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Adjunctive Intravitreal Triamcinolone Acetonide Injection at the End of a Sutureless Phacovitrectomy for Diabetic Vitreous Hemorrhage

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Abstract

Purpose: This study aims to evaluate the visual outcome, clinical outcome and complications of intravitreal triamcinolone acetonide (IVT) injections at the end of a sutureless 23 G phacovitrectomy in diabetic patients with vitreous hemorrhage.

Methods: This is a prospective comparative case study comprising 22 eyes that underwent a 23 G sutureless phacovitrectomy for diabetic vitreous hemorrhage (VH) with or without tractional retinal detachment (TRD). An IVT (4 mg/0.1 ml) injection was performed on 11 eyes at the end of the vitrectomy, and no injection was administered in 11 eyes. The main outcome measures included best-corrected visual acuity (BCVA), intraocular pressure (IOP), and incidence of postoperative VH and reoperation in patients with at least three months of follow-up.

Results: Early postoperative VH within one month occurred in (9.1%) of the IVT group and in (27.27%) of the control group. The rate of early postoperative VH was significantly reduced in the IVT group compared to the control group (p=0.006). Late postoperative VH after one month occurred in (18.18%) of the IVT group and in (27.27%) of the control group. No difference was noticed between the two groups (p=0.341). No difference in BCVA was noticed between the two groups at three ms (p>0.05). In the IVT group, The IOP on postoperative day 1 was higher than preoperative IOP (p=0.003). No significant difference in the rate of reoperation was noted between the two groups (p=0.285).

Conclusions: Adjunctive IVT injections in diabetic phacovitrectomy reduced early postoperative VH; however, it did not affect the final visual outcome.

Keywords: Triamcinolone; Intravitreal vitrectomy; Vitreous hemorrhage

Introduction

Causes of early recurrent vitreous hemorrhage (VH) include blood clots trapped in anterior vitreous gel, fibrovascular tissue remnants. Late vitreous hemorrhage is caused by anterior hyaloidal fibrovascular proliferation or neovascularization of sclerotomies [1,2]. Corticosteroids inhibit prostaglandins and inflammatory adhesion molecules and down-regulate the production of vascular endothelial growth factor [3,4]. The efficacy of intravitreal triamcinolone (IVT) for the prevention of post-vitrectomy diabetic vitreous hemorrhage has been reported [4,5]. IVT injection may be beneficial for the prompt clearing of a post-vitrectomy vitreous hemorrhage via mechanical sedimentation of the retained blood clot and a vascular stabilizing effect [6]. This study aimed to evaluate the effect of IVT injection at the end of a phacovitrectomy for vitreous hemorrhage in diabetic patients.

Methods

This is a comparative prospective randomized controlled study of 22 eyes of 22 patients with diabetic VH with or without tractional retinal detachment (TRD) divided into two equal groups. The IVT group was injected with IVT (4 mg in 0.1 ml) at the end of the operation. The study was performed in accordance with the Declaration of Helsinki. All patients were informed of the procedure and informed consent was obtained. The inclusion criteria consisted of patients who had a vitrectomy due to a non-clearing vitreous hemorrhage for one month or more with or without TRD and were followed up for three months or more. The exclusion criteria were as follows: previous ocular surgery, intravitreal injection of bevacizumab or triamcinolone within 12 months before the surgery, neovascular glaucoma, TRD caused by other eye diseases, combined tractional-regmatogenous retinal detachment, and previous vitrectomy. Each patient underwent complete preoperative ophthalmic examinations including refraction, best-corrected visual acuity (BCVA) using the Snellen chart, slit-lamp biomicroscopy, intraocular pressure (IOP) measurement using applanation tonometry, fundus examination by indirect ophthalmoscope, and B-scan ultrasonography. Follow-up examinations were performed on the first postoperative day and at months 1 and 3. For statistical analysis, the logarithm of the minimum angle of resolution (Log MAR) was used. Counting fingers was calculated as 2.0 Log MAR and hand movement was 3.0 Log MAR. The grades of VH were four grades: none (no VH), mild (visible optic disc and retinal vessels), moderate (optic disc or retinal vessels were barely visible), and severe (the optic disc was invisible). Early postoperative VH was defined as VH occurring within one month after the surgery and late postoperative VH was defined as VH occurring after 1 month.

Surgical procedures

The surgical procedures were done by a single surgeon (AL) from March 2012 to June 2014. 3 mm clear corneal tunnel was made superiorly. Two paracentesis were made at 3 and 9 o'clock using 20G MVR blades. The anterior chamber was filled with viscodispertive solution. A central capsulorhexis (5 to 6 mm diameter) was made using capsulorhexis forceps. A hydro dissection was made using a 27 G cannula. Phacoemulsification of the nucleus was performed using the horizontal chopping technique with a pulsed power of 65 mJ, a vacuum of 300 mmHg and a flow rate of 30 cc per min. The irrigation and aspiration were performed with bimanual cannulas using a vacuum of 350 mmHg and a flow rate of 35 cc per min. A foldable hydrophobic acrylic intraocular lens was implanted in the bag using viscocohesive solution. The anterior chamber was maintained using viscocohesive solution. The conjunctiva was pushed and fixed by a pressure plate, and an inferotemporal sclerotomy was done 3.0 from the limbus before inserting the cannula. The other superotemporal and superonasal cannulas were inserted. A core vitrectomy and a peripheral vitrectomy were done to relieve anterior posterior traction. The posterior hyaloid detachment was performed. Fibrovascular membrane dissection and segmentation were performed to remove all tangential traction. Vitreous base shaving with sclera depression was performed. Endolaser photocoagulation was performed to complete pan retinal photocoagulation. Retinal breaks were treated with demarcation laser with or without SF6 gas tamponade. An intravitreal injection of 4 mg (0.1 ml) triamcinolone acetonide was performed in the IVT group. No intravitreal injection was administered in the control group. At the end of the operation, the cannulas were withdrawn from their scleral tunnels, and the conjunctiva was pushed laterally with a cotton wool applicator to seal the puncture site. Any sclerotomy leaking air, gas, or liquid was sutured with 7/0 vicryl at the end of surgery. The anterior chamber was irrigated and the viscoelastic solution was removed. The corneal incisions were hydrated. The postoperative treatment included 0.3% topical gatifloxacin eye drops five times per day for one week and 1% topical prednisolone acetate eye drops five times per day, which were usually tapered off over four weeks. Patients who had fluid gas exchange were instructed to remain face down for seven to fourteen days. During the follow-up period, antiglaucomatous eye drops such as beta blockers, carbonic anhydrase inhibitors, or prostaglandin analogues were prescribed when the IOP was greater than 21 mmHg.

Statistical analysis

Means were used for the description of quantitative data, and percentages were used for qualitative data. SPSS statistical software (version 14.0; SSPS Inc., Chicago, IL, USA) was used for statistical analyses. For all statistical tests, $p<0.05$ was considered significant (Tables 1-3).

Group	BCVA	No.	%
IVT Group	HM	4	36.36%
	Less than 3/60	4	36.36%
	3/60 or greater	3	27.27%
Control Group	HM	5	45.45%
	Less than 3/60	3	27.27%
	3/60 or greater	3	27.27%

Table 1: Preoperative visual acuity: p=0.79. This table shows the insignificant difference between the two groups as regard the preoperative BCVA and the grades of BCVA in both groups.

Group	Improved		Stable		Worsened	
IVT Group	9	81.81 %	2	18.18 %	0	0%
Control Group	8	72.72 %	2	18.18 %	1	1%

Table 2: Postoperative visual outcome: p=0.28. This table shows the insignificant difference between both groups as regard the postoperative visual outcome

		Control Group	IVT Group
Preoperative	BCVA Range	HM-0.075	HM-0.075
	BCVA Mean ± SD	1.77 ± 0.29 Log MAR	1.78 ± 0.29 Log MAR
Postoperative	BCVA Range	HM −0.25	HM - 0.25
	BCVA Mean ± SD	1.07± 0.38 Log MAR	0.9 ± 0.4 Log MAR
p value		p=0.003	p=0.001

Table 3: Pre and postoperative BCVA. This table shows the significant improvement of postoperative BCVA in both groups

Results

The mean age was 51.3 ± 6.6 years (range: 34 to 73 years) in the IVT group, and 53.8 ± 8.2 years (range: 42 to 79 years) in the control group. No statistically significant differences were noted between the two groups in age; gender; type of diabetes; TRD type; preexisting complications of diabetic retinopathy such as, diabetic macular edema observed during surgery; grade of VH; and previous argon laser photocoagulation state (Tables 4 and 5).

Group	Postoperative Bleeding (4 weeks) p=0.006

	Grade I		Grade II		Grade III		Total	
	No	%	No	%	No	%	No	%
IVT Group	1	9.9%	0	0	0	0	1	9.9%
Control Group	1	9.9%	1	9.9%	1	9.9%	3	27.27%

Table 4: Postoperative bleeding (4 weeks). This table shows the significant reduction of early postoperative bleeding in IVT group.

Group	Postoperative Bleeding p=0.341							
	Grade I		Grade II		Grade III		Total	
	No	%	No	%	No	%	No	%
IVT Group	1	9.9%		0	1	9.9%	2	18.18%
Control Group	1	9.9%	1	9.9%	1	9.9%	3	27.27%

Table 5: Postoperative bleeding. This table shows the insignificant difference in late postoperative bleeding and the grades of bleeding

Surgical methods and intraoperative complications

The surgical techniques were similar for the two groups. No complications related to phacoemulsification occurred. Retinal tears occurred in four eyes (36.36%) from the IVT group and in three eyes (27.27%) from the control group. These patients were treated with endolaser photocoagulation. Early postoperative VH within one month after surgery occurred in one eyes (9.9%) from the IVT group and in three eyes (27.27%) from the control group. The rate of early postoperative VH was significantly reduced in the IVT group compared to the control group (p=0.006). All of the eyes with early VH resolved spontaneously within three weeks. Late postoperative VH more than one month after surgery occurred in two eyes (18.18%) from the IVT group, and three eyes (27.27%) from the control group, and no difference was noted among the two groups (p=0.341). However, two of the five eyes with late VH from the control group had a repeated vitrectomy if it did not resolve within one month. No case of NVG, anterior fibrovascular proliferation or retinal detachment occurred during the follow-up period. No significant difference was noted in the rate of reoperation between the two groups (p=0.285). The mean preoperative BCVA in control group was 1.77 ± 0.29 Log MAR (between 1.08 and 3.00 Log MAR) (range between HM and 0.075). Three cases (27.27%) of visual acuity of 0.05 or better were observed. In IVT group, the mean preoperative BCVA was 1.78 ± 0.29 Log MAR (between 1.08 and 3.00 Log MAR), (range between HM and 0.075). Three cases (27.27%) of visual acuity of 0.05 or better were observed. The difference in the mean BCVA between the two groups was not statistically significant (p=0.79). The final BCVA in control group improved in eight cases (72.72%), stabilized in two cases (18.18%) and deteriorated in one eye (9.9%). The mean final BCVA was 1.07 ± 0.38 Log MAR (between 0.6 and 3.00 Log MAR) (range HM–0.25). This improvement of mean visual acuity was statistically significant (p=0.003). Three cases (27.27%) reached 0.25. In IVT group, Final BCVA improved in nine cases (81.81%), and unchanged in two cases (18.18%). The mean final BCVA was 0.9 ± 0.4 Log MAR (between 0.6 and 3.00 Log MAR) (range between HM and 0.25). This improvement of mean BCVA was highly significant (p=0.001). Four cases (36.36%) exhibited BCVA of 0.25. The difference in the mean BCVA between the 2 groups at one month was statistically significant (p=0.002). The difference in the mean best corrected visual acuity between the two groups at three months was not statistically significant (p=0.28). The IOP of the control group at one week, one month and three months postoperative did not differ from the preoperative IOP (p=1.00, 1.00 and 1.00, respectively). However, the IOP of the IVT group at one week and one month postoperative was increased compared to the preoperative IOP (p=0.003). In addition, the IOP of the IVT group at one week and one month postoperative was increased compared to the IOP of the control group (p<0.0001 and 0.002, respectively).

Discussion

Recurrent VH is the commonest complication of a diabetic vitrectomy. IVT injection has been evaluated for treatment of cystoid macular edema and choroidal neovascularization [4]. This study revealed that patients that underwent IVT injection at the end of a vitrectomy had lower rebleeding and reoperation rates than the control group. Furthermore, the IVT group exhibited better visual acuity. However, the mean IOP was higher after the procedure in the study group than the control group, and it was not recommended for glaucoma patients. In this study, early postoperative VH within one month after surgery occurred in one eye (9.9%) from the IVT group and three eyes (27.27%) from the control group. The rate of early postoperative VH was significantly reduced in the IVT group compared to the control group (p=0.006). The rate of early postoperative VH of the IVT group in this study was similar to the rate of bleeding in the IVT group (13.2%) in another study [4]. Because we performed vitreous base shaving under sclera depression to completely remove the peripheral cortical gel, early VH was unlikely due to the dissolution of blood clots trapped in the remaining anterior-peripheral vitreous gel. Instead, early VH was likely due to the remnants of fibrovascular tissue. IVT reduced rebleeding due to stabilization of the vessels and inhibition of angiogenesis by decreasing vascular endothelial growth factor (VEGF). The vascular endothelium and specifically pericytes are responsible for the maintenance of vascular tone, which is modulated endothelin-1 and nitric oxide, both of which are influenced by VEGF [7,8]. The occurrence of late postoperative VH after one month postoperatively did not differ between the two groups. This finding may be due to the relatively short half-life of triamcinolone acetonide, specifically in the vitrectomized eye. The half-

life of triamcinolone acetonide is 18.6 days in the nonvitrectomized eye, and predicted to be shorter in the vitrectomized eye [9]. NVG is a serious postoperative complication of a vitrectomy for PDR. The incidence of postoperative rubeosis of the iris and NVG after vitrectomy for PDR ranges from 10 to 23% [10]. Previous studies have reported that IVT injection significantly decreased rubeosis of the iris [10,11]. Previous studies have also reported that the BCVA at six months postoperative was enhanced in patients in the IVT group compared to the control group [4]. However, in this study, the BCVA of the IVT and control groups improved from the preoperative level. The BCVA was not differing between the two groups preoperatively and at three months postoperatively. The BCVA significant different between the two groups one month postoperatively. Elevation of the IOP is the most common complication of IVT injection, which can occur in 28 to 52% of patients [12-14]. Bevacizumab reduces retinal neovascularization and rebuosis in diabetic retinopathy. Preoperative bevacizumab reduced intraoperative bleeding. IVB decreases the VEGF, retinal and disc neovascularization. Bevacizumab blocked VEGF, nitric oxide and endothelin-1, causing short period of vasoconstriction which may be similar to vascular regression. Several studies proved that intravitreal injection of bevacizumab before vitrectomy reduces the bleeding that may occur during the operation. On the other hand, one study proved that bevacizumab injection at the end of vitrectomy didn't reduce the incidence of the rebleeding in eyes underwent vitrectomy for the management of proliferative diabetic retinopathy [15-19]. In conclusion, this study demonstrates that IVT injection at the end of a 23 G phacovitrectomy in diabetic patient reduced early postoperative VH occurrence and improved visual rehabilitation relative to the control group. Adjunctive IVT injections in diabetic phacovitrectomy reduced early postoperative VH; however it did not affect the final visual outcome.

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