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Ab interno Gelatin Stent with mitomycin C using targeted supra-tenon's placement

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Table of Abbreviations

Any abbreviations that you will be using in your protocol must be defined in this table in alphabetical order. If no abbreviations are being used, then this section does not need to be included

GVT—Gelatin Stent vs. Trabeculectomy
MMC—Mitomycin C
IOP—Intraocular Pressure
PKP—Penetrating Keratoplasty
DALK—Deep Anterior Lamellar Keratoplasty
DSAEK—Descemet's stripping automated endothelial keratoplasty
DMEK—Descemet's membrane endothelial keratoplasty
CPC—Cyclophotocoagulation
AC—Anterior Chamber
POM—Post-op month

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Background

The Xen-45 gelatin microstent (Allergan, Dublin, Ireland) is a novel, bleb-forming microinvasive glaucoma surgery (MIGS).[1] Creation of a filtering bleb through the gel stent and under the conjunctiva lowers intraocular pressure (IOP) by bypassing the natural outflow pathway of aqueous. A recent retrospective cohort study showed comparable safety and risk of failure to trabeculectomy.[2] Amongst the main advantages of this device is the ability to create a bleb without dissecting and disrupting tissue, thus decreasing the amount of wound healing and potentially limiting bleb failure. However, despite demonstrating similar efficacy and safety to trabeculectomy,[2] the Xen-45 gelatin microstent continues to suffer from occasional surgical failure due to fibrosis of the filtering bleb, and obstruction of the stent.[3] Although antimetabolites, such as mitomycin C, have decreased reactionary wound healing that can result following surgery, fibrosis may still occur, especially when the components of the Xen-45 gelatin microstent are in close proximity to the fibroblastic structures of tenon's fascia.[4,5]

Tenon's capsule resembles a sponge-like layer with multiple adhesions to the overlying conjunctiva and underlying episclera.[6] Implantation of the XEN within this space creates a higher risk of obstruction and subsequent failure. To ensure the lowest potential for occlusion, bleb scarring, and failure, one must ensure careful placement of the device in the subconjunctival space, avoiding intra-tenon's placement. Placement in the supra-tenon's space is believed to maximize aqueous outflow, while preventing obstruction, limiting fibrosis of the bleb, and promoting long-term patency.[7] Despite the theoretical merits, long-term data of outcomes after targeted supra-tenon's placement is needed to fully assess its potential in improving Xen-45 microstent outcomes.

Research Question/Objective

Hypothesis

- Targeted supra-tenon's placement of the Xen-45 gel microstent results in higher success, less needling and lower IOPs than non-targeted placement.

Primary objective

- Evaluate outcomes of patients receiving an ab interno gelatin stent with mitomycin C (MMC) using targeted supra-tenon's placement to patients receiving an ab interno gelatin stent with non-targeted placement.

Secondary objectives

- Intraoperative complications: corneal abrasion or perforation, hyphema, subconjunctival bleeding, gelatin stent fracture or need for re-implanation, iris prolapse, suprachoroidal hemorrhage, vitreous loss or posterior capsule rupture.
- Management interventions (not considered complications): bleb needling, AC reformation, suture release, digital ocular compression, use of glaucoma medications, or laser/tpa to blocked ostomy or lumen.
- IOP: mean IOP, mean decrease in IOP from baseline, IOP thresholds of ≥6 and ≤17, ≥6 and ≤14, and ≥6 and ≤21 (mmHg).
- Vision: number of patients who lose more than two lines of best corrected visual acuity, post-operative cataract surgery rates, auto-refraction.
- Glaucoma medications: number of topical glaucoma medications and percentage of patients on glaucoma medications.
- Visual recovery: percentage of patients who achieve baseline best corrected visual acuity at 1 week, 1 month, 3 months, and annually thereafter.
- Non-protocol visits: number of non-scheduled non-protocol visits.

Aim of the project

- Retrospectively obtain data through a chart review for exploratory purposes.

Study Design

Population + Recruitment Strategies

- Patients aged 30-90 with primary or pigmentary/pseudoexfolliative open angle, primary closed angle, or combined mechanism glaucoma with IOP of 18-40 mmHg on maximum tolerated medical therapy who received a gelatin stent with MMC at Prism Eye Institute from June 2012 to August 2019.
- Exclusions: other forms of glaucoma, prior incisional glaucoma surgery, CPC, prior corneal graft (PKP, DALK, DSAEK, DMEK).

Sample Size

- Assuming an alpha of 0.05, a clinically significant IOP difference of 3 mmHg and a standard deviation of 5 mmHg, the estimated sample size is 88 eyes (44 eyes per group).

Tools for Data Collection

- Data will be collected from the Electronic Medical Record.

Methodology

Outcome:

Survival analysis will be determined by the following success/failure criteria:

1. Complete success:
    a. IOP: 6-17 mmHg and on no glaucoma medications (starting after POM1[3]) at least 1 month after surgery with no reoperation.
    b. Absence of the following complications:
        i. Starting after POM1[3]: shallow AC w/ iridocorneal touch, any hyphema, corneal edema, wound leak/dehiscience, choroidal effusion, malignant glaucoma, dellen/non-healing epithelial defect, ptosis, diplopia.
        ii. At any point: additional glaucoma surgery, loss of light perception vision, vitreous hemorrhage, ≥2mm hyphema, hypotony maculopathy, implant migration/blockage/exposure/extrusion, macular edema, choroidal effusion/hemorrhage requiring drainage, suprachoroidal hemorrhage, retinal detachment, suture abscess/blebitis/endophthalmitis
    c. Stable functional testing
        i. After POM1[3] no decrease in best corrected visual acuity of more than 2 lines from baseline on 2 consecutive visits (unless deemed to be due to corneal or retinal disease—e.g., retinal vein occlusion)
2. Qualified success:
    a. 'Complete success' criteria except that IOP can be above IOP thresholds, and then reduced to within the 'Complete criteria' by medications or laser in 3 visits or less.

Statistical Analysis: Analysis of variance (ANOVA) and Wilcoxon signed-rank test will be used to compare univariate normal and non-normal continuous baseline characteristics and outcomes. Fisher exact tests will be used to compare univariate categorical baseline characteristics and outcomes. Time to failure will be defined as the time from surgery to the patient no longer meeting the 'success' criteria. Multivariate analysis will be performed with Cox proportional hazard regression analysis. A p-value of 0.05 or less will be considered statistically significant.

Safety Considerations

- Given the nature of this project (retrospective chart review) there are no safety considerations.

Data Analysis

- Data analysis will follow the plan outlined above and use SAS Studio (Cary, NC).

Perceptions of Bias

- Information bias: Neither the patients nor clinicians are masked, thus in theory reporting can be influenced by performance bias and clinician beliefs. This is an inherent limitation of a retrospective study. The use of objective clinical measures to quantify success minimizes this bias.
- There may be differential loss to follow-up in the study. Patients can be lost to follow-up for a variety of reasons: because they are doing well (sent back to the referring physician), not doing well (had a complication and have sought a second opinion), or lost to follow-up for other reasons not influenced by outcomes.

Follow-up

- The follow-up will be according to the patient's electronic health record.

Project Feasibility

Ethical considerations

- Given the retrospective nature of this project the main concern is the protection of the personal health information of the patients studied. The data will be collected without personal identifying information (instead using a unique identifier), and published will be in aggregate as to not reveal personal information about any patient in an identifiable manner.

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