Evaluation of Surgical and Non-surgical Approaches in Patients with Vitreous Hemorrhage

Mehmet DEMİR[1], Çetin AKPOLAT[2], Murat KARAPAPAK[3], Yekta SENDUL[2], Dilek GÜVEN[4]

ABSTRACT

Purpose: To assess and compare the results of surgical and non-surgical approaches in patients with vitreous hemorrhage during the follow-up period.

Materials and Methods: The patients with vitreous hemorrhage were divided into 2 groups: those who did not undergo vitreoretinal surgery (Group 1) and those who underwent surgery (Group 2). A detailed ophthalmic examination was performed, including an assessment of the best corrected visual acuity (BCVA) and intraocular pressure, as well as anterior segment and fundus biomicroscopic examination. The patients demographic information, the causes of vitreous hemorrhage, the length of the follow-up period (months) and visual acuity at the first and last visits were examined for statistical analyses.

Results: The mean age was 58 ± 12 and 59 ± 12 years while number of eyes included was 140 and 52 and mean follow-up period was 3.5 ± 6.1 and 11.4 ± 13.3 months in Groups 1 and 2, respectively. In Group 1, BCVA was 0.690 ± 0.55 logMAR at baseline and 0.55 ± 0.49 logMAR ($p = 0.024$) at the final visit. In Group 2, BCVA was 1.17 ± 0.88 logMAR at baseline and 0.62 ± 0.51 logMAR in the postoperative period ($p = 0.001$). The most commonly observed causes of vitreous hemorrhage were diabetic retinopathy, retinal tears, retinal vein occlusion and posterior vitreous detachment.

Conclusion: A significant increase in BCVA was observed during the follow-up period of groups treated for vitreous hemorrhage in surgical and non-surgical manner. The increase was greater in patients underwent surgical intervention.

Keywords: Vitreous Hemorrhage, Diabetic Retinopathy, Retinal Vein Occlusion.

INTRODUCTION

Vitreous is a colorless gel that accounts for about 80% of the total volume of the eyeball.[1] Bleeding within the colorless gel is defined as vitreous hemorrhage (VH). VH is one of the most common causes of visual impairment. However, some VH patients may have no visual complaints, and the condition is incidentally detected by the physician during an examination. A precise and rapid diagnosis is critical so that the appropriate treatment may be implemented with options ranging from observation to surgical intervention. Several other conditions should be considered in differential diagnosis of VH.[2] This study reviewed VH cases with visual losses that were caused solely by VH or in association with other clinical pathologies. In each case, the clinical course of the hemorrhage was observed.

VH is a relatively common health problem. It is primarily associated with retinal diseases and usually causes severe vision loss. In a study by Lindgren et al. that reviewed a population of 542,000 over a period of more than 2.5 years, annual 7 VH cases per 100,000 people were identified annually (in comparison, retinal detachment (RD) was observed in 12 cases per 100,000 people per year).[3, 4] Most VH cases in children occur as a result of blunt or penetrating trauma, including accidental injuries.[5, 6] In addition, the VH symptoms and results in young patients also differ from adult patients.[7]

MATERIALS and METHODS

We retrospectively reviewed 185 eyes of 185 patients with VH (86 females, 99 males) between 2010 and 2016. All the

1- Associate Prof., MD., Sisli Hamidiye Etfal Training and Research Hospital, Ophthalmology Department, Istanbul, Turkey

2- Ophthalmologist, Sisli Hamidiye Etfal Training and Research Hospital, Ophthalmology Department, Istanbul, Turkey

3- Assistant MD.,Sisli Hamidiye Etfal Training and Research Hospital, Ophthalmology Department, Istanbul, Turkey

4- Prof. MD., Sisli Hamidiye Etfal Training and Research Hospital, Ophthalmology Department, Istanbul, Turkey

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Correspondence Adress:
Cetin AKPOLAT
Sisli Hamidiye Etfal Training and Research Hospital, Ophthalmology Department, Istanbul, Turkey
Phone: +90 505 487 8436
E-mail: akpolatcetin@yahoo.com

procedures were performed in accordance with the ethical standards of the institutional research committee and the Declaration of Helsinki.

The patients were examined in terms of their demographic, systemic and ophthalmologic aspects, including any blood diseases or trauma that might have caused an intraocular hemorrhage. The VH patients who did not undergo vitreoretinal surgery and whose progress was monitored through follow-up were included in Group 1, and the patients who underwent surgery were included in Group 2. All the patients received detailed ophthalmic examinations during each visit. The time interval for follow-up examinations varied according to the ocular findings. The visual acuity (VA) analyses (according to the Snellen chart), biomicroscopic examinations, intraocular pressure (IOP) measurements and fundus examinations were performed in both groups during the follow-up period. VA was defined using the best corrected visual acuity (BCVA) test. The BCVA scores were determined based on the Snellen chart and converted to units based on the logarithm of the minimum angle of resolution (logMAR). Pregnant patients, children, traumatic cases, patients with cancer and patients with previous ocular surgery were excluded from the study. The BCVA and IOP measurements were performed at baseline and final visit were used for the statistical analyses. Sonographic eye examination and orbital tomography were performed on any patient with an inadequate fundus view or with a suspicion of an intraocular foreign body (IOFB), respectively. In the cases of clear media opacity, laser photocoagulation was performed on the patients with VH resulting from retinal tears or proliferative diabetic retinopathy. The patients with VH not resulting from retinal tears or detachment, the patients who did not have spontaneous recovery of the hemorrhage within five to six months and the patients who had IOFB were treated with pars plana vitrectomy (PPV).

We evaluated the causes of the VH, the length of the follow-up periods (months), the BCVA and IOP values, any complications, and the number and types of surgeries.

The SPSS version 15.0 for Windows program was used for the statistical analyses. Number and percentage were used for the categorical variables. Mean, standard deviation, and minimum and maximum values were used for the numerical variables. In the dependent groups, the ratios were analyzed using the McNemar-Bowker test. The relationships between the numerical variables were examined using the Spearman correlation analysis when the parametric test condition was not provided. The numerical variables of the independent groups (more than 2 groups) were compared using the Kruskal Wallis test if the normal distribution conditions were not provided. The rates of the independent groups were compared using the chi-square analysis. The Monte Carlo simulation was applied when the conditions could not be provided. The statistical significance was accepted as $p < 0.05$.

RESULTS

The mean age was 58 ± 12 and 59 ± 12 years while number of eyes included was 140 and 52 and mean follow-up period was 3.5 ± 6.1 and 11.4 ± 13.3 months in Groups 1 and 2, respectively. In Group 1 (140 of 185 eyes, 72.9%), the BCVA scores were 0.690 ± 0.55 logMAR at the baseline and 0.55 ± 0.49 logMAR ($p = 0.024$) at the final visit. In Group 2, the BCVA scores were 1.17 ± 0.88 logMAR prior to surgery and 0.62 ± 0.51 logMAR in the postoperative period ($p = 0.001$). There was a statistical change in the BCVA scores in both groups.

The VH causes, surgical procedures, surgery numbers and tamponade types are described in Table 1.

The four most common causes of VH were diabetic retinopathy (DR) (59–53%), retinal tear (10–17.8%), retinal vein occlusion (RVO) (10.7–6.7%) and posterior vitreous detachment (PVD) (9.3–13.3%). In Group 2, 44% of the VH patients underwent combined cataract and PPV surgeries, and the most commonly used retinal tamponade (in 13/45 cases) was silicone.

In the patients who underwent surgery (Group 2), the most common accompanying pathology was DR; followed by PVD, RD and retinal tear. In these cases, the mean preoperative follow-up time was 12.7 ± 26.3 months, and the mean postoperative follow-up time was 48.2 ± 57.9 months.

Of the VH patients who needed surgery, 51.9% were phakic at the time of admission. The average number of the surgeries was 1.7 ± 1.0 per patient.

DISCUSSION

The incidence of spontaneous VH is about 7 cases per 100,000 individuals. VH is a common diagnosis in ophthalmology clinics and has various causes depending on the age of the population and the region.[8] The most common causes of spontaneous VH are proliferative DR (32%), retinal tear (30%), proliferative retinopathy after RVO (11%) and PVD without retinal tear (8%).[9] VH may occur secondary to a choroidal neovascular membrane (CNV), a polypoidal choroidal vasculopathy (PCV), a retinal macro aneurysm, a subarachnoid hemorrhage (Terson's syndrome) or various vasculopathies that lead to neovascularization. In pars planitis, the hemorrhage may

Table 1. Parameters compared between the two groups

Parameters	Group 1	Group 2
VH Causes		
DM	83	24
RD	14	8
RVO	15	3
PVD	13	6
Trauma	9	2
Surgery	0	1
Drug (Coumadin)	2	0
Unknown	6	1
CNV	1	2
Surgery	***N/A***	
PPV+		45
+PHACO		20
+SBS		2
Operation Numbers		
1		27
2		12
3		3
4		2
5		0
6		1
Tamponade	***N/A***	
Silicone		13
SF6		6
C3F8		3
Air		0
Fluid		23
Laser		11

DM: Diabetes mellitus, RD: Retinal detachment, RVO: Retinal vein occlusion, PVD: Posterior vitreous detachment, CNV: Choroid neovascular membrane, PPV: Pars plana vitrectomy, PHACO: Phacoemulsification, SBS: Scleral buckling surgery, SF6: Sulfur hexafluoride, C3F8: Perfluoropropane

result from the vascularized snowball. In other rare cases, the hemorrhage might result from dyscrasias, valsalva retinopathy or intraocular tumors.[10, 11] In our study, the four most common causes of VH were DR (59–53%), retinal tear (10–17.8%), RVO (10.7–6.7%) and PVD (9.3–13.3%). The most common cause in young people was trauma.

During the course of VH, the blood in the vitreous gel initially creates a localized clot; subsequently, fibrinolysis dissolves the hemorrhage into the gel. During hemolysis, biconcave erythrocytes lose most of their hemoglobin and become spheroid erythroclasts. The biodegradation of the hemoglobin releases pigments that convey a dark yellow or orange color to the gel. The blood that spreads through the vitreous cavity quickly clots and is often slowly cleared at a rate of about 1% per day.[12] This degradation occurs faster in vitrectomized eyes and in eyes with syneretic vitreous.[13] If the hemorrhage cannot be cleared, complications may arise, such as hemosiderosis bulbi, fibrovascular proliferation and glaucoma (hemolytic, ghost cell and hemosiderotic glaucoma).[10]

The management strategies for VH depend on the etiology, the clarity of the vitreous, the condition of fellow eye, the duration of the hemorrhage and the presence of neovascularization. The condition of the fellow eye is often an important guide. The available treatment options for VH include observation, laser photocoagulation, intravitreal anti-vascular endothelial growth factor (VEGF) injection, PPV and enzymatic vitreolysis.[14, 15] Every VH is not a surgical emergency. In patients without RD, retinal tears, intraocular tumors, or iris or angle neovascularization, observation may be initially attempted. Observation can be continued for as long as two to three months.[13] If there is a severe vitreous detachment, the subhyaloid hemorrhage will be cleared earlier than the intravitreal hemorrhage.[16] If the VH is associated with RD, CNV, PCV or any condition that is likely to progress rapidly (if untreated), an urgent vitrectomy should be performed. Vitrectomy is indicated for all cases of non-regressive VH. Unexplained VH is highly risky. Sarrafizadeh et al.[17] retrospectively evaluated the results of the conservative treatment of patients with unexplained severe VH and reported that surgery was needed in 78% of these cases. Some studies have reported that the early use of vitrectomy reduced the RD ratio and led to a more rapid VA improvement.[18-20]

Our study compared patients who underwent PPV surgery with those who did not undergo surgery. The etiologic causes and the VA gain during the follow-up period were compared between the two groups. The majority of VH patients (70%) did not require surgery. After DR and RVT, the most common cause of VH was PVD. The mean follow-up time was significantly longer in Group 2, likely due to the surgical intervention in patients. Both groups had a similar mean VA at the end of the follow-up period. The visual gain was higher in the eyes who underwent surgery because, in these cases, the preoperative visual acuity values were lower. One study reported a mean age at VH onset of 54.7 ± 12 years for patients with DR.[21, 22] Another study reported a mean age at VH onset of 30 years in 20 patients with Eales' disease.[23]

Previous studies on VH in children have reported that unilateral hemorrhage occurs in 90.5% of all cases.[24, 25]

Another study that evaluated 32 patients with VH and a closed-globe injury[26] found that 99% of the patients had a unilateral VH. The literature has reported more VH involvement in the right eye than the left eye, but no explanation for this occurrence has been provided.[27]

VH is a frequently encountered complaint in vitreoretinal clinics. When analyzing a VH case, the cause of the hemorrhage should be well-defined. The early detection and timely treatment of the conditions that are prone to VH can reduce the hemorrhage incidence. In patients with VH, rapid evaluation and proper treatment are critical for obtaining the best VA results.

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