

Usage of Tissue Plasminogen Activator for Blood Clot in XEN Stent Lumen

XEN Stent Lümeninde Oluşan Kan Pıhtısı için Doku Plazminojen Aktivatörü Kullanımı

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ABSTRACT

XEN 45 stent (Allergan, Dublin, CA) is a new minimally invasive glaucoma surgery (MIGS) method using the identical outflow pathway as trabeculectomy, but less conjunctival scarring. A 65-year-old female underwent XEN stent implantation surgery, due to uncontrolled intraocular pressure and visual field deterioration in the right eye despite medical treatment. Postoperative gonioscopy examination revealed a blood clot occluding the stent orifice. Intracameral injection of tissue plasminogen activator (tPA) was performed to dissolve the blood clot and to open the lumen. However, hyphema filling 2/3 of anterior chamber was developed on the first day following injection. During follow up, hyphema was rapidly reduced by diffusing to subconjunctival area via stent and completely disappeared on post-operative 10th day. Intracameral tPA is a useful option in breaking down the blood clot obstructing the XEN stent lumen but it should not be forgotten that anterior chamber hemorrhage may come out if it is applied in the early postoperative period.

Key Words: Glaucoma, XEN gel stent, minimally invasive glaucoma surgery.

ÖZ

XEN 45 stent (Allergan, Dublin, CA), trabekülektomi ile aynı dışa akım yolunu kullanan, ancak konjonktivada daha az skara sebep olan yeni bir minimal invaziv glokom cerrahisidir (MIGS). Altmış beş yaşındakı hastaya, medikal tedaviye rağmen sağ gözde kontrolsüz göz içi basıncı ve görme alanı kaybında ilerleme nedeniyle XEN stent implantasyonu uygulandı. Ameliyat sonrası gonyoskopi incelemesi sırasında stent orifisini tıkayan bir kan pıhtısı saptandı. İntrakameral doku plazminojen aktivatörü (tPA) enjeksiyonu, kan pıhtılarını çözmek ve lümen tıkanıklığını gidermek için yapıldı. Bununla birlikte, enjeksiyon sonrası 1. günde ön kamaranın 2/3'ünü dolduran hifema gelişti. İzlem sırasında hifemanın stent yoluyla subkonjonktival alana yayılarak hızla azaldığı görüldü ve postoperatif 10. günde hifema tamamen kayboldu. İntrakameral tPA, XEN stent lümenini tıkayan kan pıhtılarını çözmede faydalı bir seçenek olmakla birlikte, erken postoperatif dönemde uygulandığı takdirde ön kamara kanamasına sebep olabileceği unutulmamalıdır.

Anahtar Kelimeler: Glokom, XEN jel stent, minimal invaziv glokom cerrahisi.

INTRODUCTION

XEN 45 stent (Allergan, Dublin, CA) is a new minimally invasive glaucoma surgery (MIGS) method using the identical outflow way as trabeculectomy, but less conjunctival scarring. It has been approved by the Food and Drug Administration (FDA) in 2016 and started to take place in clinical practice. XEN 45 gel stent is designed accordingly by the principle of Hagen-Poiseuille laminar flow law in order to provide protection against hypotony

with the control of outflow.¹ The most important advantage that implant provides is the goal of minimizing serious complications occurring during conventional surgeries. Currently, as with all MIGS techniques, clinical experience with XEN stent is limited and a number of publications about its safety and efficacy need to improve.²⁻⁴ In this case report, we present the management of a case with occluded stent lumen due to anterior chamber blood clot following XEN stent implantation. This is the first case report that

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demonstrates application of intracameral tissue plasminogen activator (tPA) in a nonfunctioning XEN gel stent to best of our knowledge.

CASE REPORT

A 65-year-old female underwent XEN stent implantation surgery, due to uncontrolled intraocular pressure (IOP) and visual field deterioration in the right eye despite medical treatment. Preoperatively, visual acuity of the patient was 10/10 and her IOP was 25 mm Hg despite the usage of combination treatment consisting of topical latanoprost, dorzolamide-timolol fixed combination and brimonidine. Shaffer's grading was grade 4 and optic nerve cup/disc ratio was 5/10. No history of previous ocular surgery was present.

XEN implantation was done under sub-tenon anesthesia. A mark 3 mm beyond limbus was placed by sterile pen on superior nasal area where the stent will be placed. Subconjunctival mitomycin-C 0.1 ml (0.01 %) was injected from the superior quadrant. Two corneal incisions were performed by 19 G MVR knife from inferior temporal and nasal, then cohesive viscoelastic 1.4 % was administered into the anterior chamber. Needle of syringe preloaded with XEN stent was inserted from inferior temporal incision and directed to supero-nasal angle. Stent was placed through the scleral tunnel to the subconjunctival area. In the meantime, the hemorrhage which occurred in the anterior chamber, was removed by irrigation along with viscoelastic. Implantation surgery was completed with transient AC bleeding and IOP was 27 mm Hg at the post-operative first day. However, during gonioscopy examination, a blood clot occluding the stent orifice was detected. Coagulum was still present at the post-operative third day and IOP level was 22 to 25 mm Hg with medication. Therefore, 25 µg/0.05 ml tPA was injected into the anterior chamber. However, hyphema filling 2/3 of anterior chamber developed on the first day following injection (Figure A). IOP was 20 mm Hg and there was subconjunctival hemorrhage at bleb area (Figure B). A

second intervention for irrigation-aspiration was proposed, however as the patient didn't consent, Then topical steroid and anti-glaucomatous drop medications were decided. During follow up, hyphema was rapidly reduced by diffusing to subconjunctival area via stent and completely disappeared at the post-operative 10th day. However, black pigment accumulation due to hemorrhage diffusing from anterior chamber, was observed on bleb area where the aqueous was drained (Figure C). IOP reduced to 12 mmHg at the first month. Partial pigmentation loss was present on anterior surface of iris but there was no transillumination defect. The subconjunctival part of the stent was easily visible within the tenon tissue that was slightly brown due to pigment accumulation (Figure D). During gonioscopy examination, the orifice of the stent was open and pigmentation was present at the trabecular meshwork (Figure E). IOP was 15 mmHg without any medication and the bleb was diffuse and flat at the post-operative first year.

DISCUSSION

During last decade, various implants and techniques targeting increased outflow were developed by using different outflow pathways of aqueous humor. Similar to trabeculectomy, XEN gel stent provides aqueous outflow via subconjunctival filtration; and beyond its efficacy, the main objective of this method is to minimize or completely eliminate the complications encountered during conventional surgery as other MIGS. In few clinical trials for short term, no serious complication resulting in visual loss was reported for XEN stent surgery.²⁻⁵ Intraoperative complications related with XEN implantation surgery are intracameral or subconjunctival hemorrhage, and failure in implantation.²⁻⁵ Reported post-operative complications are hyphema, vitreous hemorrhage, fibrous bleb development, hypertrophic bleb, occlusion of stent lumen, stent exposure, malignant glaucoma, leak/dehiscence, hypotony and choroidal detachment.²⁻⁵



Figure A. Anterior segment view at the first day following tPA injection.

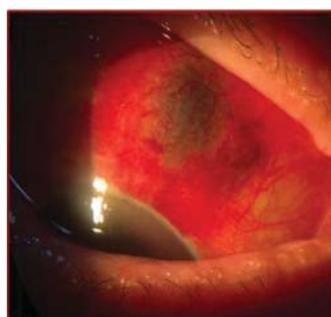


Figure B. Subconjunctival hemorrhage on filtration at the first day following tPA injection.



Figure C. View of subconjunctival part of stent at the first year.

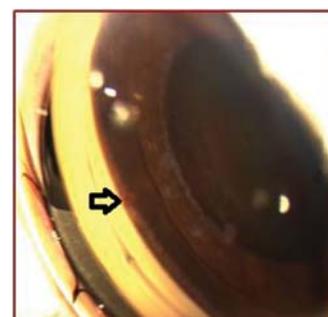


Figure D. Internal ostium of the stent (arrow) and trabecular pigmentation on gonioscopy.

Blood clot related lumen occlusion is a rare complication of this recent surgical technique and was reported in one case in the literature, Pinto et al. reported that they successfully removed the coagulum occluding inner orifice of stent by internal limiting membrane micro-forceps.⁶ In our case, we aimed to dissolve the blood clot with thrombolysis of coagulum by tPA injection to remove the obstruction of lumen. However, during early post-operative period, tPA administered by 27 G syringe through clear corneal approach, led to recurrence of hemorrhage. As stent lumen was opened and IOP was in normal range, follow up in lying position of 45° was advised to patient. The need for irrigation was eliminated since hyphema has rapidly moved toward subconjunctival area and lumen was not occluded by a second clot. Black pigmentation observed at subconjunctival area was considered as accumulation of hemosiderin resulting from hemolyzed blood cells elements. This pigmented area indicates the width of conjunctival bleb area where aqueous humor is diffused within tenon tissue from outflow pathway provided by the stent.

Intracameral injection of tPA has been advocated for treatment of intraocular blood or fibrin clots after pars plana vitrectomy, cataract surgery, and glaucoma surgery.⁷ Zalta and colleagues reported that tPA successfully cleared and prevented obstruction of valved glaucoma drainage implants.⁸ Hyphema is the most frequent complication of intracameral tPA injection after glaucoma surgery.⁹ Although an optimal intracameral therapeutic dose of tPA has not been determined, 25 µg tPA proved to be safe and efficient in the treatment of severe fibrinous reactions in the anterior chamber with potentially minimal complications.^{10,11} However, Lundy et al. recommended using a dose of less than or equal to 6 to 12.5 µg to minimize risk of hyphema after glaucoma surgery.⁹ The only complication that we encountered was also hyphema that appeared on day 1 after injection. However, the hyphema resolved without any associated rise in IOP or recurrent bleeding. The patient achieved IOP control without further intraocular surgery. But accumulation of blood and fibrin products subconjunctivally may predisposes to more wound healing leading to fibrosis and may have bearing on long term success of the procedure.

This is the first case report that demonstrates application of intracameral tPA in a nonfunctioning XEN gel stent to best of our knowledge. Intraocular blood may obstruct the XEN stent lumen, thereby compromising aqueous outflow and causing filtration failure. Intracameral tPA is a useful option in breaking down the blood clot obstructing the XEN stent lumen but it should not be forgotten that anterior chamber hemorrhage may come out if it is applied in early postoperative period. Compared with a second operation, tPA injection is much less invasive and it rapidly dissolves blood clots. In order to minimize the risk of postinjection bleeding,

utilizing low doses or delayed injection are conceivable, if there is no blood clot resolution spontaneously.

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Conflict of Interest: The authors declare that they have no conflict of interest.

Ethical approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent: Informed consent was obtained from all individual participants included in the study.

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