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Sutured Versus Sutureless Sclerotomies after 25 Gauge Vitrectomy without an Internal Tamponade

Ilkay Kilic Muftuoglu[1], Mark Espina[1], Frank Tsai[1], Hema Ramkumar[1], Michael Goldbaum[2] and William R Freeman[1*]

[1]*Department of Ophthalmology, Jacobs Retina Center at the Shiley Eye Institute, University of California San Diego, USA*

[2]*Department of Ophthalmology, Shiley Eye Institute, University of California San Diego, USA*

[*]**Corresponding author:** William R Freeman, Department of Ophthalmology, Jacobs Retina Center at the Shiley Eye Institute, University of California San Diego, CA, USA, Tel: 858-534-3513; Fax: 858-534-7985; E-mail: wrfreeman@ucsd.edu

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Abstract

Objective: We wished to determine whether suturing of 25 gauge sclerotomies was advantageous in maintaining normal intraocular pressure (IOP) or preventing hypotony after 25-gauge vitrectomy in eyes not requiring internal tamponade.

Methods: Two-hundred seventeen consecutive 25-gauge vitrectomy surgeries from 2010 to 2013 performed at a single center by two surgeons were retrospectively reviewed. Patients were divided into 2 groups based on the surgeon's routine use of suture in such cases. Surgeon 1 (sutureless group) did not suture any sclerotomies unless intra-operative leakage was noted and surgeon 2 (sutured group) sutured all 25 gauge sclerotomies routinely. Patient data was retrieved from charts and from this we determined the mean IOP change from baseline, hypotony incidence, and complications.

Results: There was no significant difference in the mean IOP change at any postoperative visits (p=0.18 at postop day 1, p=0.3 at postop week 2, p=0.23 at postop 1 month, and p=0.43 at postop month 3) between the two groups. The hypotony rate was 10.9% in surgeon 1 and 9% in surgeon 2 group at postoperative day 1 (p=0.82). One patient required suture placement at postoperative day 1 in sutureless group. No complications were seen related with hypotony at any groups.

Conclusion: In our population, there is no increased risk of hypotony with sutureless transconjunctival 25-gauge vitrectomy. Suturing of non-leaking 25-gauge wounds has no effect on complications from hypotony.

Keywords: 25 gauge vitrectomy; Hypotony; Intraocular pressure; Sutureless vitrectomy; Sutured vitrectomy; IOP; Vitrectomy

Introduction

Pars plana vitrectomy (PPV), pioneered by the late Dr. Robert Machemer, began in the 1970's with a 16-gauge unimanual full function probe [1]. Since then, the increasing sophistication of surgical instrumentation has allowed for surgery to be more precise, efficient, and less invasive. Recently, many retina surgeons have shifted from 20-gauge vitrectomy to 23-, 25-, and 27-gauge systems.

The majority of vitrectomy surgeries performed in the Unites States is now performed using a 25-gauge vitrectomy system [2]. Compared to conventional 20-gauge three-port vitrectomy, 25-gauge transconjunctival sutureless vitrectomy decreases surgical time, patient discomfort, and need for conjunctival peritomy for sclerotomy exposure [3,4]. However, an important concern with sutureless sclerotomies is the risk of poor wound apposition resulting in post-operative hypotony and its related complications. Approximately one third of retinal surgeons routinely perform a partial or complete air-fluid exchange in routine cases in the belief that this helps sclerotomy wound closure and prevents post-operative hypotony [5].

The incidence of hypotony after 25-gauge vitrectomy has been described in several prospective and retrospective case series and was reported to be anywhere between 0% to 20% on post-operative day one [4,6-13]. It has been noted to occur even in cases of 25-gauge vitrectomy that had sutures placed at the conclusion of surgery to close sclerotomies that appeared to persistently leak after cannula removal [7].

Despite several reports on the hypotony rates after 25 gauge pars plana vitrectomy in various vitreoretinal diseases with or without suturing of sclerotomies, to the best of our knowledge, there is no report showing the impact of the routine suturing in the hypotony and related complications. At our institution two retina surgeons had a different approach with one never suturing unless an obvious wound leak was present and one always suturing all 25 gauge sclerotomies. Therefore, we conducted this study to detect the effect of routine suturing of 25-gauge sclerotomies on post-operative intraocular pressure and hypotony in eyes that were filled balance saline solution at the end of the vitrectomy procedure and compared them with the eyes that did not require any suture at the conclusion of the surgery.

Materials and Methods

Participants

We retrospectively reviewed the medical records of 432 consecutive patients who underwent 25-gauge transconjunctival 3-port pars plana

vitrectomy using the 25-gauge instrumentation and vitrector (Constellation, Alcon, Fort Worth, Texas, US) at the Shiley Eye Institute between 2010 to 2013 by two retina surgeons (W.R.F. and M.G.). All patients were consented prior to surgery. University of California San Diego Institutional Review Board approval was obtained for the review and analysis of patient data. The study adhered the to the tenets of the Declaration of Helsinki eyes for research involving human subjects and complied with Health Insurance Portability and Accountability Act (HIPAA) of regulations.

Study design

The inclusion criteria included not requiring internal tamponade such as intravitreal gas (SF6 or C3F8) or silicone oil. Since topical dorzolamide/timolol ophthalmic eye drop (Cosopt, Merck Sharp&Dhome, BN Haarlem) was installed immediately at the end of the surgery and was continued for the first postoperative month 1 for the gas filled (SF6 or C3F8) eyes by the first surgeon to prevent any acute IOP increase following surgery, and second surgeon infrequently used this eye-drop as a prophylactic agent; gas filled eyes were excluded (n=110) from the analysis to avoid any bias in the IOP measurements. Eyes filled with silicone oil tamponade (n=90) were also excluded due to difference in type of used silicone (5,000-centistoke silicone oil versus 1,000-centistoke) between 2 surgeons. Other exclusion criteria included eyes with prior glaucoma drainage surgery, prior scleral buckle and a history of trauma of the eyeball.

The surgical indications for vitrectomy included vitreous hemorrhage, epiretinal membrane removal, significant vitreous opacities, pars planitis, and vitreous biopsy, and fine needle aspiration biopsy.

Data collection

All patients underwent a comprehensive ophthalmological examination including best-viusal acuity using biomicroscopy using the Early Treatment Diabetic Retinopathy Study (ETDRS) chart (Chart "R"; Precision Vision, La Salle, Illinois, USA), slit-lamp biomicroscopy, dilated fundus examination with binocular indirect ophthalmoscopy using either a 78- or a 90-diopter indirect slit-lamp lens and a 20-diopter binocular indirect ophthalmoscopy, intra-ocular pressure measurement (Goldman applanation tonometry, Haag-Streit Bern, Switzerland) prior to surgery and at postoperative (postop) visits including postop day 1, week 2 (visit between week 1-2), month 1, and month 3. Intraocular pressure (IOP) was checked using the same method in all eyes. Patients were evaluated for age, indication for the surgery, history of the previous vitrectomy, lens status, rate of suturing, post-operative hypotony, and use of anti-glaucomatous eye drops. Hypotony was defined as IOP ≤ 5 mmHg. Severe hypotony was defined as any complication related to low intraocular pressure requiring suturing or return to the operating room. Perioperative and postoperative complications, if present, were also noted at follow-up visits.

Surgical technique

All surgeries were done under subtenon anesthesia (lidocaine HCl, 40 mg/ml (Vintage Pharm, Huntsville, AL) and 0.75% bupivicane (Hospira, Inc, Illinois) mixture) by the 2 retina surgeons after an appropriate skin preparation with povidone iodine and draping. Both surgeons performed shelved sclerotomies through displaced conjunctiva with a 25-gauge trochar-cannula system (Alcon, Ft. Worth Texas, US). This technique allows retention of the cannula through the sclerotomy after removal of the trochar blade. Sclerotomies were performed 3.5 mm from the limbus for pseudophakic eyes and 4 mm from the limbus for phakic eyes using angle scleral incisions in all eyes. Two surgeons both used the same angle incisions for the sclerotomies. A contact irrigating lens and or wide-angle contact lens used to facilitate posterior segment visualization. Both surgeons used the same vitrectomy system (Alcon Constellation, Ft Worth, Texas, USA) and all eyes underwent a complete vitrectomy with elevation or removal of posterior hyaloid.

After removing the instrumentation and infusion cannulas at the conclusion of the case, surgeon 1 (sutureless technique, WRF) performed a sutureless closure by compressing the sclerotomies with toothed forceps upon removal of the cannulas. The wounds were observed for leakage, and, if present, the sclerotomies were sutured. Patients who required suturing of the sclerotomies at the end of the surgery (n=5 eyes) were excluded from the analysis to avoid any bias. Surgeon 2 (sutured technique, MHG) used sutures regardless of the tightness of the wound in all cases. Polyglactin 7-0 absorbable sutures (Vicryl, Ethicon) placed transconjunctivally with either a simple interrupted suture or X-suture (two parallel passes), which was subsequently examined to ensure water-tight closure.

In the presence of coexisting significant cataract, phacoemulsification was performed before the vitrectomy procedure and the corneal incisions were sutured with 10-0 nylon suture and was checked for leakage before and after vitrectomy.

At the conclusion of the case if no allergies were present, both surgeons injected subconjunctival antibiotics (ceftazidime 2.25 mg/0.1 ml (Fortaz, GlaxoSmithKleine, NC)) and steroid (triamcinolone (Kenalog, Bristol-Myers Squibb, NY, USA)).

Statistical analysis

The mean IOP difference was defined as the difference between the baseline pre-operative IOP and the post-operative IOP measured at follow-up visits.

Normality was checked using Kolmogorov-Smirnov tests. Mann-Whitney U test was used to compare IOPs between 2 groups at follow-ups. The mean change in IOP was checked using Wilcoxon-sign test or when appropriate, student t test in individual group. The incidence of hypotony was compared using the Fishers exact or chi square test between 2 groups. P-values represent results for 2-sided tests, with values less than 0.05 considered statistically significant. All analysis was done using SPSS 23 software.

Results

Demographics of the patients

A total of 217 eyes of 213 patients were included the study, 128 eyes underwent pars plana vitrectomy by the first surgeon (sutureless group) and 89 patients had vitrectomy by the second surgeon (sutured group). There was no significant difference in the mean age of the patients between 2 groups (69.9 ± 12.3 years in sutureless group versus 64.5 ± 17.2 years in sutured group, p=0.06). The baseline characteristics of the patients are summarized in Table 1. The preoperative lens status of the patients was similar among the groups. In sutureless group, most of the patients were phakic (62.9%) at baseline. There was no significant difference in the distribution of

patients with prior vitrectomy before the enrollment between 2 groups (p=0.937).

	Sutureless group (Surgeon 1)	Sutured group (Surgeon 2)	p
Number of eyes, n	128	89	
Mean age, year ± SD (range)	69.9 ± 12.3 (20-94)	64.5 ± 17.2	0.06
Gender, % (male/female)	68/58	46/41	0.78
Lens Status			0.332
Phakic, n (%)	64 (50)	55 (62.9)	
Pseudophakic, n (%)	31 (24.2)	14 (15.73)	
Aphakic, n (%)	2 (1.56)	1 (1.12)	
Combined phaco, n (%)	31 (24.2)	19 (21.3)	
History of prior vitrectomy, n (%)	25 (19.5)	17 (19.1)	0.937
N: Number, SD: Standard Deviation, Phaco: Phacoemulsification, Continuous variables are presented as mean and standard deviation			

Table 1: Demographics and characteristics of the patients undergoing 25-Gauge tranconjunctival vitrectomy with suture (sutured group) and without suture (sutureless group) closure of the sclerotomies.

The indications for the vitrectomy are shown in Table 2. Most of the patients (40.6% in sutureless group and 40.4% in sutured group) underwent PPV for epiretinal membrane in 2 groups. There was a significant difference in the indications of the surgery between 2 groups (p=0.003).

	Sutureless (n=128)	Sutured (n=89)	p
			0.003
ERM, n (%)	52 (40.6%)	36 (40.4%)	0.78
Non-clearing vitreous hemorrhage, n (%)	18 (14%)	8 (8.9%)	0.64
Pars planitis, n (%)	11 (8.6%)	3 (3.3%)	0.43
Visually significant vitreous floaters, n (%)	12 (9.4%)	6 (6.7%)	0.31
Lens dislocation, n (%)	10 (7.8%)	4 (4.5%)	0.32
Dropped nucleus, n (%)	2 (1.6%)	4 (4.5%)	0.76
Persistent CME, n (%)	15 (11.7%)	5 (5.6%)	0.43
Vitreous biopsy, n (%)	4 (3.1%)	6 (6.7%)	0.65
Fine needle aspiration biopsy, n (%)	4 (3.1%)	17 (19%)	0.005
N: Number, ERM: Epiretinal Membrane, CME: Cystoid Macular Edema			

Table 2: Indications for 25-gauge pars plana vitrectomy in sutured and suturuless group.

Mean intraocular pressure change

The mean IOP over the follow-up is showed in Figure 1. Although mean IOP at baseline was slightly higher in sutured group (16.4 ± 9.3 *vs.* 15 ± 5.5, p=0.224), there was no significant difference in the mean IOP between 2 groups at any time point (p=0.66 at postop day 1; p=0.749 at postop week 2; p=0.638 at postop month 1 and p=0.29 at postop month 3).

The mean change in IOP over the follow-up is summarized in Table 3. Sutureless group showed slight increase in the mean IOP at postoperative day 1, whereas sutured group exhibited slight decrease at all postoperative visits. There was no significant difference in the mean IOP change compared to baseline between 2 groups at any time point.

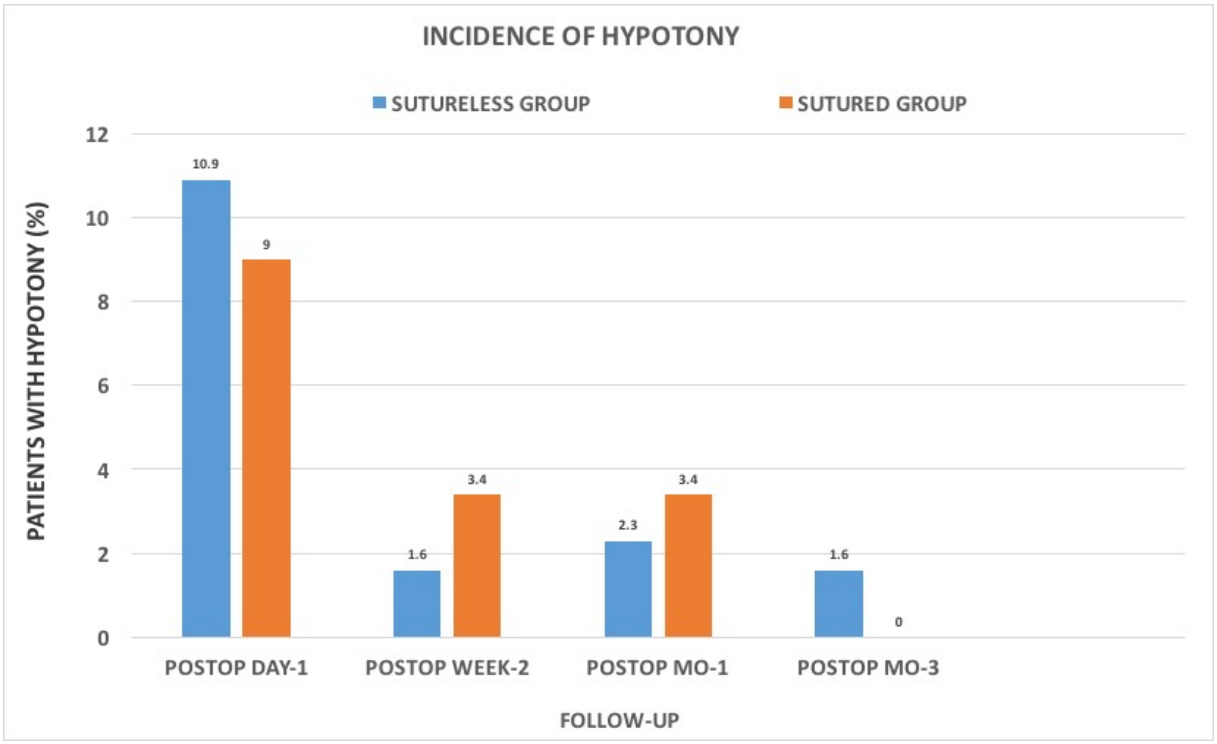

Figure 1: The incidence of hypotony during the follow-up in sutureless group and sutured group.

	Suturuless Group	Sutured Group	p
Postop day 1	0.5 ± 10.3	-1.3 ± 11.2	0.18
Postop week 2	0.5 ± 7.1	-0.8 ± 9.8	0.3
Postop- month 1	-0.06 ± 6.1	-1.5 ± 9.6	0.23
Postop-month 3	0.5 ± 5.9	-1.6 ± 10.4	0.43
IOP: Intraocular Pressure, Parameters are presented as mean and standard deviation			

Table 3: The comparison of mean IOP change between 2 groups during the follow-up.

Hypotony

The incidence of hypotony over the follow-up is illustrated in Figure 2. The incidence of hypotony was 10.9% (14 eyes) in sutureless group and 9% (8 eyes) in sutured group at postoperative day 1; the difference was not significant (p=0.82). In sutureless group, among the 14 eyes with hypotony at postoperative day 1, 12 (85.7%) had normalized IOP at postoperative week 2. In sutured group, among the 8 eyes with hypotony at postoperative day 1, 6 eyes (75%) showed normal IOP at postoperative week 2. Two of them exhibited normalized IOP at month 3.

There was no significant difference in the percentage of patients with hypotony between 2 groups at post-op week 2 (p=0.4), at month 1 (p=0.69). Although there was no patient with hypotony in the sutured group at postoperative month 3, 2 eyes had hypotony in sutureless group at postop month 3. One of 2 eyes had chronic uveitis and underwent vitrectomy for severe pars planitis. The patient showed significant decrease in IOP (IOP=0) at postoperative day 1, which then tend to fluctuate and eventually went back to 0 at postop month 3. The other patient who underwent prior vitrectomy due to endophthalmitis had hypotony at postoperative week 2, since then IOP did not normalize during the follow-up. None of these eyes had hypotony related complications such as choroidal detachment.

In group 1 (sutureless), 1 patient had hypotony with a shallow anterior chamber due to leaking from the sclerotomy sites at postoperative day 1 and required suture placement at postoperative day 1. Afterwards, the postoperative IOP was normalized, and patient did not require any further intervention for any complication or IOP management.

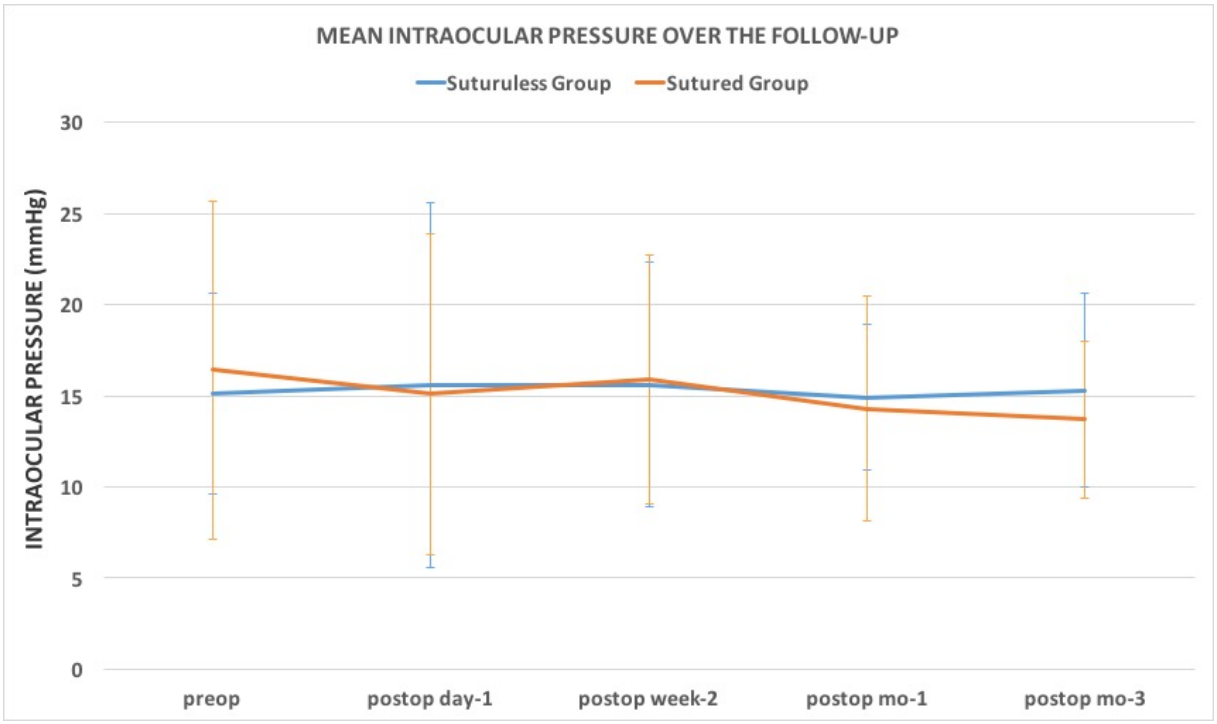

Figure 2: The mean change in the intraocular pressure over the follow-up in sutureless group and sutured group.

Intraocular pressure elevation

Intraocular pressure increase (IOP>21 mmHg) was seen in 27/128 eyes (21%) in the sutureless group and 16/89 eyes (18%) in the sutured group at postoperative day 1. There was no difference in the rate of elevated IOP between the two groups (p=0.68). Of these, 19 eyes (12 eyes from sutureless group, 7 eyes from sutured group) required topical anti glaucomatous eye drops.

No case was seen with choroidal detachment due to hypotony in both groups.

Discussion

In this study we compared the mean intraocular pressure changes and rate of hypotony in patients undergoing trans-conjunctival 25 gauge pars plana vitrectomy with sutured versus sutureless sclerotomies. We could not find any significant difference in the mean IOP change between 2 groups at any time points, moreover, the hypotony rate was found to be similar in 2 groups (10.9% versus 9%) at postoperative day 1, which thereafter decreased to 1.5% and 0 at postoperative month 3. These results show that suturing non-leaking 25-gauge sclerotomies does not lead to a clinically significant decrease in hypotony, both techniques yielded similar IOP change postoperatively in eyes not requiring internal tamponade such as silicone oil or gas.

In previous reports, the hypotony incidence after 25-gauge vitrectomy has been reported to be 0-30% at the first postoperative day 1 [4,6,7]. Early hypotony has also been reported to occur as early as postoperative hour 2 without any clinically prominent leakage by slit-lamp examination [7]. In our study, despite the presence of hypotony (IOP ≤ 5 mm Hg) with an incidence of approximately 10% at postoperative day 1 in both groups, IOP was normalized in 85.7% of eyes with sutureless sclerotomies and in 75% of eyes with sutured sclerotomies at week 2 without any further intervention. Over time, postoperative hypotony became less frequent with an incidence of 10% and 9% in group one and two lowering to 1.5 and 0% respectively by month 3. Our incidence of hypotony is lower than that in some other studies and may be related to careful compression or pinching of the wound with forceps during cannula removal in the non-sutured group. These results confirmed that both sutureless and sutured 25 gauge transconjunctival vitrectomy is a safe option in eyes with certain vitreoretinal pathologies.

There are some limitations of the study. This was a comparative study of surgery done by two different surgeons. A randomized study would eliminate any other factors that could be involved in effecting IOP post operatively. Although sutured and sutureless groups were comparable in terms of most of baseline characteristics of the patients, there was a significant difference in the percentage of patients who underwent surgery for the choroidal biopsy. However, we believe that the low percentage of these eyes and complete removal of vitreous would less likely to introduce bias. On the other hand, we did not study eyes with silicone oil because the two surgeons used different silicone oils with surgeon one using 5000 centistoke oil and surgeon two using 1000 centistoke oil. We also excluded eyes with intraoperative gas tamponade, because surgeon one consistently gave dorzolamide/timolol medication topically starting intraoperatively and surgeon two did not. That would bias the hypotony data towards having more hypotony or lower IOP in surgeon one's cases (data not shown). We have not shown this data because it can be confounded, but it is interesting nevertheless. Therefore, our results reflect a subset of patients undergoing pars plana vitrectomy and are not clinically applicable to complicated vitreoretinal cases such as proliferative

vitreoretinopathy. However, despite these limitations, we included a high number of patients done by 2 retina surgeon using the same sclerotomy incision technique (same angle incision technique).

In conclusion, sutureless and sutured closure of sclerotomies can cause similar change in the mean intraocular pressure and both result in hypotony with a rate of approximately 10% at postoperative day 1. Our results strongly suggest that routine suturing of non-leaking 25g sclerotomies after vitrectomy has no significant effect on intraocular pressure or risk of hypotony and may be unnecessary.

Conflict of Interest

None of the authors have any financial/conflicting interests to disclose.

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