



ISSN: 2456-2912

VET 2024; 9(2): 100-103

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Received: 19-01-2024

Accepted: 28-02-2024

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## Successful management of cataracts in dogs by phacoemulsification with IOL implantation: Review of two cases

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DOI: <https://doi.org/10.22271/veterinary.2024.v9.i2b.1181>

### Abstract

Two cases of dogs were brought to the surgical department of the Mumbai Veterinary College with a history of ocular discharge, lens opacity, and a gradual progressive loss of vision. Induction of general anesthesia with Propofol (4 mg/kg), atropine 0.04 mg/kg SC, and triflupromazine hydrochloride 1 mg/kg, IV as premedication and maintenance with isoflurane was done. Atracurium (0.2 mg/kg body wt IV) was used as a muscle relaxant. Phacoemulsification was performed for cataract removal, and implantation of intraocular lenses was performed to achieve the best possible vision outcome in dogs. The animals had an uneventful recovery with vision.

**Keywords:** Cataract, dog, phacoemulsification, IOL implantation

### Introduction

In dogs, cataracts are a prevalent eye disease that can be effectively treated only with surgical extraction followed by intraocular lens implantation (Bhutto *et al.*, 2021) <sup>[1]</sup>. Congenital and acquired cataracts are the two types of cataracts. According to Liu *et al.* (2017) <sup>[9]</sup>, cataracts constitute the leading cause of global blindness, contributing to 47.8% of all blindness cases worldwide. The most prevalent risk factor for cataracts is advanced age. Physical risk factors are not present in cases of senile cataracts. In veterinary medicine, cataract extraction is a frequently performed ocular procedure that uses a variety of surgical procedures. At present, the recommended treatment approach involves phacoemulsification combined with the implantation of an intraocular lens (IOL). The use of an IOL enhances visual function in eyes without a natural lens and diminishes the likelihood of developing posterior capsular opacity (PCO) post-surgery. IOL displacement, however, may lead to altered vision and increased risks following surgery (Bhutto *et al.*, 2021; Nochez *et al.*, 2010) <sup>[1]</sup>. The IOL material that is most frequently used in veterinary practice is polymethyl methacrylate, or PMMA (Liu *et al.*, 2017) <sup>[9]</sup>. But researchers have also looked into substitute materials including silicone and hydroxyethyl methacrylate (HEMA) optic IOLs (Davidson *et al.*, 1990; Kim and Oh 2018) <sup>[4, 7]</sup>. When compared to alternative lens materials, Utilizing an acrylic intraocular lens (IOL) with a squared edge has been linked to a reduced occurrence of posterior capsular opacification (PCO), as indicated by studies conducted by Christine *et al.* (2011) <sup>[3]</sup> and Montes-Mico and Cervino (2009) <sup>[11]</sup>. The reduced incidence of posterior capsular opacification (PCO) associated with acrylic lenses is attributed to their firm attachment to the posterior capsule and their distinctive optical design, which hinders the migration of lens epithelial cells into the optic region, as highlighted in the research by Christine *et al.* (2011) <sup>[3]</sup>. While flexible acrylic intraocular lenses (IOLs) are commonly used in dogs, the prevention of PCO is generally not a primary consideration in their optical design, as indicated by Harathi *et al.* (2020) <sup>[5]</sup>. Our study aimed to investigate the surgical results linked to the combination of phacoemulsification and the placement of a pliable acrylic intraocular lens (IOL) in dogs diagnosed with cataracts.

## Case history and observation

### Case 1

A 10-year-old male miniature pinscher, weighing 10kg, was presented to the surgical department at Mumbai Veterinary College, Parel, with the primary complaint of vision impairment. Upon ophthalmic examination, cloudy and white lenses were observed in both eyes, indicative of cataract symptoms. According to the dog owner, the onset of cataract symptoms began several months ago in the right eye and one year ago in the left eye (refer to Fig. 1). Cataract symptoms typically progress gradually over an extended period. Consequently, even though object images appear blurred and unclear, and there may be some visual discomfort, patients often fail to recognize these symptoms. The extent of visual impairment varies based on the degree of lens opacity and lesion location. In cases of partial opacity, object images may overlap, even in the vision of one eye, as noted by Mahbulul *et al.* (2019) [10]. The Schirmer tear test results indicated a rate of 18 mm/min for the right eye and 19 mm/min for the left eye. Additionally, intraocular pressure (IOP) measurements using TonopenVet fell within the normal range, registering at 17 mmHg for the right eye and 22 mmHg for the left eye. While the patient exhibited no responses in the menace response test, dazzle reflex test, and maze test, both palpebral reflexes and corneal reflexes were present. These findings align with similar observations reported by Myeong-Gon Kang *et al.* (2022) [6].

### Case 2

An eight-year-old non-descript male dog weighing 15.5 kg was presented with a history of blindness, hitting the wall while walking, and whiteness inside both eyes. On ophthalmologic examination, the dog did not exhibit a menace reflex, showed a positive response to the pupillary light, and the fundus was not visible in either eye. A bilateral mature cataract was confirmed (Fig.2). Cornea, conjunctiva, and sclera were clear. Intra-ocular pressure was measured using TonopenVet and was 15 mmHg for both eyes. The animal was healthy. Hematological and serum biochemistry results were normal as shown in (Table 1).



Fig 1: Showing Case 1: Miniature pincers dog with bilateral cataract



Fig. 2 Showing Case 2: Non-descript dog with bilateral cataract

Table 1: Hematobiochemical parameter before surgery

Parameter	Reference range	Case 1	Case 2
Hemoglobin (g/dL)	12 to 18	12	14
PCV (%)	37 to 55	36	42
TLC (10 <sup>3</sup> /cc)	6 to 17	15.54	16
Neutrophil count (%)	60 to 70	65	60
Lymphocyte count (%)	12 to 30	12	15
Total protein (g/dL)	5.5 to 7.5	5.50	5.8
Serum albumin(g/dL)	2.5-3.5	2.86	2.5

Phacoemulsification (PHACO) is presently the standard approach for treating cataracts due to its smaller incision requirement compared to intracapsular cataract extraction (ICCE) or extracapsular cataract extraction (ECCE). This results in a reduced overall surgical time, as indicated by Linebarger *et al.* (1999) [8] and You *et al.* (2020) [14]. The cataractous lens in one eye was removed using phacoemulsification.

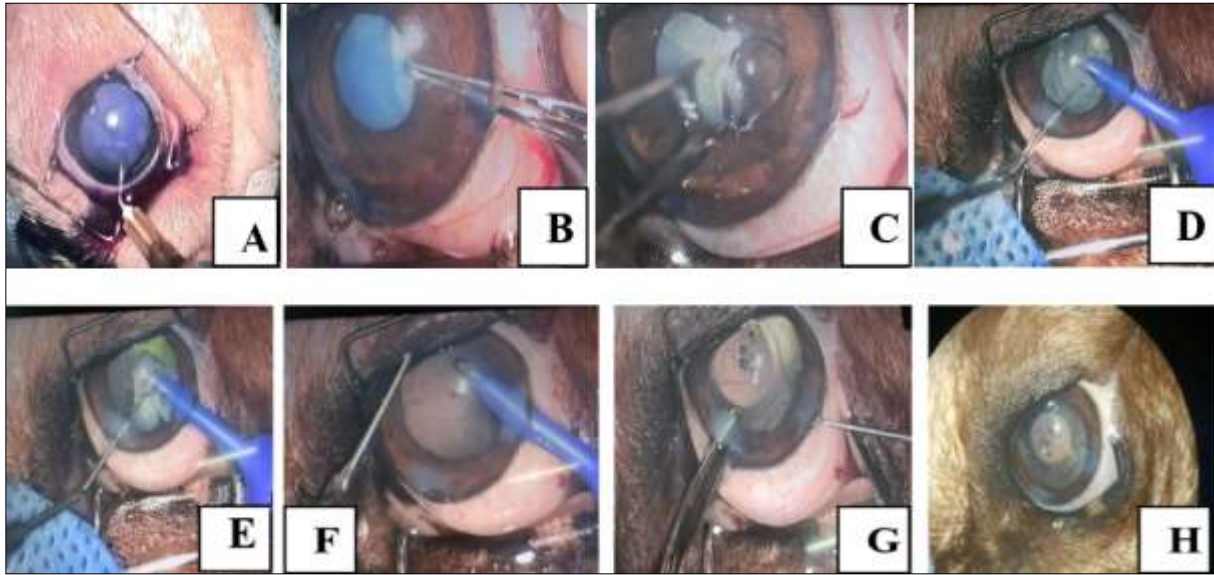
### Preoperative Preparation for Cataract Surgery:

In preparation for cataract surgery, topical treatments included the use of broad-spectrum ophthalmic antibiotics, Moxifloxacin HCL 0.5%, administered 6 hours for 24-48 hours before the procedure, along with topical corticosteroids for 48-72 hours preoperatively. On the day of surgery, mydriasis was induced using 1% atropine sulfate three times at 30-minute intervals starting 2 hours before surgery. Topical non-steroidal anti-inflammatory agents were applied every 30 minutes, beginning 1-3 hours before the procedure. Additionally, systemic non-steroidal anti-inflammatory agents and antibiotics were administered immediately before surgery.

### Treatment and Discussion

Following standard aseptic surgery preparation, the canine patient received premedication with atropine sulfate (0.04 mg/kg SC) and intramuscular triflupromazine hydrochloride (1 mg/kg IV). General anesthesia was induced with propofol (4 mg/kg slow IV), and isoflurane gas was used for maintenance. To prevent pupil movement during surgery, Atracurium (0.2 mg/kg IV), a muscle relaxant, was administered. The patient was positioned supine, and a 2.8-mm corneal incision was made at the corneal limbus edge, 2 mm away. Trypan blue dye was instilled for improved visualization of the anterior capsule. A continuous curvilinear capsulorhexis was performed with Utrata capsule forceps, and visco-elastic agents (hydroxypropyl methylcellulose) were injected into the anterior chamber for stability. Hydrodissection was carried out using lactated Ringer's solution to loosen the outer cortex from the lens capsule. Phacoemulsification commenced in the anterior lens cortex and nucleus, employing the divide and conquer technique for nucleus removal. The remaining cortex and nucleus were fragmented through parallel sculpting. Careful removal of cataractous material was conducted to avoid posterior lens capsule tearing. An irrigation-aspirating handpiece facilitated the removal of residual cataract material. If an intraocular lens (IOL) was implanted, the anterior capsulectomy diameter was adjusted to be 1 mm less than the IOL optic diameter. A hydrophobic foldable acrylic lens was used, and inserted into the capsular bag without enlarging the corneal incision. To ensure physiological pressure in the anterior chamber, a balanced salt solution was injected in the final step, estimating intraocular pressure (IOP) through digital palpation instead of a tonometer.





**Fig 3:** Showing Cataract surgical procedures steps

(A) Corneal tunnel, (B) Instillation of trypan blue dye, (C) Continuous Curvilinear Capsulorrhexis, (D) Hydrodissection, (E) Phacoemulsification of cataract, (F) Aspiration of cortical lens matter, (G) IOL implantation, (H) After IOL placement.

#### Postoperative care for cataract surgery

Animals were post-operatively followed for 30 days along with an infusion of topical antibiotics (Moxifloxacin HCL 0.5%), artificial tears (Carboxymethyl Cellulose 0.5%) and anti-inflammatory Eye Drops Fluorometholone 0.1% were given 3- 4 times daily. Broad-spectrum systemic antibiotics and anti-inflammatory drugs for BID for 7 days were given. Advised for the Elizabethan collar on at all times for 4 to 8 weeks after surgery, to keep him from hurting himself.



**Fig 4:** Shows quite wonderful and better recovery in Case 1 (A) and case 2 (B)

#### Conclusion

The patient regained vision in the treated eye following cataract surgery with PHACO and presently engages in daily activities without experiencing visual discomfort. In the context of canine cataract surgery, PHACO emerges as a vital therapeutic procedure essential for restoring eyesight.

#### Acknowledgment

The author extends their support to the Department of Veterinary Pathology.

#### Conflict of interest

No potential conflict of interest relevant to this article was reported.

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