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Clinical Report

Cataract Extraction by Phacoemulsification Procedure in a Hybrid Lion (*Panthera leo persica*): A Case Report

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ABSTRACT

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The medical record of a 25-year-old male hybrid lion weighing 154 kg named Tippu, with a history of blindness in the right eye since one year housed at Anna Zoological Park, Vandalur Zoo in Chennai, India was referred to the Ophthalmology Unit of Madras Veterinary College Teaching Hospital for expert opinion and treatment. As per the request from the zoo authority, a team of surgeons from Madras Veterinary College visited the zoo. The lion was immobilized with xylazine hydrochloride, 1.5 mg/kg body weight, and ketamine hydrochloride, 2.5 mg/kg body weight intramuscularly were given by using a darting gun and a detailed ophthalmic and neurological examinations, ophthalmoscopy and tonometry were performed. The condition was diagnosed as a unilateral cataract of the right eye (OD) and the most appropriate surgical correction by the Phacoemulsification method was advised. The lion was intubated with a No. 18 cuffed endotracheal tube and general anesthesia was maintained with 2% Isoflurane in oxygen. The surgical procedure was carried out using one-handed phacoemulsification and the nucleus is fragmented into four pieces. At the end of the procedure, yohimbine hydrochloride was administered 0.1 mg/kg body weight intravenously. Mild fibrin deposition was noticed in the anterior chamber postoperatively for four weeks, after which the lion showed an uneventful recovery.

Introduction

Opacification of the lens resulting in blindness is considered as one of the major pathologies where the vision can be restored through surgical means. While the incidence of cataracts in dogs parallels that in humans, their occurrence in other species of

comparative ophthalmology is meager.¹ The management of cataracts in felines is similar to that in the dog and surgical removal of the lens is the only effective treatment for mature cataracts. Medical therapy for cataracts is ineffective and delay in effective therapy may cause lens-induced uveitis.² Reports in wild animals are scarce as the disease itself is scarce.

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But this is not at all a limitation to applying the latest innovative methods adopted in a surgical attempt to address such an issue. The complications are less due to advancements in instruments, equipment, and improved optics in operating microscopes.

Being a center treating cataracts successfully in small animals with IOL implantation a case of a visually challenged lion belonging to Arignar Anna Zoological Park was referred for expert treatment. Given the situation above, the lion was examined and this paper reports successful treatment of cataracts in a lion through the latest surgical procedure, phacoemulsification.

Case Description

The medical record of a 25 five-year-old hybrid male lion, Tippu weighing 154 kg with a history of blindness, in the right eye was referred to the Small Animal Ophthalmology unit of Madras Veterinary College teaching hospital for an opinion on expert treatment. On perusal of the record, it was found that the lion was maintained in captivity in a healthy state and the hematological and biochemical parameters were normal. Ophthalmic examination of the right eye from a distance in ambient lighting revealed normal neuro-ophthalmic reflexes with a complete palpebral reflex to an alarming gesture and a positive dazzle to a bright light stimulus. An examination in the dim lighting of the cage during late evening revealed moderate lens opacity. Photic stimulation revealed a miotic pupil with a strong pupillary light reflex (PLR).

The lion was subjected to a detailed ophthalmic examination under general anesthesia. A mixture of xylazine hydrochloride and ketamine hydrochloride was administered using a blowgun for darting³. Preoperative blood workup and radiographs of the thorax and abdomen were also taken to rule out any incidental pathology. Thoracic lateral radiograph, hematological, and serum biochemistry results were within normal limits. Detailed ophthalmic examination with an indirect ophthalmoscope and 20 D condensing lens revealed a cornea, conjunctiva, and sclera. The PLR was strong and the anterior chamber appeared normal. Intraocular pressure approximated 22 mmHg for the right eye (OD) and 25 mm Hg in the left eye (OS) using a tonometer. Post dilation with Tropicamide topically, a mature cataract was identified with no background of tapetal and non-tapetal fundic images. Preoperatively, the combination of topical eyedrops Ocepred (ofloxacin 0.3% and prednisolone acetate 1%) was advised at a

dose rate of one drop 3 times daily for four days to reduce impending uveitis.

Treatment and Outcome

Immobilization was carried out with a mixture of xylazine hydrochloride 1.5 mg and ketamine hydrochloride 2.5 mg/kg administered intramuscularly using a darting gun and required incremental doses of xylazine and ketamine were administered to achieve recumbency and immobilization characterized by absence of ear flick reflex.

The lion was blindfolded and the forelimbs were hobbled. The intravenous catheter (18 gauges) was fixed. The actual weight of the lion was recorded and was transported to the operation theatre of Zoo Veterinary Hospital for further procedures. Induction with the intravenous administration of propofol (0.5 mg/kg) and isoflurane 2% in oxygen was used as a maintenance agent through a closed-circuit rebreathing system. Tippu was positioned in lateral recumbency with the head in a latero-oblique position. The eye was cleaned using sterile cotton buds soaked with 0.5% Povidone-iodine solution. The right eye was draped aseptically, (disposable adhesive ophthalmic drapes, Surgiware) after positioning towards the operating microscope to ensure primary gaze and globe exposure during surgery. Two stay sutures were also placed. Balanced salt solution (BSS) was used to moisten the cornea throughout the procedure (Figure1).

One-handed phacoemulsification technique (Storz, Protégé) was performed through a 2.8 mm corneal incision. The clear corneal incision was performed using the tip of a No. 11 Bard-Parker blade held in a Swiss blade breaker. Intracameral adrenaline 1:1000 was used as a mydriatic. The anterior chamber volume was restored with viscoelastic material (2% hydroxypropyl methylcellulose). A modified curved 24-gauged needle was used to perform the initial capsulorhexis. An Utrata capsulorhexis forceps was used to perform the anterior lens capsulotomy wider and form a window through which an endocapsular phacoemulsification ("in the bag") technique was performed. Balanced salt solution with heparin sodium 10 IU/ml was used for irrigation/aspiration. The phaco fragmentation tip was introduced through the corneal incision and anterior capsulotomy to sculpt the central portion of the cataractous lens, followed by a nuclear rotation. Irrigation and aspiration were used towards the end of the surgery to remove the remaining lens materials with the help of an irrigation aspiration

cannula. After completion of the procedure, fundus could be seen clearly (Figure 2).

The anterior chamber was normal with an intact posterior capsule and no vitreous presentation was noticed. The viscoelastic material was then removed using the irrigation aspiration cannula before the closure of the corneal incision. The corneal incision was left to heal by self-sealing through hydro injection.⁴ Subconjunctival injection of a combination of dexamethasone 0.1 ml (2 mg/ml) and gentamicin 0.1 ml (20 mg/ml) was administered in the palpebral region.⁵ After completion of the procedure, Tippu was transported to the cage. Postoperatively the eye was treated with topical eye drops, Ocepred (Ofloxacin 0.3% and Prednisolone acetate 1%). At the end of the procedure yohimbine hydrochloride 0.1 mg/kg was administered intravenously and the lion was housed separately in a cage for 10 days.

Immediate post-operative medications could not be carried out strictly as the lion tried to attack the handlers, so also the IOP measurement and ophthalmic exam. A follow-up period of one month revealed a perfect anterior chamber, a mobile pupil, and a corneal scar. A distant neuro-ophthalmic test confirmed the statement of the Zookeepers that Tippu can track and navigate objects in the run attached to the cage with the right eye. The lion was examined after a year and there were no more vision complaints. Under sedation, a quick ophthalmic exam was done to declare that the aphakic eye is visual. Fundus imaging (Figure 3)

showed a normal optic disc with normal vasculature (Figure 4).

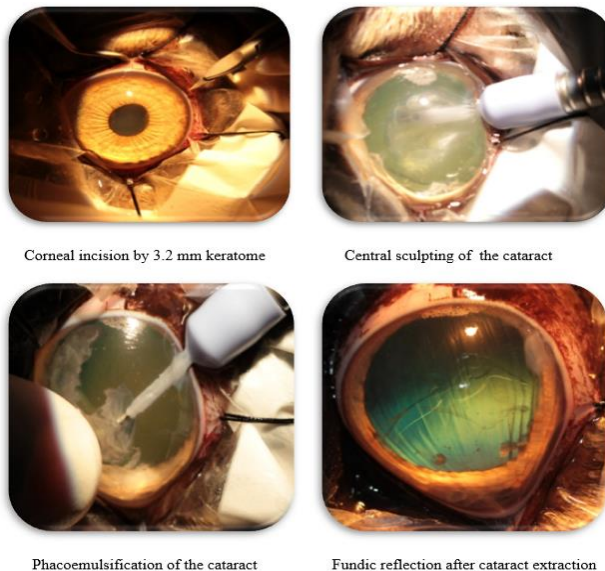


Figure 2. Phacoemulsification procedure



Figure 3. Lion fundus imaging



Figure 1. Anesthesia and positioning of Lion procedure.



Figure 4. Lion fundus after cataract extraction

Clinical Relevance

Cats are to have a lesser prevalence of cataracts⁶ and always dogs are over-represented with this pathology to Veterinary Ophthalmologists.⁷ An incidence of 23.12 % over a period of 2 years in canines was reported in the University Teaching Hospital.⁸ Reports of cataract formation and its surgical treatment are rare in lion on scanning through the literature. As such a review is possible only in captive lions and difficult in forest settings hence the incidence or prevalence of cataracts in lions does not reflect a correct figure. Generally, in dogs lens degeneration occurs as a result of metabolic diseases or old age. Cataract formation due to systemic diseases, medications, or eye trauma is also reported.^{9,10} Genetics also play a major role in the development of cataract.¹¹ The cause of the occurrence of cataracts in the right eye of Tippu could not be predicted. The medical record of Tippu did not show any recent trauma but the old age and previous trauma could be attributed to the absence of other systemic and metabolic diseases. The right eye was quiet without any sign of systemic disease involvement.

A detailed ophthalmic examination is always a challenge for the comparative ophthalmologist when compared to human counterparts and more in the case of wild animals. The domestic cats during the post-operative period also pose a challenge due to improved sight. There are many limitations and challenges for detailed ophthalmic examination in a wild animal. The Zoo Veterinarian can refer cases only with permission from the Forest and Wild Life Department only refer cases for such detailed procedures and the lion being an endangered species, there is always a risk of life on account of the capture procedure involved hence the priority is the life. The examinations with direct and indirect ophthalmoscopes were useful to reveal a mature cataract.¹²

In this case, as per the record, the lion was apparently healthy and hence this examination could be planned under deep sedation. The positioning of the eyeball in a latero oblique angle for obtaining tapetal reflection while doing the procedure was satisfactory. The procedure of phacoemulsification has been well detailed in the dog by various authors¹³⁻¹⁶ and experienced satisfactory in lion eye as well. In this case, as the lens was harder the phaco power was set at 80% and a 45° beveled tip was used. As against a typical capsulorhexis in routine cataract surgery, here only a

wider capsulotomy was done with the help of Utrata capsulorhexis forceps. As the chamber was deep the use of a phaco fragmenter aided during surgery.

One-handed phacoemulsification was found sufficient to extract a large-sized lens in this case. Though the anterior chamber was deep for the phaco probe, frequent use of viscoelastic material profusely and the intact anterior capsule facilitated the fragmented lens pieces towards the corneal endothelium. Usually, such attempts in dogs might result in corneal edema. However, in the present case being a feline species, there was no postoperative corneal edema. The complete removal of the cortical material was possible with the regular IA cannula available in the Protege machine. The 2.8 mm corneal incision was not sutured instead was sealed with corneal hydration. This method was preferred as was found useful in canine cataract surgeries, especially in referred cases from far-off places where the corneal suture removal demanded the presence of an expert. Here the need for a suture removal under repeated sedation was avoided considering the age of the lion. Though post-operative medication instructions were not followed by the zookeepers, cage handlers, as expected there were few post-operative issues.

The authors restate the following reasons which support the above observation. (Hypothesis) 1. The strict schedule of preoperative drugs using corticosteroids to prevent impending uveitis 2. Miniature capsulotomy 3. Endocapsular phacoemulsification 4. Intraoperative subconjunctival injection 5. The species being a feline. Sardari *et al.* (2007) reported that the cataract surgery failed in an African lion with lens luxation and mentioned poor postoperative management as the reason. The author has suggested later that temporary tarsorrhaphy would have helped.¹⁷ In the case of veterinary patients, success in phacoemulsification cataract surgery is mainly due to less intervention in the eye. In Extra Capsular Cataract Extraction (ECCE) a larger corneal incision and sutures would call for more attention to the eye during the post-operative period and hence in the authors' opinion temporary tarsorrhaphy procedures should be restricted to only salvaging procedures. The importance of post-operative medications and management was stressed during the early years¹⁸ and the same is important still in veterinary patients as the success of surgery is not always related to sophistication in instruments and equipment.

Advances in ocular therapeutics have paid more attention to post-operative cataract management by introducing a biodegradable cohesive depot of dexamethasone introduced into the ciliary sulcus or the nasal punctum at the end of the surgery, where it delivers a tapering dose of dexamethasone for about 21 days. This would address and mitigate greatly the dependence on compliance from the handlers especially in zoo animal ocular surgery.¹⁹ While surgical removal of the degenerated or opaque lens is the best method of treatment⁹ it has to be mentioned in this decade that the refined surgical treatment using ultrasound energy phacoemulsification is the final solution.¹⁶ Removal of cataracts allowed a hyperopic vision called aphakic refraction.

Phacoemulsification is a technically demanding microsurgical procedure, which is not reported in wild cats and involves less surgical time, and provides early visual rehabilitation postoperatively. The Asiatic lion population, *Panthera leo persica* is listed as endangered species is more seen in Gir National Park, Gujarat, India.

Conflict of Interest

The authors declare that they have no conflict of interest.

References

1. Gelatt KN. Essentials of veterinary ophthalmology, 2nd edn. 2008; 234-246.
2. Cooley PL. Phacoemulsification in a clouded leopard (*Neofelis nebulosa*). *Veterinary Ophthalmology*. 2001; 4(2): 113-117.
3. Ali M. Propofol or ketamine as maintenance agents in xylazine-ketamine induced captive lions. *MVSc thesis submitted to Tamil Nadu Veterinary and Animal Sciences University, Chennai, India*. 2005
4. Hirasaka TO, Katakami CH, Yamamoto MI. Corneoscleral wound healing after self-sealing cataract surgery--2. Cellular proliferation. *Nippon Ganka Gakkai Zasshi*. 1995; 99(7): 755-762.
5. Tuntivanich P, Tuntivanich N. Phacofragmentation and aspiration in canine mature cataract: Surgical

- technique, success rate and complications. *The Thai Journal of Veterinary Medicine*. 2007; 37(2): 33-45.
6. Glaze MB, Gelatt KN. Feline Ophthalmology. In: *Veterinary Ophthalmology*. 3rd edn. 1999; 1103-1033.
7. Appel SL, Maggs DJ, Hollingsworth SR, Kass PH. Evaluation of client perceptions concerning outcome of cataract surgery in dogs. *Journal of the American Veterinary Medical Association*. 2006; 228(6): 870-875.
8. Ramani C, Nitin JD, Manoj Kumar A, Nagarajan L, William BJ. A report on Aphakic vision following phacoemulsification and intraocular lens power requirements in cats. *International Journal of Canine Practice*. 2014; 6 (1), 42-44.
9. Slatter D. Fundamentals of veterinary ophthalmology, 2nd edn. Saunders, Philadelphia, pp 1990; 365-393.
10. Barnett KC, Crispin SM. Feline ophthalmology. An atlas and text. Saunders, Philadelphia, 1998; 112 -121.
11. Gelatt KN, MacKay EO. Prevalence of primary breed-related cataracts in the dog in North America. *Veterinary Ophthalmology*. 2005; 8(2): 101-111.
12. Ramani C, Ahirwar MK, Shafiuozama M, D'souza NJ, Nagarajan L. Incidence of cataract in dogs: a retrospective study. *Tamilnadu Journal of Veterinary and Animal Sciences*. 2013; 9(3): 231-233.
13. Davidson MG. Phacoemulsification and intraocular lens implantation: a study of surgical results in 182 dogs. *Progress in Veterinary and Comparative Ophthalmology*. 1991; 1: 233-238.
14. Nasisse MP, Davidson MG. Surgery of the lens. In: *Veterinary Ophthalmology*. 3rd edn. 1999; 827-856.
15. Glover TD, Constantinescu GM. Surgery for cataracts. *Veterinary Clinics of North America: Small Animal Practice*. 1997; 27(5): 1143-1173.
16. Gilger BC. Phacoemulsification: technology and fundamentals. *Veterinary clinics of North America: Small Animal Practice*. 1997; 27(5): 1131-1141.
17. Sardari K, Emami MR, Tabatabaee AA, Ashkiani A. Cataract surgery in an African lion (*Panthera leo*) with anterior lens luxation. *Comparative Clinical Pathology*. 2007; 16(1): 65-67.
18. Seitz R, Weisse I. Operation on a congenital cataract in a Siberian tiger. *Ophthalmologica*. 1979; 178(1-2): 56-65.
19. Donnenfeld E, Holland E. Dexamethasone intracameral drug-delivery suspension for inflammation associated with cataract surgery: a randomized, placebo-controlled, phase III trial. *Ophthalmology*. 2018; 125(6): 799-806.