ORIGINAL ARTICLE

Phacoemulsification in Post Vitrectomy Eyes; Result and Complications

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ABSTRACT

Introduction : To evaluate visual outcome and complication rate of phacoemulsification in post vitrectomy eyes.
Methods : retrospective descriptive study
Result : Data from seventy-five eyes was analyzed. Mean BCVA improves from 1.8 LogMAR (0.2-2.5) to 1.3 LogMAR (0-2.5) postoperatively, with biggest improvement of 0.57 LogMAR shows in patients with preoperative BCVA of <1.8 LogMAR. Only 1.3% patient has intraoperative complication, and 52% patient has postoperative complication, of which 27.9% is PCO. Patients with silicon oil who underwent combination surgery of phacoemulsification and silicon oil extraction has higher redetachment rate (33%) compare to patient who only underwent phacoemulsification (20%).
Conclusion : Phacoemulsification improves BCVA in most patients, and intraoperative complications rate was low. There was evidence of correlation between higher redetachment rate and combination of phacoemulsification with silicon oil extraction.

Keywords : Phacoemulsification, vitrectomy, biometry

Cataract is a common complication in post vitrectomy eyes. [1,2] After 2 years, 76% patients who have undergone vitrectomy will develop cataract. [3] Pathogenesis of cataract formation in post vitrectomy eyes has not been established, although certain risk factors are thought to be significant such as patient's age, preoperative cataract formation, diabetes, silicon oil or gas use for endotamponade, and intraoperative mechanical trauma. [1,2,4,5]

Many factors shall be considered in planning for cataract extraction on post vitrectomy eyes, regarding risk of complications and visual prognosis. [1] Cataract extraction in post vitrectomy eye is a high-risk procedure with high difficulty level. [1] Anatomical changes in post vitrectomy eyes such as instability of posterior capsule, loss of vitreous cushion, weakening of zonules can lead to insufficient pupil dilation and increase mobility of lens-iris diaphragm. [2,6] Phacoemulsification is the method of choice on these patients, due to its ability to control fluid dynamics and intraoperative IOP better. [1,2,7] Visual outcome in post vitrectomy eye rely heavily on macular condition post vitrectomy, thus proper

patient education shall be done on case-by-case basis. [1]

There are currently no data on visual outcome and complication rate of phacoemulsification in post vitrectomy eyes in RSCM Kirana. The aim of this study is to evaluate visual outcome and complication rate of phacoemulsification in post vitrectomy eyes in RSCM Kirana.

METHODS

This is retrospective descriptive study, done by reviewing chart and operative report of patient with history of vitrectomy who underwent phacoemulsification in Ophthalmology Department Cipto Mangunkusumo Hospital between Januari 2014 to December 2014. Inclusion criteria are all data of patient with history of vitrectomy who underwent phacoemulsification in Cipto Mangunkusumo Hospital during study period, patient is excluded if chart can not be found, there are no data of vitrectomy operative report, and no data of visual acuity prior to phacoemulsification and minimum of 3 weeks post phacoemulsification, and if phacoemulsification was done in conjunction to other procedure with exception of silicon oil removal.

Patient data was first found by reviewing cataract extraction report in cataract and refractive surgery division and vitreoretinal division in Ophthalmology Department, Cipto Mangunkusumo Hospital, chart of patient with history of vitrectomy and phacoemulsification are then reviewed. Detailed chart review provide information regarding preoperative, intraoperative, and postoperative data for each patients. Preoperative data included age, sex, uncorrected visual acuity (UCVA) and best corrected visual acuity (BCVA), visual acuity immediately after vitrectomy, reason of vitrectomy, endotamponade type, time span between vitrectomy and phacoemulsification. Intraoperative data include date of phacoemulsification, operator, and intraoperative complication. Postoperative data include uncorrected visual acuity (UCVA) and best corrected visual acuity (BCVA) 3 weeks postoperative, postoperative complication, and time span between NdYag laser capsulotomy on patient who develop posterior capsule opacification (PCO). Patient information was recorded and tabulated on computerized database using SPSS version 11.0.

Table 1. Baseline characteristic of patients

	Number (%) of patients
Age	
Median	51
Range	15 - 73
Time span between vitrectomy and phacoemulsification	
Median	11
Range	2 - 95
Indication for vitrectomy	
RRD	48 (64)
TRD	10 (13.3)
VH	7 (9.3)
RRD + Macular hole	4 (5.3)
Macular hole	2 (2.7)
Trauma	2 (2.7)
ERM	2 (2.7)
Endotamponade of vitreous cavity	
Silicon oil	56 (74.7)
Saline	8 (10.7)
SF6 gas	7 (9.3)
C3F8 gas	4 (5.3)

RRD = rhegmatogenus retinal detachment;
TRD = tractional retinal detachment;
VH = vitreous haemorrhage;
ERM = epiretinal membrane

RESULT

Total of 121 eyes meet inclusion criteria, of which data from 75 eyes from 74 patients was analyzed. Chart were not found in 30 eyes, 6 has no vitrectomy operative report due to it being done in other hospitals, 9 has incomplete data, and 1 eyes were excluded because phacoemulsification was combined with trabeculectomy.

The median age was 51 years with a range from 15 to 73 years with slight men predominance (64%).

Table 2. Median time span between vitrectomy and phacoemulsification by type of endotamponade

Endotamponade	Median (range) in months
Silicon oil	11.5 (2 - 26)
Saline	10.5 (3 - 26)
Gas SF6	8 (3 - 17)
Gas C3F8	40.5 (7 - 95)

The median time span between vitrectomy and phacoemulsification is 11 months with a range from 2 to 95 months. Rhegmatogenus retinal detachment (RRD) is the most common indication for vitrectomy (64%), and silicon oil is the most common type of endotamponade (74.4%).Most patients has preoperative BCVA of <1/60 (52%), and only 9.3% have preoperative BCVA of ≥ 6/18. Postoperatively, most patient still retains BCVA of <1/60 although the percentage has declined (32%), while the percentage of patients with BCVA of ≥ 6/18 increases to 25.3%. Measured by LogMar value, there are 0.1 difference between preoperative and postoperative UCVA median and 0.5 difference between preoperative and postoperative BCVA median. There are four data set that were not counted in LogMar measurement due to having light perception (LP) as preoperative BCVA, one of the data has LP both pre and postoperative, and three data has visual acuity of hand movement (HM) postoperative.

Table 3. Postvitrectomy, Prephacoemulsification and post phacoemulsification UCVA and BCVA

	Postvitrectomy Number (%) N = 67	Prephacoemulsification Number (%) n = 75	Postphacoemulsification Number (%) n = 75
UCVA			
≥ 6/18	1 (2)	3 (4)	9 (12)
<6/18 – ≥6/60	13 (19)	7 (9.3)	13 (17.3)
<6/60 – ≥3/60	9 (13)	8 (10.3)	12 (16)
<3/60 - ≥1/60	26 (39)	18 (24)	15 (20)
〈1/60	18 (27)	39 (52)	26 (34.7)
BCVA			
≥ 6/18	3 (5)	7 (9.3)	19 (25.3)
<6/18 – ≥6/60	19 (28)	12 (16)	16 (21.3)
<6/60 – ≥3/60	6 (9)	7 (9.3)	7 (9.3)
<3/60 - ≥1/60	21 (31)	10 (13.3)	9 (12)
〈1/60	18 (27)	39 (52)	24 (32)

Most patient shows improvement of postoperative BCVA (66.7%). There are 21.3% patient who has persistent postoperative BCVA and 12% shows decrease of postoperative BCVA. Patient with preoperative BCVA <1/60 shows the biggest improvement, with mean of 0.57 LogMar, while patient with preoperative BCVA of <6/18 - ≥ 6/60 shows least improvement by only 0.04 LogMar. This is though to be the effect of 2 extreme values on which both patient experience redetachment during 3 weeks postoperative. If both extreme values were extracted, the group will have 0.3 LogMar increase of postoperative BCVA. The mean increase for the whole group of patient is 0.4 LogMar.

Postvitrectomy BCVA is only available for analysis in 66 patients. Compared with postvitrectomy BCVA, 35 (53%) patient has better visual acuity

following phacoemulsification. Ten patients (15.2%) has equal BCVA and 21 patients (31.8%) has decreased BCVA postphacoemulsification. Among those who has worse VA following phacoemulsification, 62% has postoperative complication. Change in BCVA range between 0.1 – 1.8 in group with better VA postphacoemulsification and -0.1 - -1.9 in group with worsen VA. If cause of vitrectomy is taken into consideration, it shows that the lowest percentage of improved VA and higher percentage of worsened VA both occurs in patients with RRD, 47.7% and 36.4% respectively.

The median time span between vitrectomy and phacoemulsification is 11 months, with range of 2 to 95 months. The shortest median of time span between vitrectomy and phacoemulsification is in group of patient using SF6 gas as endotamponade by 8 months, while the longest are the group of patients using C3F8 gas as endotamponade by 40.5 months. This finding is due to two extreme values being in C3F8 gas group, each was 65 and 95 months. If both values were excluded, the median for C3F8 group was 13 months.

This study found very low intraoperative complication; only 1 patient (1.3%) has complication of posterior capsule rupture (PCR) and zonulisis. Postoperative complication was found to happen in 48% patients, with PCO being the most common complication (27.9%). There are 4 patients with multiple postoperative complications, 2 patients has increase IOP and PCO, 1 patient have intraocular lens (IOL) drop and redetachment, and 1 patient have PCO and redetachment. Among 22 patients who has PCO, 13 has undergone NdYag capsulotomy. Median of time span between phacoemulsification and NdYag capsulotomy is 3 months, with range from 1 month to 12 months. There are 14 cases with postoperative redetachment, all happen in patients with RRD as indication of vitrectomy and silicon oil endotamponade. Of which, higher percentage of redetachment happens in patients who underwent combined procedure of phacoemulsification and silicon oil removal than patient who underwent phacoemulsification alone, each 33% and 20% respectively.

DISCUSSION

Cataract is one of the most common postoperative complication of vitrectomy.[1] This statement is reflected in median age of patients found in this study. The median age of patients in this study is 51 years, relatively younger than what was found in study by Triwijayanti, et al,[8] which were done in the same center on patients who underwent phacoemulsification due to senile immature cataract. Study by Triwijayanti, et al,[8] found most patients fell on 56-65 years age category.[8] This finding shows that cataract formation is affected more by timing of vitrectomy, and thus can happen earlier than cataract formation due to degenerative changes. A distinctive factor that was analyzed in this study was type of endotamponade, with SF6 endotamponade group having shortest time span between vitrectomy and phacoemulsification. However, there is no literature comparing rate of cataract development in between types of endotamponades, although study by Federman, et al, [9] on patient with silicon oil endotamponade note increase rate of cataract formation in patients with diabetes, 6 months versus 3 months respectively. [9]

Visual prognostic in such cases determined by previous indication of vitrectomy and preoperative macular condition, thus can vary between patients and raise the need of proper patient education prior to operation.[1]

Table 4. BCVA changes between postvitrectomy and post phacoemulsification based on cause of vitrectomy

	Number of patients	Visual Acuity		
		Improved	Unchanged	Worsened
RRD	44	21(47.7%)	7 (15.9%)	16(36.4%)
TRD	9	5 (55.6%)	1 (11.1%)	3 (33.3%)
VH	4	3 (75%)	0 (0%)	1 (25%)
RRD + Macular Hole	4	3 (75%)	0 (0%)	1 (25%)
Macular hole	1	1 (100%)	0 (0%)	0 (0%)
Trauma	2	1 (100%)	1 (100%)	0 (0%)
ERM	2	1 (100%)	1 (100%)	0 (0%)

Other similar studies on visual outcome of phacoemulsification in post vitrectomy eyes shows better result, most probably resulting from difference in indication of vitrectomy and better preoperative visual acuity. Study by Chang, et al[3] has postoperative BCVA of >6/12 in 77.4% patients, a number higher than our study. [3] In this study, the most common indication for vitrectomy is macular hole (62%), and preoperative BCVA was mostly found in group with visual acuity of 6/15 – 6/21 (54.8%).[3] Another similar result was reported by Lacalle, et al,[2] who report 56.5% patient has postoperative BCVA of >6/12.[2] In this study the most common indication for vitrectomy is proliferative diabetic retinopathy (PDR) (43.5%) and preoperative BCVA was mostly found to be 3/60 – 6/60 (39%).[2]

Table 5. Mean BCVA changes

Preoperative BCVA	Mean BCVA changes in LogMar
≥ 6/18	0.07
<6/18 – ≥6/60	0.04
<6/60 – ≥3/60	0.48
<3/60 - ≥1/60	0.46
〈1/60	0.57

The difference found in these studies is thought to be the result of different patient epidemiology, educational level, socioeconomic level, and availability of vitrectomy. Worse visual outcome that were found in this study were not due to worse quality of care, but due to worse visual potential of patients in this study. Ahfat, et al,[6] stated that increase in visual acuity in post vitrectomy patient who underwent phacoemulsification is less common in patient with history of macula off RRD and PDR.[6] This finding is similar to this study, in which lowest percentage of patient with VA improvements following phacoemulsification are in patients with RRD and TRD (47.7% and 55.6% respectively).

Phacoemulsification in post vitrectomy cases has high difficulty level and thus considered high risk. [1] However, we found very low rate of intraoperative complication of only 1.3%, compare to Cole, et al,[10] who reported 12.5% intraoperative complications, and Lacalle, et al,[2] who reported 8.7%. Similarly low rate of intraoperative complication were found in studies done by Ahfat, et al,[6] who report 2.2% intraoperative complication rate and Mirsa, et al,[11] who reported 1.7% intraoperative complication rate.

This result shows that intraoperative complication were relatively low, this is thought to be caused by better mechanical property of current phacoemulsification machine and high level of skill and experience of operator.

Some technique can be applied in phacoemulsification in post vitrectomy patients to overcome lens iris diaphragm retropulsion syndrome (LIDRS), a phenomenon that commonly happen in post

Table 6. Intraoperative and postoperative complication

	Number (%) of patients
Intraoperative complication	
No complication	74 (98.7)
Zonulisis	1 (1.3)
PCR	1 (1.3)
Postoperative complication	
No complication	39 (52)
PCO	22 (27.9)
Redetachment	14 (18.6)
Increase IOP	3 (3.9)
IOL drop	1 (1.3)

vitrectomy eyes.[2] These techniques include lowering bottle height, better wound architecture, using less power, adequate hydrodissection, and careful nucleus manipulation.[2,6,11] Cheung, et al,[12] also reported that inserting second instrument to space between iris and anterior capsule will stabilize anterior chamber in the event of LIDRS.[12]

This study found 48% postoperative complication rate, with most being PCO (27.9%). Percentage of patients who develop PCO in this study is higher than those in study by Chang, et al, [3] who report 19.4%, and Ahfat, et al, [6] who reportd only 2.2% case of PCO. [3,6] Cole, at al, [10] reported similar result, which is 25% patients who develop postoperative PCO. [10] Compare to study on PCO development post phacoemulsification on senile immature cataract conducted in our center by Ayuningtyas, et al, [13] rate of PCO in post vitrectomy patient is higher, 9.9% versus 19.4% respectively. [13] Patients in our study also need NdYag capsulotomy in much faster time, 3 versus 21 months in study conducted by Ayuningtyas, et al. [13] this is thought to be caused by the use of silicon oil and gas for endotamponade in our patients.[10] Although there are also possibilities of posterior capsule fibrosis forming before phacoemulsification, this possibility were not further analyzed due to incomplete record of intraoperative findings. In the event of intraoperative findings of posterior capsule fibrosis, NdYag capsulotomy can be scheduled faster to increase visual optimization for patients.

Rate of redetachment postoperative in this study was quite high (18.6%), this number is higher than study by Cole, et al, [10] who reported 5.2% redetachment rate and Ahfat, et al, [6] who reported only 2.2% redetachment rate. [6,10] In our study we also found that redetachment rate were significantly higher in patients who underwent combined procedure with silicon oil removal. This finding is in line with study by Ahfat, et al, [6] in which the only case with redetachment happens in patient who also underwent combined surgery with silicon oil removal. This suggests that combining phacoemulsification and silicon oil removal in post vitrectomy patient with history of RRD and silicon oil endotamponade will increase chance of redetachment. However, further studies are needed before any conclusion can be made.

We recognize some limitations in this study. First, small number of sample and high number of chart that was not available to be reviewed. Second, we were not able to conduct analysis of intraoperative difficulties due to limitation on operative report.

CONCLUSION

Phacoemulsification improves BCVA in most patients, although visual outcome is highly determined by preexisting macular condition. Intraoperative complications rate was low, although high rate of postoperative PCO and redetachment were reported. There was evidence of correlation between higher redetachment rate and combination of phacoemulsification with silicon oil extraction, however further studies are needed to draw conclusion.

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