Original Research

Haemato-Biochemical Changes Associated with Different Types of Intraocular Lens Implantation Following Phacoemulsification in Dogs

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Abstract

The present study was carried among the 18 clinical cases of dogs presented with mature cataract. They were randomly divided into three groups viz. Group A, Group B and Group C and were subjected for phacoemulsification followed by intra-ocular lens implantation of Rigid PMMA, Foldable hydrophilic acrylic and Foldable hydrophobic acrylic intra ocular lens respectively. Blood samples were collected at different intervals from all the groups in heparinised syringes as follows: preoperatively and 0, 1st, 3rd, 7th, 14th, 21st and 30th day postoperatively. The samples were subjected for various hematological and biochemical analysis. Haemoglobin and total erythrocyte count in all the animals were within the normal range pre and postoperatively. There was an apparent increase in the TLC and neutrophil values during the 1st post-operative day. Lymphocytes, monocytes, eosinophils and basophils were within the normal physiological values. Alanine amino transferase, serum creatinine and blood glucose levels did not show any significant changes and were within the normal range in all the three groups. Either the minor surgical procedure or anesthetic protocol didn't alter the haemato-biochemical parameters.

Key words: Cataract, Dogs, IOL, Phacoemulsification

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Introduction

One of the major visual handicaps in both man and animals is cataract. The cataract is a leading cause of unilateral and more often bilateral blindness in dogs (Kecova and Necas, 2004). Cataract is classified by a variety of methods, but the most common method is by age of onset (congenital, developmental or senile cataracts), stage of maturity (incipient, immature, mature, hypermature or resorbing), location in the lens (focal, capsular, cortical or nuclear) and percentage of lens involved. According to Lim *et al.* (2011) the underlying causes for cataract may include genetic mutations, diabetes mellitus, uveitis, congenital

anomaly, trauma, toxins and dietary deficiency. The opinions on cataract surgery have been changing continually with advancement of the procedure. The success rate of cataract surgery has risen significantly during last decades, especially with development of more precise microsurgical techniques and with introduction of phacoemulsification and IOL implantation (Boldy, 1988). Recently wide range of IOLs with respect to material, design, cost and biocompatibility have been evolved and were also proved widely vary as far as incision size for insertion, duration of surgical procedure, cost involved, postoperative complications and patient comfort is concerned (Kashinatha Shenoy and Gopalakrishna, 2015). The use of these lenses is limited because of side-effects secondary to the design of the IOLs, high demand in terms of outcome and patient satisfaction that leads patients and owners may see halos or have unwanted visual side-effects secondary to the optic design. However, the comparative studies on different types of intraocular lens are scanty. Hence, the present study was undertaken with an objective to compare the three different types of intraocular lens implantation on haemato-biochemical parameters in dogs.

Materials and Methods

The study was carried out in 18 clinical cases of dogs with the history of cataract presented to the Department of Surgery and Radiology, Veterinary College Hospital, Hebbal, Bangalore. All the dogs were subjected to detailed ophthalmic examination by gross examination of the eye, direct ophthalmoscopic examination and the visual function which included; menace reflex test, obstacle test, palpebral reflex test, pupillary light reflex test, tracking reflex test, Schirmer's tear test, fluorescein dye test and measuring intraocular pressure using tonometer. Clinical examination and hematobiochemical assays to assess their fitness for the surgery and those animals whose test results were within normal range were selected for the study. The 18 dogs were randomly divided into three groups *viz.* Group A, B and C of six dogs each. Group A dogs were subjected to phacoemulsification by limbal approach followed by PMMA intraocular lens implantation, in group B and C hydrophilic and hydrophobic lenses were implanted following phacoemulsification respectively using surgery as per standard procedure.

All the dogs of the study were subjected for clinical examination and vision function tests like menace reflex, obstacle test, palpebral reflex, pupillary light reflex and tracking reflex to assess the vision pre-operatively and 0, 1st, 3rd, 7th, 14th, 21st and 30th post-operative day. The blood samples were subjected for various hematological and biochemical analysis. The samples were analyzed for haemoglobin (Hb g/dl), total erythrocyte count (TEC millions/cu.mm), differential leukocyte count (DLC %) as per standard procedure. The biochemical parameters viz, Alanine amino transferase (ALT units/liter), alkaline phosphates (AP units/liter), serum creatinine (mg/dl) and Random blood sugar were estimated by Ames glucometer (Gx, USA). All the results of the visual function test, clinical examination of the eye, haematological and biochemical studies were statistically analyzed by unpaired t-test, using computer

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based statistical programme Graph pad prism, and interpreted as per the procedure described by Snedecor and Cochran (1996) to arrive at conclusion.

Results and Discussion

The results of haematological and biochemical parameters recorded in group A, B and C animals at different intervals are presented.

Haematological Parameters

Haemoglobin and total erythrocyte count in all the dogs were within the normal range and did not show any deviations from the normal values during the pre and post- operative study (Table 1).

Table 1: Mean±SE values of haemoglobin, total erythrocyte count and total leukocyte count in dogs of different groups

Parameters	Haemoglobin (g/dl)			Total Erythrocyte Count (10 6 /cmm)			Total Leukocyte Count (103 /cmm)		
Days	A	B	C	A	B	C	A	B	C
0 (Before)	11.91±0.44	12.11±0.22	12.50±0.28	5.03±0.21	4.87±0.44	5.73±0.11	12.38±0.43	12.02±0.16	12.46±0.19
0 (After)	12.28±0.47	12.42±0.01	12.57±0.44	5.06±0.69	5.06±0.68	5.80±0.11	12.86±0.30	12.76±0.12	13.43±0.20
1	12.17±0.27	12.59±0.44	12.48±0.32	5.85±0.69	5.50±0.68	6.00±0.21	13.35±0.32	13.12±0.12	13.67±0.19
3	12.33±0.46	12.63±0.21	12.83±0.32	5.90±0.46	5.90±0.45	6.20±0.44	12.20±0.28	12.53±0.95	13.28±0.17
7	12.18±0.31	12.86±0.13	12.83±0.30	5.75±0.27	5.95±0.33	5.88±0.01	12.15±0.33	12.17±0.12	12.80±0.17
14	12.29±0.28	12.60±0.54	12.87±0.22	5.87±0.32	5.87±0.31	5.84±0.31	12.05±0.21	12.20±0.23	12.58±0.15
21	12.43±0.21	12.18±0.10	12.89±0.22	5.91±0.12	5.87±0.31	5.66±0.05	12.00±0.18	12.36±0.76	12.57±0.15
30	12.58±0.32	12.51±0.11	12.50±0.30	5.92±0.21	5.91±0.28	5.55±0.69	11.99±0.18	12.26±0.62	12.36±0.14

Similar findings were also reported by Lew and Lew (2009) and Namratha (2012), Hmar (2014) Madan (2015) and Amitha (2016). Since the technique involved minor surgical procedures which did not result in any major blood loss, no changes in haemoglobin levels were anticipated. There was an apparent increase in the TLC and immediately post-surgery and could be due to post-operative inflammatory changes, which is in agreement with Mahesh and Vasanth (2007), Namratha (2012), Hmar (2014) Madan (2015) and Amitha (2016).There was also an apparent increase in neutrophil values during the 1st post-operative day which may be due to post-operative inflammation at the surgical site and healing of the surgical wound. These findings were in accordance with reports of Hmar (2014) Madan (2015) and Amitha (2016). The values of lymphocytes, monocytes, eosinophils and basophils were within the normal physiological values (Table 2).

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Table 2: Mean ± SE values of differential leukocyte count in dogs of different groups

Parameters (%)	Days Group	0 (Before)	0 (After)	1	3	7	14	21	30
Neutrophils	A	74.17±1.21	77.66±1.44	75.83±1.22	74.33±1.00	73.18±1.55	73.81±1.64	73.34±1.29	73.22±1.55
	B	73.22±1.30	74.11±1.15	75.36±1.15	73.73±1.00	74.52±1.13	74.67±1.04	73.50±1.15	72.72±0.63
	C	71.68 ± 1.36	72.82 ± 0.40	71.06 ± 0.53	72.68 ± 0.6	71.12 ± 0.62	71.22 ± 0.82	70.33±21	71.22±0.54
Lymphocytes	A	21.88 ± 0.22	24.13 ± 0.26	22.00 ± 0.66	23.54 ± 0.82	23.22 ± 0.52	24.67 ± 0.32	21.88 ± 0.22	22.21± 1.21
	B	21.50±1.20	23.83±1.35	21.33±0.80	21.00±1.75	23.17±2.20	23.33±1.11	20.67±1.41	21.17±1.08
	C	20.33±1.20	22.50±1.48	23.17±2.15	24.33±1.23	24.83±1.95	23.83±1.22	24.00±1.24	23.17±2.12
Monocytes	A	1.02±0.42	1.32±0.61	0.81±0.10	1.02±0.23	0.86±0.34	1.33±0.22	0.83±0.51	0.88±0.22
	B	1.06±0.33	1.11±0.06	1.04±0.22	0.87±0.34	0.68±0.20	0.85±0.47	1.00±0.01	0.66±0.43
	C	1.20±0.22	0,83±0.18	0.95±0.12	0.83±0.11	0.98±0.07	0.95±0.14	1.00±0.01	1.01±0.41
Basophils	A	0.12±0.11	0.20±0.00	0.32±0.22	0.50±0.21	0.32±0.21	0.65±0.22	1.00±0.20	0.50±0.00
	B	0.17±0.10	0.21±0.00	0.32±0.25	0.31±0.25	0.53±0.20	0.65±0.01	1..01±0.00	0.50±0.21
	C	0.83±0.40	1.00±0.26	1.17±0.40	0.83±0.30	0.67±0.42	0.47±0.17	0.33±0.33	0.67±0.33
Eosinophils	A	0.83±0.08	1.40±0.05	1.00±0.43	0.63±0.04	0.66±0.40	0.92±0.33	0.82±0.22	1.12±0.22
	B	0.51±0.31	0.67±0.10	0.27±0.10	0.53±0.50	0.45± 0.05	0.32± 0.12	0.44± 0.05	0.65±0.11
	C	1.22±0.33	1.63±0.30	1.11±0.11	1.51±0.02	0.79± 0.03	0.67± 0.22	0.67± 0.05	0.76±0.18

Biochemical Parameters

The biochemical parameters *viz.* Alanine amino transferase, serum creatinine and blood glucose levels did not show any significant changes and within the normal range (Table 3). Neither the surgical procedure nor the anaesthetic protocol didn't alter the biochemical parameters. Similar observations were also reported by Sudha (2005), Lew and Lew (2009), Hmar (2014), Madan (2015) and Amitha (2016).

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Table 3: Mean±SE values of Alanine amino transferase, serum creatinine and random blood sugar level in dogs of different groups

Parameters		Alanine Amino Transferase (IU/L)	Serum Creatinine (mg/dl)	Random Blood Sugar (mg/dl)
Group	Days			
A	0 (Before)	18.32±0.09	1.103 ± 0.03	95.60±4.52
	0 (After)	26.49±3.13	1.000 ± 0.08	98.38±2.23
	1	29.56±1.65	1.000 ± 0.08	98.60±3.44
	3	36.13±1.33	1.062 ± 0.06	97.00±2.35
	7	36.18±2.43	1.062 ± 0.06	95.83±3.12
	14	28.75±2.05	0.9780±0.02	98.50±4.03
	21	34.00±0.15	1.070 ± 0.08	96.38±4.64
	30	27.57±1.24	1.101 ± 0.05	96.90±4.52
B	0 (Before)	21.83±4.66	1.150±0.09	92.10±4.43
	0 (After)	26.70±4.30	1.113±0.15	93.10±4.06
	1	29.62±5.17	0.895±0.06	93.10±3.22
	3	28.03±4.96	0.968±0.10	93.83±4.12
	7	26.73±5.68	1.025±0.55	93.40±4.22
	14	25.99±5.97	0.915±0.13	92.80±4.12
	21	26.33±6.30	1.03±0.09	90.00±4.64
	30	25.33±5.99	1.03±0.08	91.10±4.11
C	0 (Before)	25.33±0.36	0.94±0.06	91.81±3.14
	0 (After)	28.39±1.90	0.97±0.05	93.01±3.00
	1	25.09±0.65	1.01±0.04	96.17±4.26
	3	32.9±3.70	0.92±0.06	95.83±4.62
	7	36.23±4.63	1.03±0.11	96.50±3.11
	14	34.64±3.89	1.08±0.03	91.84±4.43
	21	32.76±1.89	1.07±0.08	90.00±2.23
	30	28.23±1.62	1.03±0.04	91.00±3.22

Conclusion

The haemato-biochemical changes induced by the procedures in three groups were of transient in nature. This indicates the surgical procedure was minor, would not alter the liver and kidney functions. Thus, proved to be safe and effective for the management of cataract in dogs. In comparison Group C animals with Foldable Hydrophobic acrylic lens proved superior followed by Group B with Foldable Hydrophilic acrylic lens and then the Group A with Rigid PMMA lens as for as post-operative complications, vision improvement and owners response is concerned.

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