

Clinical Report

Using Ahmed's Gonioimplant Valve to Surgical Treatment of Glaucoma in Two Dogs

Hamidreza Fattahian^{*1}, DVSc
Hooman Molookpour², DVM
Hamid Mohyeddin³, DVM
Alireza Hoseinzadeh⁴, DVM

¹Department of Surgery, Faculty of Specialized Veterinary Sciences, Science and Research Branch, Islamic Azad University, Tehran, Iran.

²Dr. Hooman's Small Animal Private Clinic, Tehran, Iran.

³Department of Clinical Sciences, Faculty of Veterinary Medicine, Garmsar Branch, Islamic Azad University, Garmsar, Iran.

⁴Pardis Small Animal Private Clinic, Tehran, Iran.

Abstract

Case Description- An eleven-year-old Golden retriever male dog (dog I) and a four-year-old neutered Toy Terrier (dog II) were referred to Small Animal Clinic. Dog I was suffered from partial loss of vision and engorgement of episcleral vessels of his right eye and dog II was blind. Intraocular pressure (IOP) of right eye was 37.8 mmHg in dog I and 34.5 and 31.6 mmHg in the right and left eye of dog II that measured by Schiøtz tonometer, respectively.

Treatment and Outcome- Medical treatment was started to reduce ciliary body secretions and increase drainage. On day 3, surgical treatment were carried out using of Ahmed's gonioimplant valve AGV S2 and AGV FP7 in right eye of dog I and II, respectively. Post-operative care was carried out with topical and systemic anti-glaucoma, anti-inflammatory and antibiotic drugs. Intraocular pressure was dropped into normal level the day after surgery in both dogs.

Clinical Relevance- Authors hope that clinicians examined eyes and be awared strictly about glucoma and consider suitable immediate medical therapy because of preserving and maintaining vision of eye. Moreover operation using of valved gonioimplant (Ahmed's valve) is preferable for long-term treatment of glaucomatous cases with anti-glaucoma drugs.

Key words: Glaucoma, Ahmed's Gonioimplant Valve, Dog.

*** Corresponding author:**

H.R. Fattahian, DVSc

Department of Surgery, Faculty of Specialized Veterinary Sciences, Science and Research Branch, Islamic Azad University, Tehran, Iran.

E-mail address: hrfattahian@yahoo.com

Case Description

An eleven-year-old Golden retriever male dog (dog I) and a four-years-old neutered Terrier (dog II) were referred to Small Animal Clinic (Dr. Hooman's and Pardis Small Animal Private Clinics). In physical exam pain, engorgement of episcleral vessels, and with menace examination, partial loss of vision of right eye in dog I and blindness in both eyes of dog II were detected without buphthalmus. Intraocular pressure (IOP) of right eye was 37.8 mmHg in dog I and 34.5 and 31.6 mmHg of right and left eyes of dog II measured by Schiøtz tonometer, respectively. The blood samples were taken and hematologic and biochemical profiles were assessed. All tested profiles were in normal values. No ulceration was observed using fluorescein staining of cornea in both dogs. No lens dislocation and retinal detachment of interest eyes were revealed by ophthalmoscopic and ultrasonographic evaluations. The present study addresses the new surgical technique for treatment of glaucoma in two referral dogs.

Treatment and Outcome

According to the clinical and laboratory findings, medical treatment was prescribed for both dogs. Dorzolamide (12qh, two drops per each eye) and Latanoprost (24qh, two drops per each eye) were prescribed as topical carbonic anhydrase inhibitor and prostaglandin derivative, respectively.

On day 3 after starting medical treatment, IOP of both interest eyes in dog I and II reduced to 7.8 and 8.5 mm Hg. Surgery was conducted on day 3 after starting medical treatment. Dogs received dextrose-saline solution at (20 ml/kg/hr) preoperative medication before anesthesia. Cefazolin (22 mg/kg, IV) was administrated as a prophylactic antibiotic before operation in both cases. Then Propofol (7.5 mg/kg, IV) was administrated as an induction and maintenance of anesthesia. The patients were positioned in left lateral recumbency and the upper eyelid cilia was trimmed. Preocular area was cleaned with gauze sponges by sterile saline. Povidine-iodine solution (1.25%) was used to disinfect the conjunctival sac and then operative site was carefully cleaned with ethyl alcohol. The surgical field was draped with three field drapes. The preparing process was similar in both dogs.

A conjunctival-Tenon's capsule incision was made parallel to and approximately 5mm posterior to the limbus in the supertemporal quadrant of the globe. The dissection was continued down to the sclera and extended both anteriorly toward the limbus and posteriorly between the extraocular muscle to form a subconjunctival-Tenon's capsule pocket (Fig. 1). After 5 minutes, the pocket was irrigated thoroughly with at least 45 ml of 0.9 % normal saline. After preparing pocket the Ahmed's gonioimplant valve AGV-S2 and AGV-FP7 in right eye of dog I and II, respectively (Fig.2) was primed and verified to be patent by flashing it with 0.9% normal saline and blunt-tipped 27 gauge irrigation canula. Immediately the implant was anchored to the sclera with 8-0 monofilament Polyamide using simple interrupted suture technique 8 mm posterior to limbus (Fig. 3).

After using 23-gauge needle to enter the anterior chamber and make a tunnel (Fig. 4), the Ahmed's gonioimplant tube was inserted through the 23 gauge needle track. The tube ideally was protruded into the anterior chamber 2mm so that no to touch the cornea, and not to extended into the papillary aperture, and the tip was cut with a 30 °C bevel (Fig. 5).



Figure 1. Making pocket between tenon's capsule and sclera (Dog II).



Figure 2. Ahmed's gonioimplant valve AGV-S2 (Dog II).

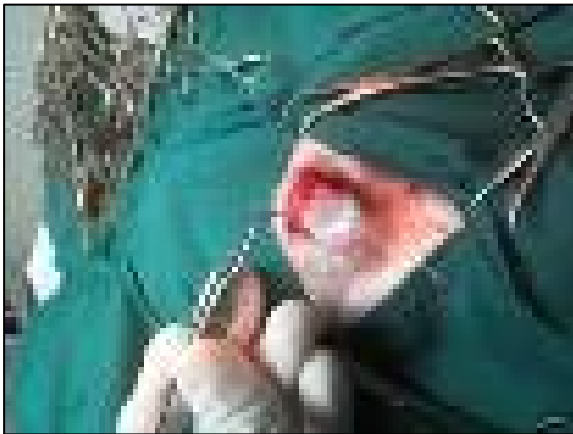


Figure 3. Insertion Ahmed's gonioimplant valve into pocket (Dog II).

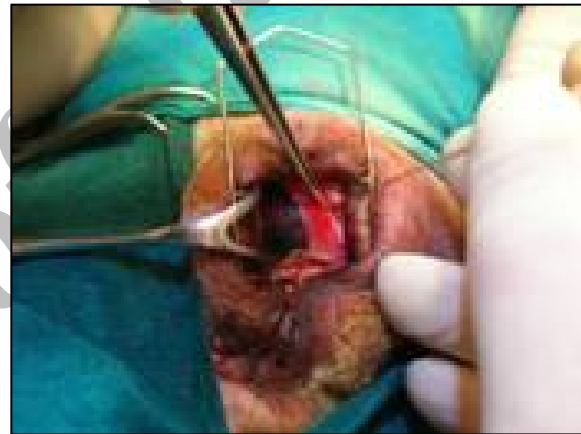


Figure 4. Using 23-gauge needle to enter the anterior chamber and make a tunnel (Dog I).

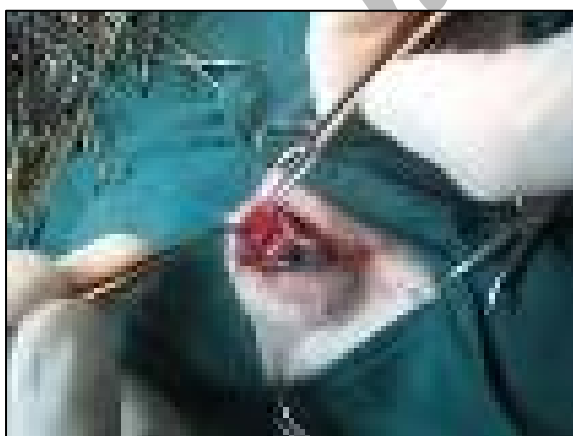


Figure 5. Insert the tube into anterior chamber (Dog II).

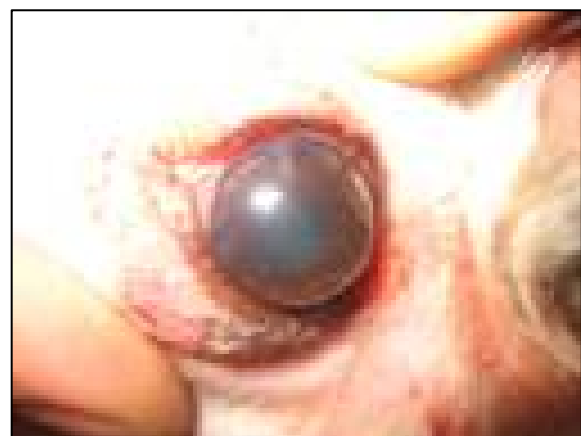


Figure 6. Right eye after complete insertion Ahmed's gonioimplant valve in (Dog II).

To secure the tube, a limbus based $\frac{1}{2}$ thickened scleral flap was made (4mm wide by 6 mm long), and Tenone's capsule was closed with a simple continuous suture using 7-0 polyglactin 910 (Fig. 6).

An Elizabethian collar was used to reduce self trauma postoperatively. Preoperative antiglaucoma drugs (Dorzolamide, 12qh, two drops per each eye; Latanoprost, 24qh, two drops per each eye) was continued, Betamethazone ophthalmic drop (6qh), systemic Prednisolone (0.5 mg/kg, 24qh), and Chloramphenicol ophthalmic drop (12qh) systemic Amoxicillin-clauvulonic acid (22 mg/kg, 8qh) also administered postoperatively. Two latter medicines were prescribed for 5 days. With the exception of Dorzolamide (6 months), topical anti-glaucoma drug (Latanoprost) and systemic and topical anti-inflammatory therapy were tapered in two weeks.

There was no any relevance infection or inflammation in both dogs. Intraocular pressure of operated eyes was 10.2 mmHg and 7.8 mmHg in dog I and dog II on day 2 post-operatively. Follow up period was 9 months. Intraocular pressure in eye of dog I and dog II was 7.1 and 5.9 mmHg on day 14 post-operatively. Vision was preserved and at least maintained a pain free eye recovered in the right eye of dog I and clinical signs (pain and engorgement of episcleral vessels) due to increased intraocular pressure of dog II were relieved. The orifice of Ahmed's gonioimplant tube in dog II was occluded in month 3 and intraocular pressure was raised up to 27 mmHg. The tube was opened using blunt-tipped 27 gauge needle with normal saline 0.9% through making an opening of cornea the opposite side of tube.

Discussion

Glaucoma is an abnormal increase of intraocular pressure.¹ Glaucoma is one of the most frequent causes of irreversible blindness in dogs and cats.^{1,2} The disease is classified into primary and secondary also and in the state of drainage angle as open, narrow and close. The most important sign of glaucoma is progressive loss of vision.^{1,2} Glaucoma is a complex of pathologic conditions with clinical manifestations due to the elevation in intraocular pressure and its consequences^{1,2} this sentence is somehow a repeating sentence. Interference with axoplasmic flow in the optic nerve head, death of retinal ganglion cells and their axons, and irreversible blindness are common features of all glaucomatous cases in acute condition with very high IOP.^{1,2}

Aqueous is free of cells and protein and is produced by active secretion and ultra filtration at the epithelium covering the ciliary body.^{2,3} Aqueous passes into the posterior chamber and through the pupil into the anterior chamber.² From the anterior chamber the aqueous passes between the pectinate ligaments and enters the ciliary cleft, which contains the trabecular meshwork.^{2,3} Finally, aqueous filters through the meshwork enter the blood-free venous angular aqueous plexus and then the scleral venous plexus, before re-entering the venous system.^{2,3} Causes of variation in aqueous production including diurnal variation, age, blood pressure, drugs and ocular inflammation, all elevate intraocular pressure and could cause glaucoma.^{1,3,4}

Review of the data collected by the veterinary medical data base during a 20-year period indicated that approximately of every 119 dogs and of every 367 cats were blinded by this disease.⁵ Some researchers suggested preserving vision or at least maintaining a pain free blinded eye medically, surgically, or both.⁶ However, the majority of glaucomatous cases ultimately require some form of surgical intervention and medical therapy's typically used as an adjunct to surgery when additional pressure reduction is necessary or as a bridge to surgery.^{5,6} Medical therapy, dorzolamide and timolol for 11 months, after insertion Ahmed's gonioimplant valve has

been recommended.⁶ Topical dorzolamide was prescribed after operation for more than 6 months. The most appropriate procedure depends on the eye has potential for retaining vision.^{2,4} On the other hand surgical procedures were carried out to reduce pain due to increasing intraocular pressure.^{2,5} Investigators believe that medical therapy is usefulness for long-term because of reducing of receptor response to Latanoprost in canine eye versus human.^{1,2,4} Therefore, trephination-iridectomy, cyclocryotherapy and cycloablation were introduced to treatment of various type of glaucoma in animals in the past.¹ All techniques had adverse effects such as poor outflow facility and fibrosis over the filtering site resulted in failure of these procedures to control pressure within a few weeks to months after operation.¹ Then attempt by numerous investigators over many years to use different types of drainage implants as a conduit for aqueous to the subconjunctival space in glaucomatous canine eye have been successful.^{3,4,6,7,8} Nowadays, a number of artificial aqueous humor shunts (gonioimplants) have also been used to try to create a pocket through which aqueous can filter into the subconjunctival space and thereby circumvent the flow limiting effect of fibrosis.^{4,6,7,9,10} In an attempt to circumvent mentioned problems, valve gonioimplant have been developed.^{1,2} Valve gonioimplant (Ahmed) remains closed at intraocular pressures less than 8-12 mmHg but opens and allows aqueous to exit when intraocular pressure is higher than the mentioned pressure.² Authors used the artificial aqueous humor shunts in two dogs who suffered from narrow angled glaucoma. Fortunately, intraocular pressures in both eyes of the dogs whom were operated using Ahmed's gonioimplant valve AGV-S2 and AGV-FP dropped into 7.1 and 5.9 mmHg during two weeks after the surgery in the operated eyes dog I and dog II, respectively. Fibrin clot was not occluded the orifice of the tubes in both dogs at first day post operatively, but 3 month after the operation occlusion was happened in dog II and intraocular pressure was increased suddenly. Some investigators have reported that occlusion of the orifice of the Ahmed's gonioimplant valve tube occurs in day 1 or 2 postoperatively, but in dog II, it happened 3 months later.^{1,2,6} We hope that clinician be aware about this very complicated disease and after recognition of disease signs, immediate medical therapy has to be performed. Then after early reduction of intraocular pressure, it is recommendable it's preferable to use Ahmed's gonioimplant valve to be placed for long term glaucoma management.

References

1. Gelatt KN, Mackay EO. Changes in intraocular pressure associated with topical dorzolamide and oral methazolamide in glaucomatous dogs. *Vet Ophthalmol* 2001;4: 61.
2. Miller PE. Glaucoma. In: Slatter D. *Textbook of small animal surgery*. 3rd ed. Vol 2. Philadelphia: WB Saunders Co, 2003; 1454-1477.
3. Cruise L, McClure R. Posterior pathway for aqueous humor drainage in the dog. *Am J Vet Res* 1981;42: 992.
4. Gelatt KN, Mackey EO. Modified Ahmed anterior shunt to the parotid duct in the glaucomatous beagle. *Trans Am Coll Vet Ophthalmol* 2000;31: 17.
5. Slatter D. *Fundamentals of Veterinary Ophthalmology*. 3rd ed. Philadelphia: WB Saunders Co, 2001; 350-380.

6. Garcia-Sanchez GA, Whitley RD, Brooks DE, et al. Ahmed valve implantation to control intractable glaucoma after phacoemulsification and intraocular lens implantation in a dog. *Vet Ophthalmol* 2005;8(2): 139-144.
7. Bedford PGC. Use of a one-piece drainage system in the treatment of closed angle glaucoma in a dog. *J Small Anim Prac* 1988;29: 231.
8. Sapienza JS, Woerd AVD. Combined transscleral diode laser cyclophotocoagulation and Ahmed gonioimplantation in dogs with primary glaucoma 51 cases (1996–2004). *Vet Ophthalmol* 2005;8(2): 121-127.
9. Chew SJ, Ritch R. Neuroprotection: The next breakthrough in glaucoma? *Proceeding. 3rd annual optic nerve rescue and restoration think tank. J Glaucoma* 1997;6: 263.
10. Tinsley DM, Betts DM. Clinical experience with a glaucoma drainage device in dogs. *Vet Comp Ophthalmol* 1994;4: 77.

Archive of SID

استفاده از گونیو ایمپلنت احمد در درمان جراحی گلوکوم در دو قلابه سگ

حمیدرضا فتاحیان^۱، هومن ملوک پور^۲، حمید محی الدین^۳،

علیرضا حسین زاده^۴

^۱ گروه آموزشی جراحی، دانشکده علوم تخصصی دامپزشکی، واحد علوم و تحقیقات، دانشگاه آزاد اسلامی، تهران، ایران،

^۲ کلینیک خصوصی حیوانات کوچک دکتر هومن، تهران، ایران،

^۳ گروه علوم درمانگاهی، دانشکده دامپزشکی، دانشگاه آزاد واحد گرمسار، گرمسار، ایران،

^۴ کلینیک خصوصی حیوانات کوچک پردیس، تهران، ایران.

توصیف بیماران و یافته های بالینی- دو قلابه سگ نر، ۱۱ ساله، گولدن رتریور (سگ I) و تریر نر ۴ ساله اخته شده (سگ II) با علائم ضعف بینایی چشم راست (سگ I)، و نابینایی هر دو چشم (سگ II) به درمانگاه دامپزشکی ارجاع داده شدند. پس از معاینه درمانگاهی و اندازه گیری فشار کره چشم گلوکوم در هر دو بیمار تشخیص داده شد.

درمان و نتیجه آن- بلافاصله درمان دارویی به منظور کاهش تولید مایع داخل چشم از طریق بخش ترشحات اجسام مژگانی و افزایش برداشت مایع از طریق عروق دور صلبیه و شبکه جمع کننده مایع داخل چشم (در ناحیه قرنیه ای - عنبیه ای) استفاده شد. سپس در روز سوم پس از درمان دارویی هر دو بیمار تحت جراحی و کار گذاری ایمپلنت دریچه احمد AGV و AGV S2 FP7 به ترتیب در چشم راست هر دو سگ قرار گرفتند. مراقبت های پس از جراحی با بهره گیری از داروهای پایین آورنده فشار چشم، ضد التهاب و آنتی بیوتیک های موضعی و عمومی انجام پذیرفت. فشار داخل کره چشم در دامنه طبیعی در روز پس از جراحی قرار گرفت.

کاربرد بالینی- نویسندگان امیدوار هستند که کلینیسین ها معاینه دقیق چشم را انجام داده و نسبت به بیماری گلوکوم آگاه بوده و درمان دارویی مناسب را در نظر داشته باشند. چراکه درمان زود هنگام دارویی مانع از دست رفتن و یا کاهش بینایی می شود. بعلاوه انجام درمان جراحی با استفاده از دریچه گونیوایمپلنت احمد در درمان طولانی مدت دارویی بیماران گلوکومی توصیه می گردد.

کلید واژگان- گلوکوم، دریچه گونیو ایمپلانت احمد، سگ.