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Haemato-biochemical variations in dogs undergoing phacoemulsification and implantation of canine-specific intraocular lens for cataract

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Abstract

Cataracts represent a leading cause of reversible blindness in dogs, often progressing to lens-induced uveitis and glaucoma if untreated. Phacoemulsification with intraocular lens (IOL) implantation is widely accepted as the gold standard for canine cataract management, offering improved visual outcomes and quality of life. This study assessed haematological and biochemical changes following phacoemulsification with canine-specific IOL implantation in six dogs presented to the Department of Veterinary Surgery and Radiology, Veterinary College, Bengaluru. Animals were premedicated with atropine sulphate, butorphanol, and diazepam, induced with propofol, and maintained under anaesthesia. Phacoemulsification was performed to remove cataractous lens material, followed by implantation of a +41 D foldable acrylic IOL. Haematological parameters (erythrocyte count, leukocyte count, haemoglobin) and biochemical indices (serum creatinine, alanine aminotransferase, random blood sugar) were analysed using automated veterinary analysers, with statistical evaluation by one-way ANOVA. Results revealed non-significant variations across all parameters, with transient leukocytosis on day 2 attributed to postoperative inflammation. Biochemical values remained within normal physiological ranges, indicating minimal systemic impact. Overall, phacoemulsification combined with canine-specific IOL implantation proved safe and effective, enabling successful restoration of vision with negligible haematological or biochemical alterations, thereby reinforcing its role as the preferred surgical technique in canine cataract management.

Keywords: Phacoemulsification, 41D canine specific lens, cataract

1. Introduction

Vision is essential for environmental interaction, communication, and overall quality of life in dogs. Among canine ocular disorders, cataract is one of the leading causes of reversible blindness, particularly in ageing animals, and may result in significant visual impairment and discomfort if left untreated. Delayed management of mature or hypermature cataracts can lead to serious complications such as lens-induced uveitis and glaucoma, thereby reducing the success of surgical intervention. Advances in veterinary ophthalmology have established phacoemulsification with intraocular lens (IOL) implantation as the gold standard treatment for canine cataracts (Cook, 2008). Early surgical intervention is now recommended to restore vision and minimize postoperative complications. Recent developments in IOL design and biomaterials have further improved surgical outcomes, biocompatibility, and postoperative visual rehabilitation in dogs. Canine eyes generally require higher dioptric power lenses (40–43 D) than humans, emphasising the importance of species-specific considerations in veterinary cataract surgery.

2. Materials and Methods

The study was conducted in six clinical cases of tom cats presented to the Department of Veterinary Surgery and Radiology, Veterinary College, Bengaluru. Six cases of dogs with cataract were selected for the study regardless of age and breed. Selected dogs were fasted for

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12 hours for food and 6 hours for water before surgery. The dogs will be administered with preanesthetic medication, Inj. Atropine Sulphate at 0.04 mg/kg body weight and Inj. Butorphanol at 0.2 mg/kg body weight intramuscularly followed by Inj. Diazepam at a dose rate of 0.5mg/kg body weight intravenously. After 10 minutes, the anaesthesia will be induced with Propofol at a dose rate of 6 mg/kg body weight intravenously and maintained with Propofol to effect. The animals were positioned in dorsal recumbency. Phacoemulsification was performed using a phaco handpiece to sculpt, fragment, and aspirate the cataractous lens material while preserving the posterior capsule. A canine-specific hydrophobic foldable acrylic intraocular lens (+41 D) was implanted into the capsular bag through the main incision using an injector system.

Haematological parameters, including Total Erythrocyte Count (TEC, 10⁶ cells/cmm), Total Leukocyte Count (TLC, 10³ cells/cmm) and Haemoglobin (Hb, g/dL) were analysed using the Mindray BC-2800 Vet automated haematology analyser. Biochemical indices such as serum creatinine (mg/dL) and alanine aminotransferase (IU/L) were evaluated using the micro lab instruments RX-50 Biochemical semi-auto analyser using diluent reagents as per the manufacturer's guidelines. The resulting haematological and biochemical data were subjected to statistical evaluation through one-way Analysis of Variance (ANOVA) with the computer-based statistical program GraphPad Prism.

3. Results and Discussion

3.1 Haematological analysis

3.1.1 Total erythrocyte count (10⁶ cells/mm³)

The mean $\pm$ SE value of total erythrocyte count (10⁶ cells/mm³) before surgery was 6.01 $\pm$ 0.16. Postoperative mean $\pm$ SE values varied from 5.72 $\pm$ 0.23 on day 2, 5.54 $\pm$ 0.41 on day 4, 5.98 $\pm$ 0.26 on day 6, 6.01 $\pm$ 0.17 on day 14, 5.95 $\pm$ 0.12 on day 21, and 5.84 $\pm$ 0.09 on day 30. The variations in the mean $\pm$ SE values of the total erythrocyte count were statistically nonsignificant ($p > 0.05$), and the values remained within the normal physiological range.

3.1.2 Total Leucocyte Count (TLC) (10³ cells/mm³)

The mean $\pm$ SE value of total leucocyte count (10³ cells/mm³) before surgery was 12.42 $\pm$ 2.56. Postoperative mean $\pm$ SE values varied from 11.71 $\pm$ 1.36 on day 2, 11.76 $\pm$ 1.00 on day 4, 12.07 $\pm$ 1.14 on day 6, 11.85 $\pm$ 1.07 on day 14, 11.81 $\pm$ 0.92 on day 21, and 11.93 $\pm$ 0.94 on day 30. The variations in the mean $\pm$ SE values of the total leucocyte count were statistically non-significant ($p > 0.05$) in the selected dogs.

3.1.3 Haemoglobin (g/dL)

The mean $\pm$ SE value of haemoglobin (g/dL) before surgery was 13.08 $\pm$ 0.85. Postoperative mean $\pm$ SE values varied from 12.95 $\pm$ 0.58 on day 2, 12.26 $\pm$ 0.86 on day 4, 12.61 $\pm$ 0.61 on day 6, 12.61 $\pm$ 0.41 on day 14, 12.66 $\pm$ 0.44 on day 21, and 12.61 $\pm$ 0.37 on day 30. A progressive increase in haemoglobin was observed after one week of surgery up to the 60th postoperative day. However, the differences in the mean $\pm$ SE values were not statistically significant ($p > 0.05$), which may be attributed to minimal haemorrhage during surgery.

Haemoglobin and total erythrocyte counts in all animals were within the normal range and showed no deviations during the pre- and post-operative days. Similar findings were reported by Amitha (2016) [6], Suresh (2018) and Karebharmannavar

(2019), as they stated that the technique involved minor surgical procedures did not result in any major blood loss and no changes in haemoglobin levels were anticipated.

There was an apparent increase in the TLC immediately on the 2nd post-operative day, and that could be due to post-operative inflammatory changes, agrees with Mahesh (2006), Vasanth (2007), Namratha (2012), Hmar (2014), Madan (2015), Amitha (2016) [6].

3.2 Biochemical parameters

3.2.1 Serum creatinine (mg/dL)

The preoperative mean $\pm$ SE value of serum creatinine (mg/dL) was 1.09 $\pm$ 0.08. Postoperative mean $\pm$ SE values ranged from 0.93 $\pm$ 0.07 to 1.09 $\pm$ 0.08. The variations in the mean values of serum creatinine were statistically non-significant ($p > 0.05$) and remained within the normal physiological limits.

3.2.2 Alanine Amino Transferase (ALT) (IU/L)

The preoperative mean $\pm$ SE value of serum alanine aminotransferase (IU/L) was 40.77 $\pm$ 7.09. Postoperative mean $\pm$ SE values ranged from 36.95 $\pm$ 1.39 to 44.35 $\pm$ 3.51. The variations in the mean values of serum alanine aminotransferase were statistically non-significant ($p > 0.05$) and remained within the normal physiological range.

3.2.3 Random Blood Sugar (RBS) (mg/dL)

The preoperative mean $\pm$ SE value of random blood sugar (mg/dL) was 99.38 $\pm$ 1.01. Postoperative mean $\pm$ SE values ranged from 92.01 $\pm$ 3.04 to 101.86 $\pm$ 0.80. The variations in the mean values of random blood sugar were statistically non-significant ($p > 0.05$) and remained within the normal physiological range.

Alanine aminotransferase, serum creatinine and random blood sugar levels did not show any significant changes and were within the normal range. Neither the surgical procedure nor the anaesthetic protocol altered the biochemical parameters. Similar observations were reported by, Amitha (2016) [6] and Karebharmannavar (2019).

4. Conclusion

Phacoemulsification combined with canine-specific intraocular lens implantation is a safe and effective technique for the management of cataracts in dogs. The current study details the changes in haemato-biochemical parameters before and after phacoemulsification procedure. Non-significant variations in the haematological parameters were noticed in all six cases. Leucocytosis was observed immediately on the 2nd post-operative day, and that could be due to post-operative inflammatory changes. Serum biochemical studies revealed non-significant variations in the serum alanine aminotransferase and serum creatinine values, which were within the normal physiological range. The procedure enables successful restoration of vision with minimal postoperative complications when performed with proper case selection, surgical precision, and postoperative care. Overall, this approach significantly improves visual outcomes and quality of life in affected animals.

Conflict of Interest

Not available

Financial Support

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