cataract surgery (SICS)

At 10 to 12 O'clock position of limbus, the bulbar conjunctiva was incised and reflected. A semi lunar incision was given 2 mm away from limbal margin using BP handle (No.3) with 15 number blade (Fig 6). One tunnel was prepared using crescent and cornea incised by keratome. At 3 and 9 O'clock position two ports were made on limbal junction using MVR blade. Simcoe's 2 ways cannula was attached to anterior chamber (AC) for irrigation. Throughout the procedure RL was sprinkled over cornea to keep moist. At 3 O'clock port one air bubble was injected below cornea and Trypan blue solution sprinkled over anterior capsule of lens. The anterior capsule was cut and reflected using 26 gauge capsule-rhexis needle (Fig 7). The site was thoroughly flushed using hydro-dissection cannula fitted with 10 ml syringe having RL to dislodge lens from capsular bag. The cataractous lens was over matured having chalky materials. Hence, that was irrigated, flushed and aspirated. Repeated flushing was done to remove remnants of lens materials. Visco-elastic substance was pushed into AC and flushed using RL. Then Polymethylmethacrylate (PMMA) intra ocular lens (IOL); (Aurolens, Aurolab, India) of 41 D was pushed into capsular bag. The AC was thoroughly irrigated and flushed, one large air bubble pushed to elevate cornea in normal shape (Fig 8). Both 3 and 9 O'clock ports were sealed by hydration and 10 to 12 O'clock tunnel sutured using 8-0 nylon. The conjunctiva was covered at incised site and plugged using bipolar electrocautery. Dexamethasone 0.2 ml was injected sub-conjunctively. A Povidone iodine eye drop was instilled. Eyelids were closed by tarsorrhaphy. All the cases were administered with inj ceftriaxone sodium and tazobactum @ 20 mg/kg body weight and inj meloxicam @ 0.2 mg/kg body weight twice daily along with eye drops of Ofloxacin and flubiprofen 6 times daily. The animals were applied with Elizabethan collar and the owners were advised to take proper care and prevent mutilation. In SICS dog the suture

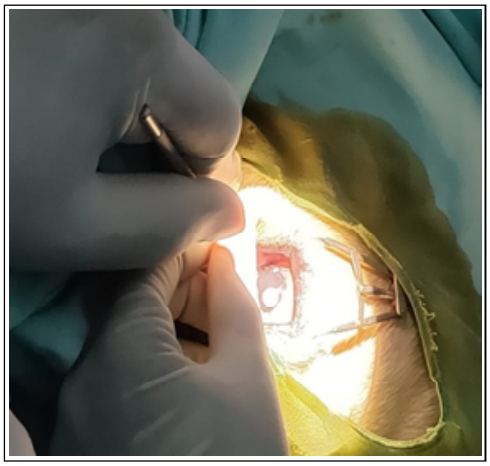


Fig 5: Showing application of eye speculum.

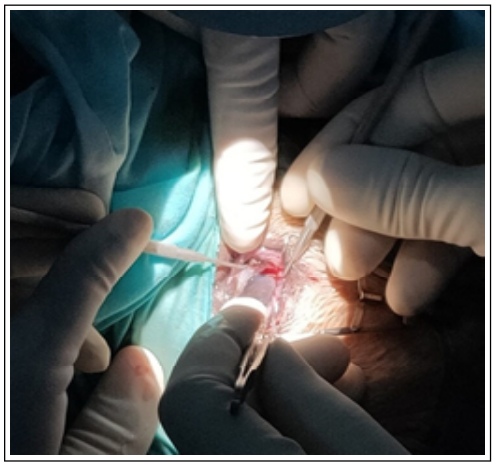


Fig 6: Showing Limbal incision on bulbar conjunctiva.

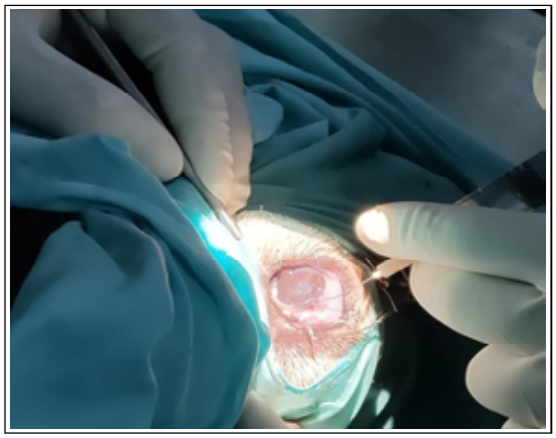


Fig 7: Showing Capsulo-rhexis of anterior capsule of lens.



Fig 8: Showing eye after irrigation of anterior chamber after IOL implantation.

materials were removed after 14 days. The animals regained vision slowly with adaptation of lenses at about 20 to 30 days after operation. No problem was evinced with any of the animal.

RESULTS AND DISCUSSION

The total numbers of ophthalmic cases registered was 23 (0.59%) of the total canine cases 3847 and out of which cataract cases diagnosed was 8 (34.78%) and 0.20% of total number of canine cases presented to TVCC spanning over four months. This is in agreement with earlier research findings (Ramani *et al*., 2013). All the cataract cases diagnosed during the study period aged between 4-11 years with variable body weight ranging from 8.5 to 44 kg. Majority of dogs (62.5%) diagnosed for cataract were below 10 years of age with only 37.5% dogs were above 10 years age (Table 1). Only one case of diabetic cataract was encountered which tends to be 12.5%. Breed wise occurrence of cataract cases in canines revealed higher incidences in Spitz (n=4, 50%) followed by Labrador (n=2, 25%), French Mastiff (n=1, 12.5%) and Dalmatian (n=1, 12.5%) respectively. Gender wise incidence resulted higher occurrences in the male dogs (n=5, 62.5%) as compared to females (n=3, 37.5%). Within this limited number of 8 cases, the age wise incidence of cataract was between the ages 4 to 11 years *i.e.* adult hood to senile stage (Table 1). Present findings were in congruent with earlier reports (Ramani *et al*., 2013; Bath *et al*., 2006; Gelatt *et al*., 2005). There were bilateral cataracts in 5 dogs (62.5%), while unilateral cataract cases in 3 dogs (37.5%) as recorded during the study period. In all the cases the eye sizes were normal except case no.6 (Dalmatian) where glaucoma was seen in left eye.

There was high degree of menace response (+++) in unaffected eyes (n=3) while affected eyes showed less response to menace test (+ to ++). High degree of Pupillary Light Reflex (PLR) (+++) was seen in 3 unaffected eyes among 16 eyes of 8 cataract affected dogs (Table 2). The affected eyes showed less response to the test (+ to ++) which is in consonance with previous findings (Bath *et al*., 2006).

All the 3 unaffected eyes showed negative to obstacle test means the dog moved aside and did not collided with the card board placed in between the dog and its owner followed by call made by the owner to move towards the owner. All the affected eyes revealed positive to obstacle test. After directing one penlight beam through the pupil, the reflection of greenish coloration reflex was seen in 3 unaffected eyes indicating positive for tapetal reflex test. In all the cataract affected eyes, no greenish color reflex was seen indicating negative for tapetal reflex test (Table 2). The Schirmer's tear test (STT) showed nearly normal value in both the cataract affected and non-affected eyes ranging from 13 mm/min to 18 mm/min. Both cataracts affected and non-affected eyes revealed intraocular pressure ranging from 17 mmHg to 30 mm Hg except left eye of case no.6 which showed 38 mm Hg indicating glaucoma (Table 1). Similar reports published on ophthalmologic examination of a dog in which menace reflex was negative, pupillary light response was positive and fundus was not visible in right eye confirming case of mature cataract (Suresh *et al*., 2018).

In slit-lamp bio microscopy, out of 8 nos. of cataract affected dogs, hyper matured cataracts were seen in 4 eyes of 3 dogs (Case no.1 OD, case no. 4 OU and case no. 5 OD). The matured cataracts were examined in 4 eyes of 3 dogs (case no. 2 OS, case no. 5 OS and case no. 8 OU). The immature cataracts were found in 5 eyes of 4 dogs (case no. 2 OD, case no. 3 OS, case no. 6 OU and case no. 7 OS). The pseudo-exfoliation was seen in both eyes of one dog (case no. 5). Complete cataract was observed in 8 eyes of 5 dogs (case no, 1 OD, case no.2 OD, case no. 4 OU, case no. 5 OU and case no. 8 OU) while cortical cataract was seen in case no. 3 (OS). The nuclear cataract was seen in case no. 2 (OS), case no. 6 (OU) and case no. 7 (OS). Similar findings were observed by other researchers (Cullen *et al*., 2005; Maehara *et al*., 2005; Kalaka *et al*., 2017). In the present study, out of 16 eyes of 8 cataract affected dogs the hyper matured cataracts were seen in 4 eyes of 3 dogs (25%), matured cataracts in 4 eyes of 3 dogs (25%) and immature cataracts in 5 eyes of 4 dogs (31.25%) which is similar to the previous findings (Kalaka *et al*., 2017).

In this study, sonography was done in all the 8 dogs having cataract, by 7.5 MHz linear transducer where as Kumar *et al.* (2008) examined the eye in 20 dogs using real time B mode, grey scale and dual frequency with 5-10 MHz. In B-mode ultrasonography, corneal opacification was found in left eye of two cases (case no. 4 and 6). Increased echogenicity of lens was found in all cataract affected dogs. The unaffected eyes of unilateral cataract cases showed anechoic lens (Table 2). But the cataractous lens appeared as a mild hyper-echoic area immediately deeper to aqueous humor. The prominent changes marked were hyper echoic in anterior and posterior cortices and nucleus too. Increase of lens thickness in matured cataract as intumescences was revealed in 3 dogs of bilateral cataract cases (case no. 2, 5 and 6). Reduction of lens thickness was seen in immature cataract as loss of lens protein in one dog (Sl. no. 7). Blood flow was evident on retinal wall in all the cases. Similar findings were also reported by earlier workers (Cullen *et al*., 2005; Williams, 2004; Vasough *et al*., 2008).

Examination of blood collected from affected dogs revealed that, the average values of TEC, Hb%, TLC, N%, L%, E%, M%, B% were 6.70±0.32 million/mm^3, 11.30±0.40 g/dl, 10.77±2.16 thousand/mm^3, 69.12±2.44%, 24.50±1.67%, 2.62±0.26%, 3.12±0.58%, 0.5±0.18% respectively. One case showed leukocytosis with neutrophilia (case no. 3). In rest of the cases it was within the normal range indicating

Table 1: Showing results of Schirmer's tear test and IOP measurement of cataract affected dogs.

Breed	Age (in years)	Sex	Site of cataract	Eye	Schirmer's tear test (mm/min)	IOP (mmHg)
Labrador	6	M	Unilateral	Left	15	17
Retriever			Cataract (OD)	Right	13	20
Spitz	10	F	Bilateral	Left	13	22
			Cataract	Right	17	19
Spitz	7	M	Unilateral	Left	14	26
			Cataract (OS)	Right	16	18
Spitz	7	M	Bilateral	Left	16	23
			Cataract	Right	18	19
Labrador	5	F	Bilateral	Left	15	26
Retriever			Cataract	Right	14	28
Dalmatian	11	F	Bilateral	Left	17	38
			Cataract	Right	16	22
French	4	M	Unilateral	Left	13	25
Mastiff			Cataract (OS)	Right	15	21
Spitz	10	M	Bilateral	Left	16	30
			Cataract	Right	14	26

Table 2: Showing results of menace response, pupillary light reflex, obstacle test, tapetal reflex test and degree of ecogenecity in USG of cataract affected dogs.

Breed	Site of cataract	Eye	Menace response	Pupillary light reflex	Obstacle test	Tapetal reflex	Degree of ecogenecity in ultrasonography			
							Cornea	Lens	Vitreous body	Retina
Labrador	Unilateral	Left	+++	+++	Negative	Positive	-	-	-	-
Retriever	Cataract (OD)	Right	+	+	Positive	Negative	-	++++	-	-
Spitz	Bilateral	Left	+	+	Positive	Negative	-	++	-	-
	Cataract	Right	++	+	Positive	Negative	-	+++	-	-
Spitz	Unilateral	Left	+	+	Positive	Negative	-	++	-	-
	Cataract (OS)	Right	+++	+++	Negative	Positive	-	-	-	-
Spitz	Bilateral	Left	+	+	Positive	Negative	+	++++	-	-
	Cataract	Right	+	+	Positive	Negative	-	++++	-	-
Labrador	Bilateral	Left	++	++	Positive	Negative	-	+++	-	-
Retriever	Cataract	Right	+	+	Positive	Negative	-	++++	-	-
Dalmatian	Bilateral	Left	+	+	Positive	Negative	+	++	-	-
	Cataract	Right	+	++	Positive	Negative	-	++	-	-
French	Unilateral	Left	+	+	Positive	Negative	-	++	-	-
Mastiff	Cataract (OS)	Right	+++	+++	Negative	Positive	-	-	-	-
Spitz	Bilateral	Left	+	++	Positive	Negative	-	+++	-	-
	Cataract	Right	+	+	Positive	Negative	-	+++	-	-

N.B. - Degree of echogenicity rated in 0 to 4+ scale basis).

absence of any systemic bacterial infection. Examination of serum of cataract affected dogs revealed that, the average values of serum glucose, total protein (TP), albumin, globulin, Blood Urea Nitrogen (BUN) and creatinine were 114.62±9.65 mg/dl, 6.14±0.15 g/dl, 3.28±0.11 g/dl, 2.74±0.07 g/dl, 13.02±1.22 mg/dl, 1.03±0.06 mg/dl respectively. One case showed hyperglycemia (case no. 4). In rest of the cases it was within normal range indicating absence of any systemic alteration. Haemato-biochemical parameters in cataract dogs as found in this study were in consonance with other reports (Bath *et al*., 2006).

All the four dogs which were operated for cataract surgery recovered successfully and regained vision at about 20 to 30 days after operation. During the period as per availability and requests of the owners only four nos of cases were operated and out of which 3 were of matured and one hyper matured stages of cataract. Hence phaco-technique was adopted in 3 nos of matured cases but not in hyper matured case. Ganesan *et al.* (2018) implanted a suitable 37-41 D multifocal plate haptic single-piece hydrophilic 2-hydroxy ethyl methacrylate (HEMA) IOL through the extended (3.5-4.0 mm) main incision into the capsular bag in twelve eyes after phaco-emulsification. In the present case used 41D PMMA IOL for intraocular implantation.

CONCLUSION

There was a prevalence of 34.78% of cataract among dogs with ophthalmic complications as recorded during the present study. Higher incidence of cataract was observed in males, Spitz breed and dogs with less than 10 years age. Haemato-biochemical parameters were within normal range in majority of dogs diagnosed for cataract indicating no systemic affections. Increased echogenicity of lens along with negative tapetal reflex was found in all the cataract affected eyes. Since operative procedure is the only method of choice for cataract treatment, hence both phaco and SICS techniques were adopted accordingly and treated the cases. All the dogs regained vision slowly after adoption of lens which took 20-30 days. Though the study period was a short duration of only 4 complete months, still then the study projected one good analysis of reports with adoption of therapeutic management. The outcome results with 100% success rate to regain vision in the companion animals which never demand for their problem.

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