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# INTRASCLERAL PROSTHESIS IN KITTEN AS AN OPTION FOR EYEBALL ENUCLEATION

**Iuliana IONASCU, Adina ARGASEALA, Seralp UZUN, Gina GIRDAN**

University of Agronomic Sciences and Veterinary Medicine of Bucharest,
59 Marasti Blvd, District 1, Bucharest, Romania

Corresponding author email: driulianaionascu10@gmail.com

***Abstract***

*Feline herpesvirus is associated with complex ocular disorders: buphthalmia, descemetocele, deep corneal ulcers or penetrating corneal wound, in many cases the enucleation of the eyeball being the unique surgical option. During a period of 2 years (2016-2018), in 11 kittens with the age between 4 weeks and 6 months, intrascleral prosthesis was performed as an alternative to eyeball enucleation. Seven cases needed corneal reconstruction: we performed corneal-conjunctival flap in 4 patients and applied Vetshield® collagen contact lens in the other 3 patients, followed by a third eyelid flap in all patients. Periodic ophthalmologic examinations revealed a postoperative evolution without major complications. The silicone prosthesis is well tolerated by the tissue. Patients are receiving longterm local treatment with hyaluronic acid gel. Intrascleral prosthesis is an aesthetic option for keeping the eyeball into the orbit.*

***Key words****: enucleation, intrascleral prosthesis, kitten, silicone prosthesis.*

## INTRODUCTION

Feline herpesvirus (FHV-1) is widespread in the feline population worldwide, with reported exposure rates of up to 97% (Gould, 2011) and with reports of active infection rates ranging from 5 to 20% (Bol et al., 2015).

FHV-1 has been associated with a wide range of ocular disorders: ophthlamia neonatorum, blepharoconjunctivitis, corneal ulcers (superficial or deep), uveitis, keratoconjunctivitis sicca, symblepharon, corneal sequestrum. Severe cases present with descemetocele, endophtalmitis and buphthalmos (Ionascu, 2017).

Cases of feline congenital or early-onset glaucoma are associated with various ocular malformations, including aphakia microphakia, ectopia lentis, iridoschisis, pectinate ligament dysplasia, iridociliary cysts and persistent pupillary membranes. The secondary glaucomas, constituting 95-98% of feline glaucoma cases, are associated with antecedent ocular or systemic disease processes (McLellan & Miller, 2011).

All patients presented in this study had clinical sigs of herpesvirus (blepharoconjunctivitis, ocular and nasal discharge), prior or at the time of the first examination.

Cases with buphthalmos that is refractory to medical therapy, descemetocele, perforated ulcers, eyes with no realistic possibility for vision, may require enucleation of the eyeball as the only surgical option.

This paper aims to present an alternative to eyeball enucleation: intrascleral prosthesis. In cases with severe corneal damage, intrascleral prosthesis was combined with corneal surgical treatment (island conjunctival flap or Vetshield® collagen contact lens, followed by third eyelid flap).

The evisceration procedure requires the removal of the intraocular contents through a scleral incision, maintaining the corneoscleral shell, into which a silicone prosthesis is inserted and the scleral wound apposed (Gelatt & Gelatt, 2011). In contrast with eyeball enucleation, the intrascleral prosthesis results in a cosmetic repair, keeping the corneoscleral shell in place.

This study reports a postoperative evolution with no major complications, the silicone prosthesis being well tolerated by the tissue. The novelty of this study is represented by the young age of the patients, as well as the use of this surgical procedure in cases with disease previously reported as contraindication.

## MATERIALS AND METHODS

Medical records of 11 cats were analysed. Patients that were included in this study had a clinical diagnostic of glaucoma or buphthalmos, associated with secondary corneal disease and underwent intrascleral prosthesis implantation and corneal repair surgery (Table 1).

Patients underwent complete ophthalmological and physical examination. Additional diagnostic tests were performed, such as ultrasound, complete blood count and serum biochemistry.

Anterior to posterior axial globe length was determined for each eye using B-mode ultrasonography, with a 12.5-MHz ultrasound transducer.

Complete blood count and serum biochemistry showed no significant changes.

Evisceration of the eyeball and the implant of an intrascleral prosthesis (An-Vision Inc, Hennigsdorf, Germany) were decided.

The evisceration procedures requires the removal of the intraocular contents through a scleral incision, maintaining the corneoscleral shell, into which a silicone prosthesis is inserted and the scleral wound apposed (Gelatt & Gelatt, 2011).

The procedure involves exposing the bulbar dorsal conjunctiva and application of 4 stay sutures using nylon 4/0 (Ethilon 4/0, Ethicon, Johnson & Johnson, Germany). Lateral canthotomy for additional exposure was not necessary to perform. The conjunctival incision of approximately 120°-160° is performed between the stay sutures using a scalpel blade of 15 mm, at 3-4 mm distance from the limbus and parallel to it. For the scleral incision a tenotomy scissor was used. Two small hemostatic forceps were applied on both end of the scleral incision. The lens and the vitreous are easily removed, the uveal tract and the retina are removed by gentle traction using a hemostatic forceps. A lavage with saline is performed inside the corneascleral shell, to remove the blod clots and the remaining intraocular tissue. The sterile silicone prosthesis, after being flushed with saline, is implanted using a Carter injector (An-Vision Inc, Hennigsdorf, Germany). Silicone prosthesis's size was recorded for each patient. The size of the prosthesis was chosen after measuring ultrasonographically the diameter of the fellow eye minus 1-2 mm. The sclera and the overlaying conjunctiva are sutured separately using 5/0 vicryl (Vicryl 5/0, Ethicon, Johnson & Johnson, Germany), in a simple continuos suture, starting from the external angle. Seven patients needed corneal repair surgery after the prosthesis implantation. We performed an island conjunctival flap in 4 cases and applied a Vetshield® collagen bandage lens (Oasis Medical Inc, USA) in the other 3 cases, followed by a third eyelid flap in all 7 patients. The island conjunctival graft was harvested from the bulbar conjunctiva. The island conjunctival graft is sutured on the corneal defect using vicryl 8/0 (Vicryl 8/0, Ethicon, Johnson & Johnson, Germany) simple interrupted sutures. The Vetshield® collagen lens was applied in 3 cases with deep corneal ulcer. After the collagen bandage lens is hydrated with saline and applied on the corneal defect, a third eyelid flap is performed using a simple interrupted suture. The complete third eyelid flap was performed in order to mantain the collagen lens on the surface of the cornea after the surgery. The sutures are maintained for 3 weeks. Postoperative medications were similar for all patients and included meloxicam (Loxicom 0.5 mg/ml, Norbrook, Ireland) 0.1 mg/kg SID for 5-7 days, doxicycline (Ronaxan 20 mg, Merial, Lyon, France) 10 mg/kg SID 14 days, local antibiotics (Ofloxacin, Floxal, Bausch & Lomb Rochester, NY, SUA) TID for 14 days and artificial tears with hyaluronic acid TID for 30 days (Diferion®, Micromed Vet, Austria). After 30 days, the local treatment consisted only of artificial tears gel BID a la long (Optixcare Eye Lube Plus®, CLC Medica, Ontario, Canada). Patients that underwent corneal repair surgery and third eyelid flap received hyaluronic acid gel BID 6 months following sutures' removal. Histopathology performed on the eviscerated tissue excluded the presence of neoplasia and infection.

## RESULTS AND DISCUSSIONS

In the study were included 11 intact cats: 9 Domestic Shorthair and 2 British Shorthair, 3 females and 8 males. The age of the patients ranged was from 1 to 6 months. The right eye

was affected in 5 cats and the left eye in 6 cats. All 9 cases presented buphthalmos with high intraocular pressure with an IOP range from 30 mm Hg to 72 mm Hg (Figures 1 and 2).

Table 1. Patients' data included in the study

| Case number | Sex | Age | Name, Breed | Diagnosis | Prosthesis size | Corneal repair surgery | Complications |
|---|---|---|---|---|---|---|---|
| 1 | M | 1 month | Piki, DSH | OS Buphthalmos, aphakia, secondary corneal ulcer | 17 | - | - |
| 2 | M | 4 months | Amir, British Shorthair | OD Congenital glaucoma, buphthalmos, posterior lens luxation, mature cataract | 18 | - | - |
| 3 | M | 1 month | Stelu, DSH | OS Buphthalmos, superficial corneal ulcer | 17 | - | - |
| 4 | F | 2 months | Maxi, DSH | OS Buphthalmos, aphakia | 17 | - | - |
| 5 | M | 4 months | Chiorete, DSH | OD Buphthalmos, aphakia, central desmetocele | 19 | Island conjunctival flap + 3rd eyelid flap | - |
| 6 | M | 6 months | Thomas, DSH | OS Buphthalmos, aphakia, central desmetocele | 19 | Island conjunctival flap + 3rd eyelid flap | - |
| 7 | M | 5 months | Berlioz, DSH | OS Buphthalmos, aphakia, central desmetocele | 19 | Island conjunctival flap + 3rd eyelid flap | - |
| 8 | F | 6 months | Freia, DSH | OD Buphthalmos, central desmetocele | 18 | Island conjunctival flap + 3rd eyelid flap | OD Entropion, 2 months postoperatively |
| 9 | F | 4 months | Matoosh, British Shorthair | OD Buphthalmos, secondary corneal ulcer | 17 | Vetshield® + 3rd eyelid flap | - |
| 10 | M | 6 months | Tufi, DSH | OS Congenital glaucoma, secondary corneal ulcer | 18 | Vetshield® + 3rd eyelid flap | OS Superficial corneal ulcer, 7 days postoperatively |
| 11 | M | 5 months | Emi, DSH | OD Buphthalmos, secondary corneal ulcer | 18 | Vetshield® + 3rd eyelid flap | - |

Figure 1. OD Buphthalmos, posterior cataract lens luxation (case 2)

Figure 2. OS Buphthalmos (case 1)

Eight cases presented corneal disease. Three cases presented secondary corneal ulcer with positive fluorescein test (Figures 3 and 4) and one case presented vascularized corneal ulcer (Figure 5).

Four cases presented central descemetocele (Figures 6 and 7). In 5 cases the ultrasound examination revealed aphakia.

Figure 3. OS Buphthalmos, secondary corneal ulcer (case 3)

Figure 4. OD Buphthalmos, secondary corneal ulcer (case 11)

Figure 5. OS Buphthalmos, secondary vascularized corneal ulcer (case 1)

Figure 6. OS Buphthalmos, central descemetocele (case 6)

Figure 7. OS Buphthalmos, central descemetocele (case 7)

The third eyelid flap was performed (Figures 9 and 11) in 7 cases: 3 cases with corneal ulcer and Vetshield® collagen lens application (Figure 8) and 4 cases with descemetocele and island conjunctival flap (Figure 10).

Figure 8. OD Buphthalmos and secondary corneal ulcer. Selected case for Vetshield® collagen lens aplication (case 9)

Figure 9. OD Third eyelid flap after Vetshield® collagen lens aplication (case 9)

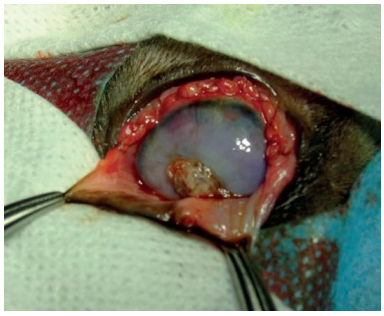

Figure 10. Postoperatively aspect of the island conjunctival flap and conjunctival suture following intrascleral prosthesis (case 6)

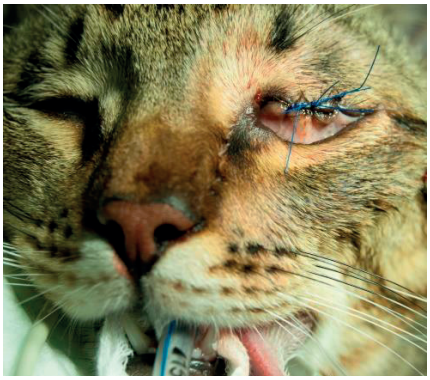

Figure 11. OS Third eyelid flap, island conjunctival flap and conjunctival suture (case 6)

Even the studies (Cook, 1997; Gelatt & Gelatt, 2011) recommend the sphere size should be +/- 1 mm of the horizontal corneal diameter of the affected eye. In our study, the silicone prosthesis size was determined by ultrasonographic measurement of the antero-posterior diameter of the fellow ocular globe minus 1-2 mm. This method was chosen because 7 cases also had concurrent corneal disease as well, and a larger sphere would have put more tension on the cornea and impaired the corneal healing under the graft or under the Vetshield® collagen lens.

The immediate postoperative aspect of the patients that underwent only intrascleral prosthesis implant reveals hemorrhage in the corneoscleral shell and chemosis of the bulbar dorsal conjunctiva (Figure 12).

Figure 12. OD Immediate postoperatively aspect, hemorrhage in the corneoscleral shell (case 2)

Following surgery, the patients were kept under observation for a mean period of 21 months, with a range between 9 months and 36 months.

The first re-check was after 24 hours postoperatively, then every week for a month, and after that, every 3 months.

The eyes were examined assessing surgical wound healing, the ocular discharge, the Schirmer Tear Test value and the corneal fluorescein uptake. One case developed corneal ulcer 7 days after the surgery (Figure 13).

Figure 13. OS Corneal ulcer 7 days after the surgery (case 10)

Clinical aspect 30 days following surgery reveals non painful eyes, with an opaque cornea. Eyes with large corneal lacerations, otherwise considered contraindication for the intrascleral implant, responded well to the implant. After the suture removal at 21 days postoperatively the fluorescein test was negative.

One patient presented mild entropion two months postoperatively. The cornea did not uptake fluorescein and surgery for the correction of the entropion was performed 6 months after the intrascleral prosthesis surgery (Figure 14).

The reason for the entropion occurrence might be the growth of the facial bones along with its structures, including the eyelids, while the elastic corneoscleral shell reduces in size over 1-3 months to conform to the implant size (Gelatt & Gelatt, 2011; Hamor et al., 1994)

Clinical aspect 3 months following surgery reveals the normal size of the eye; the cornea is opaque, has a blue color (Figures 15 and 16), normal value of the Schirmer Tear Test and negative fluorescein test.

Figure 14. Postoperatively aspect of the entropion surgery performed 6 months after the intrascleral prosthesis (case 8)

None of the patients in this study developed pigmentation of the cornea, which may be the case in dogs with intrascleral prosthesis (Wilkie et al., 1994).

Figure 15. Clinical aspect 3 months after intrascleral prosthesis for buphthalmos and aphakia (case 4)

Figure 16. Clinical aspect 3 months after intrascleral prosthesis for buphthalmos and descemetocele (case 7)

Clinical aspect 6 months following surgery in the cases with large corneal injuries reveals non painful eye with normal size; the cornea has blue color (Figure 17), normal value of the Schirmer Tear Test and negative fluorescein test.

Figure 17. OS Clinical aspect 6 months after intrascleral prosthesis for buphthalmos, afakia and corneal ulcer (case 1)

Entropion (1/11) and superficial corneal ulcer (1/11) were the only complications that occurred in this case-series.

Following evisceration with intraocular prosthesis, several adverse effects or complications can occur: corneal surface disease, entropion, keratoconjunctivitis sicca (KCS), dehiscence of the scleral suture, implant extrusion, endophthalmitis, and regrowth of undiagnosed intraocular neoplasia (Blocker et al., 2007; Ruoss et al., 1997, Cook, 1997, McLaughlin et al., 1995, Naranjo et al., 2014).

Blocker et al. stated that 52% of dogs in their study developed a superficial ulceration within the central cornea at one of the time points postoperatively. Their study also shows that the presence of buphthalmos appeared to be a factor in globes developing decreased corneal sensitivity. Given the fact that corneal diseases are the most common complication that occurs, even in the 14 days following surgery (Lin et al., 2007) and taking into consideration the decreased corneal sensitivity and the reduction in aqueous tear production, artificial tear supplements with hyaluronic acid were long term prescribed for all 11 patients.

Other reports recommend that intraocular prosthesis should be delayed or not performed in eyes with major corneal diseases, including deep ulceration and low tear production, because of the weakened cornea (Blocker et al., 2007; Gelatt & Gelatt, 2011). One study reports that intraocular silicone prosthesis were

implanted in the eyes of a horse and a dog with traumatic corneal lacerations and protrusion of intraocular contents and that they were well tolerated (Riggs et al., 1990).

Kim et al. (2015) describes in a case-report an intrascleral prosthesis with penetrating keratoplasty on perforated corneal ulcer secondary to KCS in a Shih Tzu Dog.

However, exposure of silicone ball occurred at 9 months after the surgery due to the irritation of implant, thus enucleation was performed (Kim et al., 2015).

Our study also contradicts earlier reports that have cited corneal disease as a contraindication for implantation of intraocular silicone prosthesis.

In the follow up period, all patients in this study tolerated the implant well; all patients are pain-free at the follow-up recheck examinations.

The minor complications that occurred, entropion and superficial corneal ulcer, were well controlled with hyaluronic acid as well. All owners were satisfied with the surgical outcome and the cosmetic appearance.

## CONCLUSIONS

Intrascleral prosthesis was performed as an alternative to eyeball enucleation in severe, complicated cases of increased intraocular pressure, associated with corneal ulcer and descemetocele.

Placement of an intraocular prosthetic provides comfort to the patient and a cosmetic effect to the globe.

The silicone prosthesis was well tolerated by the tissue, with no major complications.

The novelty of this study is represented by the young age of the patients, as well as the use of this surgical procedure in cases with disease previously reported as contraindication.

Postoperative treatment requires longterm administration of hyaluronic acid gel.

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