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Research Article

Vitreous Base Shaving in Diabetic Vitreous Haemorrhage

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Abstract

Aim: To evaluate vitrectomy with vitreous base shaving in diabetic vitreous haemorrhage.

Methods: The study samples were classified into two groups. Group I underwent pars plana vitrectomy without vitreous base shaving. Group II underwent pars plana vitrectomy with vitreous base shaving. Patients sampling was done using consecutive sampling technique. Patients were examined preoperatively and postoperatively at one day, one week, one month, two months and three months intervals for assessment of visual acuity changes and incidence postoperative complications.

Results: Forty six eyes of forty six diabetic patients were included in the study (twenty three eyes for each group). The difference between mean pre-operative and mean-post-operative visual acuity (log MAR) was statistically significant while there was statistically insignificant difference in visual acuity of both groups along the course of three months follow-up. Post-operative complications included complicated cataract in two eyes in group II (8.7%), persistent vitreous hemorrhage in three eyes (13.04%) in group I and one eye (4.35%) in group II and recurrent vitreous hemorrhage in two eyes (8.69%) in each group. The difference between both groups regarding post-operative complications was statistically insignificant.

Conclusion: Vitreous base shaving is beneficial in reducing post-operative vitreous hemorrhage following diabetic vitrectomy. However, it may lead to some complications like complicated cataract if good indentation was not carefully performed by the assistant.

Keywords: Diabetes mellitus; Vitrectomy; Vitreous hemorrhage; Vitreous shaving

Introduction

Diabetes mellitus is the commonest cause of proliferative vascular retinopathy [1]. The underlying abnormalities in this disorder are mainly due to retinal ischemia, which may lead to the formation and contraction of proliferative fibrovascular membranes with subsequent vitreous hemorrhage and/or retinal detachment [2]. Diabetic vitreous hemorrhage is an important cause of severe visual impairment [3].

There are many accepted standardized scale for grading vitreous hemorrhage. The scale depends on the entity and purpose of each specific study. Most studies grade the vitreous hemorrhage in a qualitative (mild/moderate/severe) or quasi-quantitative (+1 to +4) approach. Vitreous hemorrhage is usually graded on the basis of the fundus, as visualized by ophthalmoscopy [4-8].

Bhavasar et al. [9] developed a grading scale by dividing the fundus into twelve divisions like a clock face and designating a score between 0-4 for each division. The twelve scores are summed to give a total hemorrhage point score: Grade 0 equal No blood present in the vitreous, the entire retina is visible. Grade 1 equal some hemorrhage present, which obscures between a total of 1 to 5 clock hours of retina. Laser panretinal photocoagulation can be successfully performed. Grade 2 equal hemorrhage obscures between a total of 5 to 10 clock hours of central and/or peripheral retina, or a large hemorrhage is located posterior to the equator, with varying clock hours of anterior retina visible. Laser is feasible, but a full panretinal photocoagulation cannot be placed. Grade 3 equal red reflexes are present, with no retinal detail seen posterior to the equator, precluding any photocoagulation. Grade equal dense vitreous hemorrhage with no red reflex present [8].

Vitreous hemorrhage also can be graded according to the visibility of the fundus as following: None: any vitreous hemorrhage, Mild: Most of the optic disc or retinal vessels are visible. Moderate: Optic disc or retinal vessels are barely visible. Severe: Optic disc and retinal vessels are not visible [9].

Occasionally, the hemorrhage does not resolve itself spontaneously. Various forms of conservative therapy have been tried but without encouraging results. Pars plana vitrectomy may be indicated in many cases of diabetic vitreous hemorrhage. The commonest indication for pars plana vitrectomy is severing persistent vitreous hemorrhage that precludes adequate panretinal photocoagulation [10].

Vitrectomy is the main treatment for all cases of non-clearing vitreous hemorrhage. A poorer prognosis are reported in type I diabetic patients with vitreous hemorrhage and they are recommended operation within one month from the beginning of symptoms while type II diabetic patients may postpone up to three months for spontaneous clearance before operation [11,12]. Successive checking with ultrasound to exclude a tractional retinal detachment involving the macula is advised during observation period. These

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rules are loosely adhered to and more and more patients are receiving intravitreal injections and undergoing early operation [13-15].

The use of twenty three gauge sutureless vitrectomy systems with high-speed vitrectors and ports close to the tip helped whole cutting up of the membranes, avoiding the need for extra instrumentation, wide angle lenses, and chandelier light systems allowing bimanual cutting have all made and hence violent approach is being accomplished and the surgical results become more better [16-18].

Pars plana vitrectomy can be done with or without vitreous base shaving. Importance of vitreous base shaving in cases of diabetic vitreous haemorrhage is that it removes a reservoir of peripheral blood that may lead to postoperative re-bleeding or secondary (ghost cell) glaucoma. It also decreases the incidence of rebleeding from peripheral neovascularization [19].

On the other hand vitreous base shaving has complications such as: Peripheral iatrogenic retinal breaks and touch of the lens during procedure which may lead to postoperative complicated cataract [20,21].

After core vitrectomy and causing posterior vitreous detachment, peripheral vitrectomy can be done. To see and operate in the region of the vitreous base during vitrectomy operation, a surgical assistant for scleral depression or chandelier systems with more incisions are needed. Light-pipe assisted scleral depression as a standard light pipe and ring depressor compression while keeping two intraocular instruments are simple, commercial, harmless, fit for phakic and pseudophakic patients and allows the surgeon to operate freely with good control [22].

The study was conducted to evaluate vitrectomy with vitreous base shaving in diabetic vitreous hemorrhage.

Methods

Patient's enrolment

This is a comparative case study on patients with simple diabetic vitreous hemorrhage who underwent pars plana vitrectomy in Mansoura Ophthalmic Center, Mansoura University between April 2014 and August 2015. The study protocol was approved by medical research ethics committee, faculty of medicine, Mansoura University and informed consent was obtained from each participant in the study after assuring confidentiality. Inclusion criteria were patients with persistent simple diabetic vitreous hemorrhage precluding doing panretinal photocoagulation. Exclusion criteria were eyes with either tractional, rhegmatogenous or combined retinal detachment with diabetic vitreous hemorrhage, previous vitreoretinal surgery in the same eye, vitreous hemorrhage due to retinal vein occlusion (central or branch), patients with hematological disorders & bleeding tendency, eyes with ocular surface disorders such as corneal opacity and anterior staphyloma, active uveitis.

Study protocol

Preoperatively, every patient had history taking included: personal history, family history, history of drug intake including diabetic medication and history of previous ophthalmic surgeries, medical assessment included: ECG, hepatic function, renal function tests and hematological tests for complete blood picture, blood sugar ,hemoglobin percent, clotting tests, clotting time and erythrocyte sedimentation rate and ophthalmic examination included: assessment of best corrected visual acuity was done using landolt chart then visual acuities were converted to logarithm of minimal angle of resolution for statistical analysis. Counting fingers, hand movements, perception of light, and no perception of light was assigned values of 1.85, 2.3, 2.6, and 2.9 respectively, slit lamp examination of anterior segment. Assessment of intraocular pressure by Goldman applanation tonometry, gonioscopy of anterior chamber angle by Goldman three-mirror lens, fundus examination: fundus bio microscopy using 90D lens, B-scan ocular ultrasonography was used to evaluate retinal state, intraocular lens power calculation was done routinely for all cases.

The study sample was classified into two groups:

- Group (I) underwent pars plana vitrectomy without shaving of vitreous base.
- Group (II) underwent pars plana vitrectomy with shaving of the vitreous base.

Patients sampling was done using consecutive sampling technique.

Surgical technique

Before initiating this study; consent form and any other written information was given to patients to be reviewed and approved. The nature of the study was explained to each patient, its purpose, the operation involved, the probable duration, the possible risks, benefits involved and any discomfort maybe caused. Local retro-bublar anaesthesia was performed to all cases unless patient is anxious, unable to lie flat for the duration of operation or lack of cooperation whilst awake. Before the procedure, the eye was prepared with a 5% solution of povidone-iodine.

For eyes with significant pre-operative cataract, phacoemulsification of cataract was performed using Oertli OS3 Phacoemulsification System with intraocular lens implantation. Vitrectomy was done using Oertli OS3 Vitrectomy System with twenty three gauge sutureless vitrectomy systems. Sclerotomies were performed using two step techniques so; trocar was placed in the inferotemporal, superotemporal, and superonasal quadrants at a distance from the limbus, depending on phakic status. Non contact wide-angle viewing BIOM system was used for fundus viewing during vitrectomy.

Core vitrectomy was performed in all eyes and posterior vitreous face was evaluated with the aid of triamcinolone injection for confirming complete posterior vitreous detachment. In eyes with incomplete posterior vitreous detachment, induction of complete posterior vitreous detachment was done using vitreous cutter or using tano scraper and then posterior cortical vitreous was meticulously removed. If fibrovascular membranes exist, they was meticulously removed using delamination (involves the horizontal cutting of the individual vascular pegs connecting the membranes to the surface of the retina) and segmentation (involves the vertical cutting of epiretinal membranes into small segments) with securing of any bleeding points.

In group I, vitrectomy was done up to the vitreous base. In group II, following core vitrectomy, shaving of the vitreous base was done. Vitreous base shaving was done using high-speed vitreous cutting (around 5000 cpm) and a low vacuum (80 mmHg to 100 mmHg) with scleral depression performed by assistant.

In all eyes, endolaser panretinal photocoagulation was done up to ora serrata and vitrectomy was done without using any ocular tampon des or intravitreal injection of Anti-vascular growth factor. After cannula withdrawal, a blunt object was used to apply pressure to the sclerotomy site.

If wound leakage is suspected, a single polyglactin suture was used to ensure watertight closure of the sclerotomy.

Post-operatively, every patient was received: topical antibiotics and corticosteroids had ophthalmic examination included: slit lamp examination of anterior segment, assessment of intraocular pressure by Goldman applanation tonometry, fundus bio microscopy using 90D lens and B-scan ocular ultrasonography at one day, one week, one month, two months and three months of follow-up period for assessment of visual acuity changes and incidence of post-operative complications such as: vitreous hemorrhage which was assessed regarding, the Onset: either persistent vitreous hemorrhage which was obvious from the postoperative first few days or occurred within the first postoperative three weeks or early recurrent vitreous hemorrhage which occurred within 1st postoperative three months after a period of clear vitreous cavity and grading: using a 0 to 4 vitreous hemorrhage grading scale in 12 radial segments of the fundus ("clock hours"), complicated cataract.

Statistical Analysis of the data

Data was analyzed using SPSS (Statistical Package for Social Sciences) version 15. Qualitative data was presented as number and percent. Comparison between groups was done by Chi-Square test. Quantitative data was tested for normality by Kolmogrov-Smirnov test. Normally distributed data was presented as Mean ± SD. Paired t-test was used for comparison within groups. Student t-test was used to compare between two groups. Non parametric data was presented as min - max and median. Mann-Whitney test was used for comparison between groups. Wilcoxon singed ranks test was used for comparison within group.

P was considered to be statistically insignificant if > 0.05 and significant if ≤ 0.05.

Results

Demographic data and clinical characteristics

The data was collected and recorded from April 2014 till August 2015.The study was performed on forty six eyes of forty six diabetic patients; twenty three of them underwent pars plana vitrectomy up to the vitreous base (group I), and twenty three eyes underwent pars plana vitrectomy with shaving of the vitreous base (group II).

Comparison between patients of the two groups regarding the age and sex revealed statistically insignificant difference (Table 1).

Table 1: Demographic data of the studied patients.

	Group I: non-shaving (N = 23)		Group II: shaving (N = 23)		Total Both groups (N = 46)	
Gender:	No.	%	No.	%	χ^2= 098.0	P = 0.345
Males	9	39.1	6	26.1	15	32.6
Females	14	60.9	17	73.9	31	67.4
Age(years):						
Range	25 - 67		30 - 71		25 - 71	
Mean ± SD	52.35 ± 10.07		51.87 ± 9.45		52.11 ± 9.66	

Comparison between eyes of the two groups preoperative regarding lens state revealed statistically insignificant difference (Table 2).

The percent of eyes with preoperative grade 4 vitreous hemorrhage were 86.96% in both groups (Table 3).

Six eyes (26.1%) in group I and eleven eyes (47.38%) in group II underwent phacoemulsification with IOL implantation with statistically insignificant difference. (x^2 value was 2.333, P value was 0.127).

Table 2: Pre-operative lens state of eyes in both groups.

Lens state	Group I (n = 23)		Group II (n = 23)		Total (n = 46)		χ^2	P
	No.	%	No.	%	No.	%		
Pseudophakia	0	0	3	13	3	6.52	3.21	0.07
Clear Lens	4	17	2	8.7	6	13	0.77	0.38
Nuc. Sclerosis	1	4.4	4	17.4	5	10.9	2.02	0.16
Cataract	18	78	14	60.9	32	69.6	1.64	0.2

Table 3: Pre-operative grading of vitreous hemorrhage in both groups.

Grades of vitreous haemorrhage	Group I (n = 23)		Group II (n = 23)	
	No.	%	No.	%
Grade 1	0	0	0	0
Grade 2	0	0	2	8.7
Grade 3	3	13.04	1	4.35
Grade 4	20	86.96	20	86.96

The difference between mean pre-operative and postoperative visual acuity (log MAR) at each follow-up visit was statistically significant in both groups (Table 4).

Table 4: Comparison between mean pre-operative and postoperative visual acuity (log MAR) at each follow-up visit in both groups.

	Group I	Group II
Preoperative versus postoperative		
1st day	P <0.001*	P <0.001*
1st week	P <0.001*	P <0.001*
1st month	P <0.001*	P <0.001*
2nd month	P <0.001*	P <0.001*
3rd month	P <0.001*	P <0.001*

The difference between visual acuity along the course of three months follow-up was statistically insignificant in both groups (Table 5).

Table 5: Mean visual acuity (log MAR) along follow up in both groups (mean ± SD).

	Group 1 (N=23)	Group 2 (N=23)	T	P
Preoperative	2.14 ± 0.29	2.13 ± 0.30	0.094	0.926
Postoperative				
1st day	1.19 ± 0.34	1.07 ± 0.18	1.565	0.127
1st week	1.10 ± 0.34	1.00 ± 0.18	1.263	0.213
1st month	1.12 ± 0.46	1.04 ± 0.39	0.577	0.567
2nd month	1.06 ± 0.53	1.01 ± 0.41	0.301	0.765
3rd month	1.02 ± 0.51	0.99 ± 0.42	0.226	0.822

Complicated cataract occurred in two eyes (8.7%) in group II during follow-up period with statistically insignificant difference between both groups. Both eyes were noticed to have records of lens touch during operations and underwent phacoemulsification with IOL implantation later on (Table 6).

Table 6: Post-operative complications in both groups.

Post-operative complications	Group I		Group II		Total		χ^2	P
	No.	%	No.	%	No.	%		
Complicated cataract	0	0	2	8.7	2	4.35	2.246	0.134
Persistent vitreous haemorrhage	3	13.04	1	4.35	4	8.7	1.095	0.295
Recurrent vitreous haemorrhage	2	8.69	2	8.69	4	8.7	0	1
Total	6	26.08	7	30.43	13	28.26		

Persistent vitreous haemorrhage developed in three eyes (13.4%) in group I. one of them (case 3) had spontaneous resolution at the end of three months follow-up. The other two cases (cases 1 and 2) were instructed to follow-up after the end of the preoperative three months (Table 6 and 7).

Persistent vitreous haemorrhage developed in one eye (4.35%) group II. The patient was instructed for follow-up and then was re-operated (Table 6 and 8).

Table 7: Grading of persistent vitreous haemorrhage along follow up period in-group I.

	1st day postop.	1 week postop.	1 month postop.	2 months postop.	3 months postop.
Case 1	Grade **3**	Grade **3**	Grade **2**	Grade **1**	Grade **1**
Case 2	Grade **0**	Grade **1**	Grade **3**	Grade **3**	Grade **3**
Case 3	Grade **1**	Grade **0**	Grade **0**	Grade **0**	Grade **0**

Table 8: Grading of persistent vitreous haemorrhage along follow up period in group II.

	1st day postop.	1 week postop.	1 month postop.	2 months postop.	3 months postop.
Case 1	Grade **3**	Grade **3**	Grade **3**	Grade **2**	Grade **2**

Recurrent vitreous haemorrhage developed in two eyes (8.69%) in each group. The patient were instructed for follow-up and all of them were re-operated (Table 6, 9 and 10).

Table 9: Grading of recurrent vitreous haemorrhage along follow up period in group I.

	1st day postop.	1 week postop.	1 month postop.	2 months postop.	3 months postop.
Case 1	Grade **0**	Grade **0**	Grade **1**	Grade **2**	Grade **2**
Case 2	Grade **0**	Grade **0**	Grade **1**	Grade **2**	Grade **2**

Table 10: Grading of recurrent vitreous haemorrhage along follow up period in group II.

	1st day postop.	1 week postop.	1 month postop.	2 months postop.	3 months postop.
Case 1	Grade **0**	Grade **0**	Grade **2**	Grade **2**	Grade **1**
Case 2	Grade **0**	Grade **0**	Grade **0**	Grade **2**	Grade **2**

No difference in the incidence of recurrent vitreous haemorrhage between both groups (8.7%) in both groups, while persistent vitreous haemorrhage has higher incidence in group I (13.04%) than group II (4.35%). However, statistical analysis showed that, difference between both groups regarding persistent or recurrent vitreous haemorrhage was statistically insignificant (Table 11).

Table 11: Postoperative persistent and recurrent vitreous haemorrhage in both groups.

Post-operative vitreous haemorrhage	Group I (n = 23)		Group II (n = 23)		Total (n = 46)		χ^2	P
	No.	%	No.	%	No.	%		
Persistent	3	13.04	1	4.35	4	8.7	1.095	0.295
Recurrent	2	8.7	2	8.7	4	8.7	0	1
Total	5	21.74	3	13.1	8	17.39		

Difference between both groups regarding grading of vitreous haemorrhage along the course of follow-ups was statistically insignificant (Table 12).

Table 12: Grading of pre and post-operative vitreous haemorrhage along the course of follow-up in both groups.

	Group 1 (N=23)	Group 2 (N=23)	Z	P
Preoperative	4 (3 – 4)	4 (2 – 4)	0.113	0.91
1st follow-up	0 (0 – 3)	0 (0 – 3)	1.012	0.312
1w follow-up	0 (0 – 3)	0 (0 –3)	0.591	0.555
1m follow-up	0 (0 – 3)	0 (0 – 3)	0.788	0.43
2m follow-up	0 (0 – 3)	0 (0 – 2)	0.457	0.647
3m follow-up	0 (0 – 3)	0 (0 – 2)	0.405	0.686

There was statistically significant difference between grading of vitreous haemorrhage of pre-operative and each follow-up visit during the three months (Table 13).

Discussion

To reduce the risk of post-vitrectomy vitreous hemorrhage for diabetic vitreous haemorrhage, various treatments have been tested with preventative measures. Bevacizumab one week before vitrectomy reduces the occurrence of haemorrhage intra-operatively and improves vitreous clearance time post operatively [23]. Injection of triamcinolone at the end of vitrectomy for diabetic vitreous hemorrhage [24] or 10% C_3F_8 at the end of surgery may have a role in reducing the incidence of postoperative vitreous haemorrhage in the first four post operative weeks [25].

Table 13: Grading of vitreous haemorrhage of pre-operative and each follow-up visit.

	Group I	Group II
Preoperative versus postoperative		
1st day	P <0.001*	P <0.001*
1st week	P <0.001*	P <0.001*
1st month	P <0.001*	P <0.001*
2nd month	P <0.001*	P <0.001*
3rd month	P <0.001*	P <0.001*

The difference between preoperative and postoperative visual acuity was statistically significant in both groups (P <0.001).

Iqbal et al. [26]. Who discussed the visual results after pars plana vitrectomy in diabetic vitreous hemorrhage found that, the difference in pre and post-operative visual acuity was statistically significant.

Comparing the improvement between both groups, there is statistically non-significant values (P>0.05) along the course of follow-up periods.

In agreement with this study, Cheema et al. [27] who made a study to evaluate the effect of residual vitreous cortex removal in prevention of postoperative vitreous hemorrhage in diabetic vitrectomy between 2 groups found that, there was statistically insignificant difference in the mean postoperative visual acuity between both groups [27]. Complicated cataract occurred in two eyes (8.7%) in group II within three months follow-up.

Khan et al [28]. Found that complicated cataract developed in 1.7% in eyes. This difference is most probably due to performing vitreous base shaving in group II in this study, which was found to be a high risk factor for lens touch and so, higher incidence of complicated cataract [28].

Post-operative vitreous haemorrhage occurred in eight eyes (17.39%); five eyes (21.74%) in group I; three eyes in group II (13.04%). Persistent vitreous hemorrhage occurred in three eyes (13.04%) & one eye (4.35%) in group I & II, respectively. Recurrent vitreous hemorrhage occurred in two eyes (8.69%) in each group. The incidence of recurrence had statistically insignificant difference (P >0.05) between both groups.

In agreement with this study, Iqbal et al. [26] who performed complete vitrectomy found that, recurrent vitreous hemorrhage occurred in (8%) of all cases.

The present study agree with Cheema et al. [27] as incidence of recurrence in their study was (7.14%) in group II. However, we don't agree with them in incidence of recurrent vitreous hemorrhage in group I which was significantly higher (32.25%). This higher incidence may be due to longer time of follow-up in their study (8.91 months in average) while follow-up in this study was only (3 months in average).

The present study also agree with Khan et al. [28] who made a study to assess complications of twenty five gauge micro incision vitrectomy surgery in diabetic vitreous haemorrhage (without shaving of vitreous base) and found that recurrent vitreous haemorrhage occurred in (8.3%) of eyes.

Park et al. [29] who made a study to compare clinical outcomes between twenty three gauge and twenty gauge vitrectomy in patients with proliferative diabetic retinopathy and reported to do complete excision of antero-peripheral vitreous found that: Early postoperative vitreous haemorrhage within one month after the surgery occurred in (11.4%) of eyes from the twenty three gauge group and in (12.1%) from the twenty gauge group and late postoperative vitreous haemorrhage more than one month after surgery occurred in two eyes (5.7%) from the twenty three gauge group and in nine eyes (13.6%) from the twenty gauge group.

Vitreous base shaving is beneficial in reducing post-operative vitreous haemorrhage following diabetic vitrectomy. However, it may lead to some complications like lens touch if good indentation was not carefully performed by the assistant.

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