Comparison of 25 Gauge Sutureless and 20 Gauge Vitrectomy Techniques for the Management of Diabetic Vitreous Hemorrhage

Diyabetik Vitreus Kanamasının Tedavisinde 25 Gauge Sütürsüz Vitrektomi ve 20 Gauge Vitrektomi Tekniklerinin Karşılaştırılması

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ABSTRACT

Purpose: To compare anatomical and functional outcomes of 25 gauge sutureless pars plana vitrectomy (PPV) and 20 gauge PPV in eyes with diabetic vitreous hemorrhage (VH).

Materials and Methods: IIn this interventional case series 15 eyes (Group 1) underwent 20-gauge PPV, and 29 eyes (Group 2) underwent 25 gauge sutureless PPV with oblique sclerotomies due to diabetic VH. Eyes with a minimum follow-up of 6 months were evaluated. The main outcome measures were changes in visual acuity (VA), intraocular pressure (IOP), and rates of complications.

Results: In all eyes PPV was performed without complication. The mean follow-up period was 14±9.14 months. Mean VA in Group 1 increased significantly at postoperative week 1 and thereafter, whereas it increased in Group 2 at postoperative month 1 and thereafter ($p<0.05$). Mean logMAR change, mean IOP levels, and rates of complications did not differ significantly between the two groups during follow-up ($p>0.05$). Transient hypotony was detected in 3 eyes in Group 2 only ($p>0.05$). Revitrectomy was performed in 1 (6.66%) and 3 (10.34%) eyes due to postoperative rehemorrhage in the two groups, respectively ($p>0.05$).

Conclusions: In this study 25 gauge sutureless pars plana vitrectomy with oblique sclerotomies and 20 gauge vitrectomy were similarly effective and safe in the treatment of diabetic VH. Further prospective randomized and controlled studies with larger series and with longer follow-up are warranted.

Key Words: Diabetic vitreous hemorrhage, 25 gauge pars plana vitrectomy, oblique sclerotomy, pars plana vitrectomy, transconjunctival sutureless vitrectomy.

ÖZ

Amaç: Diyabetik vitreus kanaması olan gözlerde uygulanan 25 gauge sütürsüz pars plana vitrektomi (PPV) ve 20 gauge PPV ile elde edilen anatomik ve fonksiyonel sonuçları karşılaştırmak.

Gereç ve Yöntemler: Bu girişimsel olgu serisinde, diyabetik vitreus kanaması nedeniyle 15 göze 20 gauge PPV (Grup 1), 29 göze ise oblik girişli sklerotomiler ile 25 gauge sütürsüz PPV (Grup 2) uygulandı.

En az 6 ay takip edilen gözler incelendi. Başlıca incelenen parametreler görme keskinliğindeki (GK), göziçi basıncındaki (GİB) değişiklikler ve komplikasyon oranlarıydı.

Bulgular: Tüm gözlerde PPV komplikasyonsuz tamamlandı. Ortalama takip süresi 14±9.14 aydı. Ortalama görme keskinliği, 1. Grupta postoperatif 1.haftada ve sonrasında anlamlı olarak artarken, 2. Grupta postoperatif 1.ayda ve sonrasında anlamlı olarak arttı ($p<0.05$). Takip süresince iki grup arasında, ortalama logMAR farkı, ortalama GİB değerleri ve komplikasyon oranları açısından anlamlı fark saptanmadı ($p>0.05$). Geçici hipotoni, sadece 2. Grupta ve 3 gözde görüldü ($p>0.05$). Postoperatif tekrar hemoraji nedeniyle ikinci kez PPV, 1.Grupta 1 (%6.66) gözde, 2. Grupta ise 3 (%10.34) gözde uygulandı ($p>0.05$).

Sonuç: Bu çalışmada, diyabetik vitreus kanamasının tedavisinde oblik girişli sklerotomilerle uygulanan 25 gauge sütürsüz PPV ve 20 gauge PPV benzer şekilde etkin ve güvenli bulunmuştur. Daha uzun takip süreli daha geniş serilerle yapılacak prospektif randomize kontrollü çalışmalara gerek vardır.

Anahtar Kelimeler: Diyabetik vitreus kanaması, 25 gauge pars plana vitrektomi, oblik sklerotomi, pars plana vitrektomi, transkonjonktival sütürsüz vitrektomi.

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INTRODUCTION

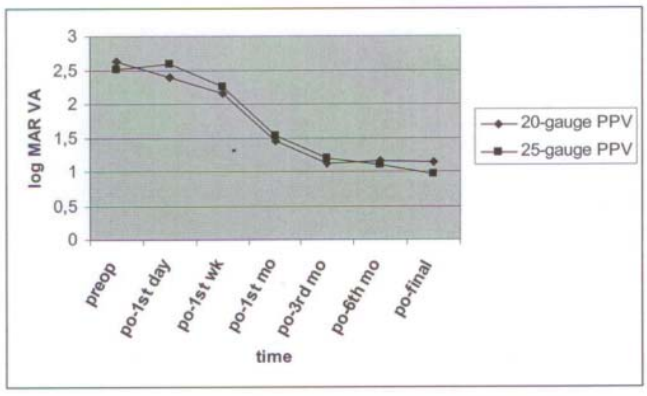
Vitreous hemorrhage (VH) from retinal neovascularization is a frequent complication of proliferative diabetic retinopathy (PDR). The prevalence of severe, nonclearing VH has been reduced by widespread use of panretinal photocoagulation, but it remains a frequent indication for vitrectomy.[1,2] Results after vitrectomy using modern instrumentation are favorable.[1, 3-10] Twenty-five gauge sutureless vitrectomy has recently emerged as the technique of choice in selected eyes, as it offers a minimally invasive surgery with rapid recovery times.[11] Success has been reported using 25 gauge sutureless vitrectomy in eyes with various vitreoretinal disorders.[12-16] Recently, standard straight 25 g incisions were modified, using oblique incisions to improve wound closure and decrease postoperative leakage.[17, 18]

In this study we compared the anatomical and functional outcomes and complications of 25 g sutureless vitrectomy with oblique sclerotomies and 20 gauge PPV in the treatment of diabetic nonclearing VH.

MATERIALS AND METHODS

In this retrospective study we evaluated the anatomical and functional outcomes of a series of 44 eyes of 44 patients with diabetic nonclearing VH who underwent PPV between January 2005 and January 2008. The risks and benefits of treatment were explained to the patients and informed consent was obtained in accordance with the Helsinki Declaration prior to the surgeries.

Inclusion criteria were diabetic VH lasting at least 3 months that precluded visualization of the fundus, and a minimum postoperative follow-up of 6 months. Exclusion criteria were rhegmatogenous retinal detachment (RD) or traction retinal detachment (TRD) detected with B-scan ultrasound, history of ocular trauma, age equal to or less than 16 years, a history of intraocular surgery other than cataract extraction, the presence of uveitis or glaucoma, and postoperative follow-up of less than 6 months.



Graphic: Changes in visual acuity in diabetic eyes that underwent 20 gauge pars plana vitrectomy or 25 gauge sutureless vitrectomy for the management of nonclearing vitreous hemorrhage.
VA Visual Acuity, PPV: Pars Plana Vitrectomy, preop: preoperative, PO: Postoperative, wk: week, mo: month.

Complete ophthalmologic examination was performed before surgery by means of B-scan ultrasound examination. Eyes with TRD or RD on B-scan ultrasonography were excluded from the study. The best corrected visual acuity (VA) was measured using the ETDRS chart. Visual acuities were converted to logarithms of the minimum angle of resolution (logMAR) score for analysis. Intraocular pressure (IOP) was measured with Goldmann applanation tonometry. Hypotony was defined as an IOP of less than 8 mmHg,[14,19] and severe hypotony was defined as an IOP of less than or equal to 5 mmHg.[20] Intraoperative and postoperative complications were monitored. The incidence of RD, vitreous or suprachoroidal hemorrhage, choroidal detachment/folds, and endophthalmitis was evaluated. Postoperative vitreous hemorrhage was defined as "early" if it occurred before postoperative month 1, and "late" if it occurred after month 1. [21] Age, gender, preoperative and postoperative VA, IOP, biomicroscopic and fundoscopic findings, intraoperative and postoperative complications were collected from the medical records. Diabetic eyes with nonclearing VH underwent 20 g PPV (Group 1), or 25 g sutureless vitrectomy (Group 2). The choice of technique was decided randomly based on availability of equipment at the time of the surgery and was unrelated to the density of the VH.

Surgical Technique

A posterior sub-Tenon's injection was given for local anesthesia in all eyes. In eyes that underwent 20 g PPV sclerotomies were performed with a microvitreoretinal blade in inferotemporal, superotemporal, and superonasal quadrants after making peritomies. In eyes that underwent 25 g sutureless vitrectomy we displaced the conjunctiva immediately above the intended sclerotomy site with the help of a cotton swab or forceps. Then the beveled trocar with the microcannula was inserted obliquely into the midvitreous through the conjunctiva and the sclera with approximately a 30° angle, as described by Lopez-Guajardo et al.[17] The sclerotomies were created 3 mm from the limbus in pseudophakic eyes and 3.5 mm from the limbus in phakic eyes. Three mililitres of 50% dextrose hypertonic solution was added to 500 mls of balanced salt solution for infusion in all phakic eyes.

The noncontact wide-angle viewing system (SDI/BIOM 3TM, Oculus Inc, Germany) was used for visualization of the fundus. Vitrectomy was performed with the Accurus 800CS (Alcon Surgical, Forth Worth, TX, USA). Either Alcon Surgical, or Bausch and Lomb (St Louis, MO, USA) 25 g transconjunctival sutureless vitrectomy system was used. The surgical technique was the same for all eyes. After all eyes underwent core vitrectomy a few drops (4 mg/0.1m) of intravitreal triamcinolone acetonide (Kenacort-A®, Bristol-Myers-Squibb, Peapack, NJ, USA) were injected into the midvitreous cavity to visualize the posterior hyaloid, thus allowing complete posterior hyaloid separation and removal. Elevation and removal of the posterior hyaloid membrane was performed

using active aspiration with the vitrectome, a 20 g posterior hyaloid elevator, or a 25 g pick. Residual peripheral vitreous was removed. Panretinal laser endophotocoagulation of approximately 800 shots was performed. The peripheric retina was checked for the presence of any iatrogenic retinal tears with scleral indentation using the wide-angle viewing system. A cutting rate of 1000-1500 cuts per minute and a vacuum level of 500 mmHg were used during 25 g PPV. A cutting rate of 1500 cuts per minute and a vacuum level of 150 mmHg were used during 20 g PPV. Fluid, air, or SF6 (%20) gas endotamponade was left in the eyes. Where co-existing cataract was present, phacoemulsification through a clear corneal incision was performed before PPV with foldable acrylic posterior chamber intraocular lens (IOL) implantation into the capsular bag.

On completion of 20 g vitrectomy, the infusion line was removed, the sclerotomies and the conjunctiva were sutured seperately with 7-0 vicryl (Ethicon, Cornelia, Georgia, USA). On completion of 25 g vitrectomy, the plugs were placed into the superior 25 g microcannulas and then the cannulas were removed, followed by the inferotemporal microcannula with the infusion line. Before removal of each microcannula a cotton swab was placed on the tract of the oblique sclerotomy and moderate pressure was applied in this area while the microcannula was removed. After each microcannula was removed, moderate pressure was applied to the entry sites with a cotton swab and the overlying conjunctiva was displaced slightly. We examined the entry sites for bleb formation from fluid or gas and for leakage. We injected subconjunctival antibiotic (cefazolin) and steroids at the conclusion of the procedure.

Table 1. Preoperative characteristics of diabetic eyes that underwent 20 gauge pars plana vitrectomy or 25 gauge sutureless vitrectomy for the management of nonclearing vitreous hemorrhage.†

	20 gauge PPV (n:15)	**25 gauge PPV (n:29)**	**P**
Male/ female ratio [n (%)]	8 (53.33) / 7 (46.66)	14 (48.27) / 15 (51.72)	1.000*
Age (years) [mean±SD]	59.73±11.77	61.37±15.47	0.720†
Fasting blood glucose (mean±SD)	154.63±76.69	154.95±73.44	0.991†
HgA1c (%) [mean±SD]	6.03±0.27	7.01±1.75	0.310†
Right/ left eye ratio [n (%)]	9 (60) / 6 (40)	14 (48.27) / 15(51.72)	0.535*
Pseudophakic eyes [n (%)]	3 (20)	5 (17.24)	1.000*
Phakic eyes [n (%)]	12 (80)	24 (82.75)	1.000*
Preoperative logMAR VA (mean±SD)	2.64±0.78	2.54±0.75	0.674†
Preoperative VA [n (%)]			
≥20/40	-	-	-
20/200-20/50	2 (13.33%)	3 (10.34)	1.000*
<20/200	13 (86.66%)	26 (89.65)	1.000*

VA Visual Acuity, SD: Standard Deviation, PPV: Pars Plana Öitrectomy, *: Fischer's exact test; †: Chi-square test.

Table 2. Changes in visual acuity of diabetic eyes that underwent 20 gauge pars plana vitrectomy or 25 gauge sutureless vitrectomy for the management of nonclearing vitreous hemorrhage compared to the preoperative levels.

VA (logMAR) [mean±SD]	**20 gauge PPV (n:15)**		**25 gauge PPV (n:29)**	
	n:15	***P****	**n:29**	***P****
Preop	2.62±0.80		2.51±0.78	
Postop 1st day	2.40±0.79	0.121	2.58±0.65	0.690
Postop 1st week	2.15±0.83	0.008	2.26±0.81	0.152
Postop 1st month	1.45±0.61	<0.001	1.53±1.02	<0.001
Postop 3rd month	1.12±0.50	<0.001	1.20±0.77	<0.001
Postop 6th month	1.16±0.49	<0.001	1.09±0.71	<0.001
Final	1.13±0.71	<0.001	0.96±0.64	<0.001

VA Visual Acuity, SD: Standard Deviation, PPV: Pars Plana Vitrectomy, Preop: Preoperative, Postop: Postoperative, *: paired t-test, postoperative VAs are compared to the preoperative VAs in each group .

Postoperatively, we performed complete ocular examinations on the first day, at the end of the first week, and after the first, third, and sixth months, and every six months thereafter. Our main outcome measures included changes in VA, IOP, and complication rates in both groups. During follow-up, argon laser photocoagulation was performed as needed and the patients were instructed to keep their routine visits with their internal specialists for metabolic control.

Statistical analysis was performed with software (SPSS 11.5 for Windows, Microsoft, USA). The difference between pre- and postoperative VA and IOP levels was compared with paired t-test. The Fisher's exact test was used to compare the preoperative characteristics, visual outcomes, and the complication rates between two groups. A p value of less than 0.05 was considered statistically significant.

RESULTS

Fifteen eyes underwent 20 g PPV (Group 1), and 29 eyes underwent 25 g sutureless PPV (Group 2). All patients had type II diabetes mellitus. Twelve (80%) patients in Group 1 and 22 (75.86%) patients in Group 2 also had systemic hypertension. Preoperative characteristics of eyes in both groups are demonstrated in Table 1. There was no statistically significant difference in these parameters between the two groups ($p>0.05$ for each evaluation (Table 1).

The surgery was successfully completed in all eyes of both groups. Intraoperatively none of the eyes demonstrated complete posterior hyaloid detachment. That is, it was at least partially attached with focal anteroposterior tractions in all eyes, and it was subsequently removed from all eyes. In 1 (6.66%), eye in Group 1, and in 4 (13.79%) eyes in Group 2 ($P=0.647$), phacoemulsification with IOL implantation was performed with PPV due to coexisting cataract. No intraoperative complications were reported in any of these eyes. No suture was placed in eyes that underwent 25 g technique. Localized bleb formation was not seen and additional gas injection was not performed in any of these eyes. In Group 1, fluid, air, or SF6 gas was left in 9 (60%), 4 (26.66%), and 2 (13.33%) eyes, respectively. In Group 2, 7 (24.13%), 11

Table 3. The follow-up time and visual outcomes in diabetic eyes that underwent 20 gauge pars plana vitrectomy or 25 gauge sutureless vitrectomy for the management of nonclearing vitreous hemorrhage.

	20 gauge PPV (n:15)	25 gauge PPV (n:29)	P*
Postoperative VA [n (%)]			
≥20/40	-	3 (6.06)	0.540
20/200-20/50	7 (43.75)	16 (48.48)	0.752
<20/200	8 (56.27)	10 (45.45)	0.334
Postoperatively VA [n (%)]			
Increased ≥2 lines	15 (100)	27 (87.87)	0.540
no change	-	2 (12.12)	0.540

VA: Visual Acuity SD: Standard Deviation, IOP: Intraocular Pressure, PPV: Pars Plana Vitrectomy, *: Fischer's exact test.

Table 4. Intraoperative and postoperative complications in diabetic eyes that underwent 20 gauge pars plana vitrectomy or 25 gauge sutureless vitrectomy for the management of nonclearing vitreous hemorrhage.

Complications n (%)	20 gauge PPV n:15	25 gauge PPV n:29	P*
Cataract progression	6 (54.54)	9 (45)	0.716
Cataract extraction	5 (45.45)	8 (40)	1.000
Recurrent VH	2 (13.33)	4 (13.79)	1.000
Early (≤1 month)	-	3 (10.34)	0.540
Late (>1 month)	2 (13.33)	1 (3.44)	0.264
Reoperation	1 (6.66)	3 (10.34)	1.000
Rise in IOP (>21 mmHg)	3 (20)	4 (13.79)	0.675
Hypotony	-	3 (10.34)	0.543

VH: Vitreous Hemorrhage, PPV: Pars Plana Vitrectomy, IOP: Intraocular Pressure, *: Fischer's exact test.

(37.93%), and 11 (37.93%) eyes were left with fluid, air, and SF6 gas, respectively. The ratio of eyes left with fluid was statistically higher when we performed 20 g PPV, and the ratio of eyes left with gas endotamponade was statistically higher in eyes that underwent 25 g PPV ($P=0.026$). Patients were followed for a mean period of 14±9.14 (range: 6-43) months. The mean follow-up time was longer in Group 1 than in Group 2 (20.46±10.77, and 10.65±6.03 months, respectively, $p<0.001$)

Changes in mean VA in both groups are given in Table 2. In Group 1 there was a significant increase in mean VA at the first postoperative week and thereafter, compared to the preoperative mean VA. In Group 2, a significant increase in mean postoperative VA was detected at the first month and at consecutive controls, compared to the preoperative mean VA. Mean VAs in both groups at all controls are demonstrated in the Figure. There was no significant difference between mean VA levels in the two groups at any of the controls ($p>0.05$). Mean changes in logMAR VA at each postoperative visit did not differ significantly between the two groups ($p>0.05$). Mean changes in logMAR VA was -1.48±0.84, and -1.55±0.82 at final control in Group 1, and in Group 2, respectively ($P=0.808$). Distribution of postoperative VA is shown in Table 3. Postoperatively, VA in Group 2 remained the same in 2 (6.89%) eyes. At the time of surgery, one of these eyes demonstrated ischemic macular edema, and the other had optic atrophy with ischemic macula.

Mean preoperative and postoperative IOPs at 1 day, 1 week, 1 month, and at the last control visit were 17.06±6.87, 16.40±7.16, 16.20±4.36, 16.33±3.08, and 15.00±1.19 in Group 1, and 16.00±3.17, 14.96±5.50, 15.37±4.18, 15.86±5.51, and 15.10±2.51 in Group 2. There was no significant difference in mean IOP levels between two groups at any of the visits ($p>0.05$). Mean pre- and postoperative IOP levels did not differ between both group of eyes during follow-up ($p>0.05$ for all measurements in each group). Postoperatively in Group 2, hypotony was detected in 2 (6.89%) eyes on day 1, and in 1 (3.44%) eye at week 1; however, there was no severe hypotony in any of the eyes in either group, and the hypotony resolved without additional procedures.

Postoperative complications in both groups are listed in Table 4. No statistically significant difference between complication rates was found between the two groups (Table 4). All eyes that developed postoperative VH were closely followed-up with clinical examinations and B-scan USG. During follow-up, late postoperative VH occurred in 2 (13.33%) eyes in Group 1 after a mean period of 4.5 months. Additional laser photocoagulation was performed in both eyes. Vitreous hemorrhage resolved spontaneously in 1 (6.66%) eye, but it persisted in the other eye, for which revitrectomy was performed. In group 2, early postoperative VH occurred in 3 (10.34%) eyes at the first week follow up. All eyes had air endotamponade. One eye had postoperative hypotony on day 1. Vitreous rehemorrhage resolved in one (3.44%) eye in which laser photocoagulation was performed. However, it persisted in 2 (6.89%) eyes, which underwent revitrectomy 6 months later, and an increase in VA was achieved. In one (3.44%) eye, late VH was observed two years postoperatively. Revitrectomy with phacoemulsification and IOL implantation was performed resulting in increase in VA. During follow-up, rise in IOP (>21 mmHg) was controlled with topical antiglaucomatous agents in 7 eyes. Progression in cataractous change was noted in 6 (54.54%) of 11, and 9 (45%) of 20 phakic eyes in Group 1 and Group 2, respectively ($P= 0.716$, Table 4). No other postoperative complication was encountered.

DISCUSSION

Nonclearing diabetic vitreous hemorrhage is still a frequent indication for PPV, and the results are mostly favorable.[1-10] Because it offers the option of minimally invasive surgery and faster patient recovery, 25 g sutureless vitrectomy has gained popularity in the treatment of selected vitreoretinal diseases. Twenty-five-gauge sutureless vitrectomy is also reported to hasten postoperative visual improvement, and to decrease surgical time, postoperative inflammation, patient discomfort, and the likelihood of corneal astigmatism.[11-16,22,23] In this study, we compared the functional outcomes and the complications of 25 g sutureless vitrectomy with 20 g PPV in the treatment of diabetic nonclearing VH. We wanted to find out if visual recovery or complication rates would differ between the two surgical techniques for this selected group of patients. We found that both vitrectomy techniques were similarly effective in the treatment of diabetic VH with no significant difference in postoperative mean VAs or mean change in logMAR VAs. However, significant increase in VA was achieved at the first postoperative week only among patients in the 20 g PPV group, compared to 25 g PPV group in which significant change in VA was observed at the first month follow up visit. In our series the ratio of eyes left with gas endotamponade was higher in eyes that underwent 25 g PPV (75% vs 40%), and we think this may have contributed to the difference noted at the first postoperative week. The more frequent use of gas endotamponade in eyes that underwent 25 g PPV was mainly due to prevent the incidence of leakage and hypotony in these eyes as reported in the literature.[24] With the dissolution of gas endotamponade, a similar increase in VA was achieved. Postoperatively, VA increased to 2 or more lines in all eyes in the 20 g vitrectomy group, and in 86% of eyes in the 25 g vitrectomy group. The percentage of eyes that achieved a VA of 20/200 or better was 44%, and 55% in the 20 g, and in the 25 g vitrectomy group, respectively, which is compatible with the literature.[2-4,6]

In our study we found that posterior hyaloid was at-

tached at least partially in all eyes. Removal of posterior hyaloid was performed with 20 g and 25 g vitrectome using active aspiration of 300 and 500 mmHg respectively. Both gauges of vitrectomes were efficient. However, as our study group consisted of diabetic eyes, posterior hyaloid detachment was more difficult to address and occasionally necessitated the use of a 20 g posterior hyaloid elevator or a 25 g pick, in two groups, respectively.

In our study, we found no difference in postoperative complication rates between the two vitrectomy techniques in this selected group of diabetic patients. Bahar et al, [6] reported that mean IOP was lower in the 25 g PPV group on the first postoperative day in their series of diabetic eyes, and commented that this initial low IOP could potentially lead to serious sequelae such as choroidal effusion, maculopathy, and endophthalmitis. We also had some concerns regarding the possibility of increased risk of hypotony and postoperative complications such as recurrent VH in diabetic eyes following 25 g sutureless vitrectomy. However, we observed no difference in mean IOP levels between the two techniques at any postoperative controls. No clinically apparent leakage from 25 g sutureless sclerotomies was observed. Postoperative hypotony was detected in 10% of eyes in the 25 g vitrectomy group and resolved spontaneously without sequela. None of the eyes had severe hypotony during follow-up. This rate of hypotony is low compared with those in the literature.[12,16,19,24] This may be due to the oblique incision technique employed in our study.[17,18] Fluid-air exchange has also been suggested to avoid postoperative leakage after 25 g vitrectomy with standard straight incisions. [24] We also preferred to leave air or gas inside the eye that underwent 25 g PPV to decrease the risk of postoperative leakage. In our 25 g vitrectomy group 76% of eyes had gas endotamponade that may have had a tamponading effect on the oblique sclerotomies from inside, and this may have enhanced self-sealing. In addition, during removal of the microcannulas we imposed moderate pressure on the sclera along the whole tract of the oblique scleral incision to encourage better apposition of the two sides of the sclerotomy. We think these factors may have played a positive role in facilitating wound closure.

The incidence of VH after vitrectomy in eyes with proliferative diabetic retinopathy ranges between zero [21] and 75%.[25] In our study we observed postoperative VH in 13%, and 14% of eyes that underwent 20 g PPV, and 25 g sutureless vitrectomy, respectively, which is compatible with the literature. The rates of reoperation for recurrent hemorrhage were also similar, being as 7%, and 10%, respectively. Early postoperative VH was noted in 3 of 4 eyes within the 25 g PPV group, whereas only the late type occurred in 2 eyes in the 20 g PPV group. Yang et al. reported in their prospective randomized series that early manifest recurrent VH was lower in eyes with 10% C^3F^8 gas endotamponade than in eyes without (0% vs 17%), and suggested that it might be a useful adjunct to vitrectomy for proliferative diabetic retinopathy.[21] In our 25 g vitrectomy group, all 3 eyes with early postoperative VH had air tamponade, and only one eye had transient low IOP (7 mmHg) for two days postoperatively. We think that air tamponade may not have been enough to prevent early VH in eyes with active proliferation. One eye in the 25 g group and 2 eyes in 20 g PPV group developed late recurrent VH despite additional postoperative laser photocoagulation for active neovascularizations on the retina. None of the eyes had rubeosis iridis. In patients with postoperative recurrent VH, mean fasting blood glucose and HgA1c levels were higher than the average of the study group as a whole. All patients had systemic hypertension and two patients who underwent revitrectomy in both groups were anemic. We think that lack of control of metabolic and systemic factors might have contributed to the incidence of especially late postoperative VH. We believe that it is important to inform patients of need to remain in close contact with their primary care physicians throughout the postoperative period, as this appears to have the potential to affect the long-term outcome of the procedure .

Although noted in the literature as possible complications, we did not observe retinal detachment,[25,26] rubeosis and neovascular glaucoma,[25,27] or, anterior hyaloid fibrovascular proliferation.[28] No choroidal detachment/folds, or endophthalmitis developed in any of the eyes. Bahar et al. reported that in their series the less invasive techniques of 25 g PPV and indirect PPV were associated with a lower rate of cataract formation and progression compared to 20 g PPV, but the difference was statistically insignificant.[6] We also observed no difference in postoperative cataract formation between 20 g PPV (55%) and 25 g sutureless vitrectomy (45%) groups, although follow-up time was longer for the 20 g PPV group. It is possible that air or SF6 endotamponades used more often in the 25 g PPV group of our study may have had an effect on cataract progression. We think a prospective larger series comparing cataract formation with equal distribution of gas endotamponades, would go far in helping to answer this question.

The retrospective nature of the study, the small number of patients, and the relatively short follow-up time are the limitations of this study. Two groups are different in the incidence of usage of air or SF6 endotamponades as they were used more often in the 25 g PPV group in order to prevent leakage from sutureless sclerotomies. This represents a limitation in comparing the results in two groups.

In conclusion, we found that both 20 g vitrectomy and 25 g sutureless vitrectomy techniques are effective and safe for the treatment of nonclearing vitrous hemorrhage in diabetic eyes. Oblique sutureless 25 g incisions did not cause a decrease in postoperative IOP, and sutureless 25 g vitrectomy did not increase the rate of postoperative complications including hypotony and rehemorrhage compared to conventional 20 g PPV. Modifi-

cation of the standard 25 g technique with oblique entries can be routinely performed to achieve better wound closure. Further prospective randomized and controlled studies with larger series and with longer follow-up are warranted to confirm the safety of 25 g technique and to compare it with conventional 20 g vitrectomy.

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