

# POST PARS PLANA VITRECTOMY CATARACT SURGERY: SURGICAL OUTCOME

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## ABSTRACT

**Objective:** To determine surgical outcome after cataract surgery in post pars plana vitrectomised eyes.

**Methodology:** This was an interventional study conducted at Department of Ophthalmology, Khyber Girls Medical College, Hayatabad Medical Complex, Peshawar, from 1<sup>st</sup> February 2016 to 30<sup>th</sup> November 2016. A total of 73 eyes of 73 patients who underwent cataract surgery in previously vitrectomised eyes were assessed for surgical outcome. Cataract surgeries were performed by manual small incision cataract surgery (MSICS) or phacoemulsification with intraocular lens (IOL) implantation. Visual acuity was recorded at baseline and at 40<sup>th</sup> post-operative day. Intraoperative and postoperative complications were documented. For statistical data analysis, snellen's visual acuity was converted to Log MAR. Visual outcome was graded as improvement, stable or deterioration. The data were analyzed using SPSS version 20.

**Results:** The mean age of our patients was 45 ±7 years. Males were 64.4% while 35.6% were females. In our study, 82.19% cases had improvement in visual acuity, 10.96% patients had stable visual acuity and 6.84% had deterioration from baseline visual acuity. The difference between baseline and follow up visual acuity was statistically significant (p =0.045). Most common intraoperative complication was posterior capsular plaque (28.7%) and most common postoperative complication was retinal detachment (13.7%).

**Conclusion:** Cataract surgery improved visual outcome in significant number of eyes that had undergone pars plana vitrectomy despite intraoperative and postoperative challenges.

**Key Words:** Cataract, Pars plana vitrectomy, Phacoemulsification

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## INTRODUCTION

Machemer in 1970 started pars plana vitrectomy (PPV) for limited indications<sup>1</sup>. However, now vitrectomy is one of the most routinely performed procedure worldwide and its indications have increased manifold<sup>1</sup>. In UK, around 20000 pars plana vitrectomies are performed each year<sup>2</sup>. PPV is now a days performed for several conditions like diabetic retinopathy, retinal detachments, vitreous hemorrhage, macular hole, trauma, infectious and inflammatory conditions of retina<sup>3</sup>. PPV is performed usually with an internal tamponade like silicone oil, gas and heavy silicone oil.

Cataract is the leading cause of blindness worldwide<sup>4</sup>. Several factors are involved in the etiopathogenesis of cataract including age, diabetes, trauma, drugs, ionizing radiations, intraocular surgery and chronic inflammation. Cataract formation is one of the most com-

mon complication of PPV<sup>5</sup>. Removal of the vitreous gel leads to progressive increase in density of cataract at 6 months and 12 months<sup>6</sup>. Cataract formation occurs in up to 80% of eyes after PPV within 2 years<sup>7</sup>. The risk factors for development and progression of cataract in post PPV patients include older age, degree of pre-operative nuclear sclerosis, intraoperative lens touch, internal tamponade like silicone oil injection and gas. Vitreous gel by itself is important in protecting the lens from increased exposure to oxygen that leads to the formation of nuclear sclerotic cataract<sup>6</sup>. Removal of vitreous exposes the lens to high oxygen concentration<sup>6</sup>. Special challenges are encountered during cataract surgery in the vitrectomised eyes, which result in a number of intraoperative and postoperative complications<sup>5,8</sup>. Such challenges are related to a number of factors including structural change induced by surgery, absence of vitreous support and underlying retinal morbidities.

Surgeon must be aware of the following factors before taking on surgery in such compromised eyes: conjunctival scarring, low endothelial cell counts, poor pupillary dilatation, increased lens-iris diaphragm retropulsion, zonular weakness and pre-existing posterior capsular damage as well as diabetic retinopathy, low scleral rigidity, cystoid macular edema and other co-morbidities. These factors will not only make cataract surgery challenging in these patients but also affect final visual outcome. Despite the increased risk and complications linked with such surgeries, about 95% of patients had improvement in BCVA or had stable BCVA and 5% showed deterioration in BCVA in a study<sup>7</sup>. Successful surgery in these cases ensures useful vision and facilitates posterior segment visualization.

As a tertiary care unit and center of excellence in vitreoretinal services, our unit receives huge burden of patients with retinal diseases. PPV is performed routinely and patients are regularly followed up for any complications. To our knowledge no or very limited data is available on this research topic in our region. Therefore this study was designed to assess surgical and visual outcome after cataract surgery in post-PPV patients. Availing such data will help us to plan better strategies to deal with such type of cataract surgeries and identify the possible implications and factors that could affect the visual outcome.

## METHODOLOGY

After approval of study from institution ethical committee, patients were admitted through outpatient department (OPD) after an informed consent. Patients included in the study were >15 years of age, any gender, having PPV done and now presenting with cataracts. Patients excluded from the study were those having retina detached, had active inflammation and those who lost to follow up. Sample size was 73, keeping 95% improvement in BCVA in post-PPV patients<sup>7</sup>, at 95% confidence interval and 5% margin of error using WHO sample size calculations.

All the data were entered on the specified proforma. Privacy and confidentiality of patients were maintained. After taking careful history from patients; visual acuity was assessed on snellen's chart and best corrected visual acuity (BCVA) was noted. Then examination of anterior & posterior segment was carried out and nature as well as type of cataract was determined. Posterior segment examination was performed on slit lamp with 78D condensing lens and with indirect ophthalmoscope. B-scan was performed in patients in whom fundus could not be examined to ascertain status of retina. Biometry of both the eyes was done and with appropriate correction for siliconized eye. Cataract surgery was done by consultant vitreoretinal surgeons and vitreoretina residents. Cataract removal was done either by small incision sur-

gery or phacoemulsification. Removal of silicone oil at the time of surgery was done only in cases where oil had emulsified. Cataract extraction was done with IOL. Postoperative assessment was carried out in terms of BCVA. Improvement was defined as gain in BCVA of one line or more on Snellen's chart at final follow up (40 days post-operatively) from base line BCVA. Deterioration was defined as decrease in BCVA of one line or more on Snellen's chart at final follow up (40 days post-operatively) from base line BCVA. No change in post operative BCVA from baseline BCVA was labelled as stable. Final visual acuity assessment was done at 40 days post operatively.

Any complications (intraoperative, immediate post-operative, early or late post-operative) were noted and managed accordingly. Bias was controlled by restriction and the exclusion criteria was followed to control the confounders in the study.

## RESULTS

The study comprised a total of 73 eyes of patients who underwent cataract surgery in previously vitrectomised eyes. The mean age of the patients of the whole study population was  $45 \pm 7$  years. Gender distribution among 73 patients was analyzed as 47 (64.4%) males and 26 (35.6%) females.

Preoperative and postoperative visual acuity among 73 patients was analyzed and is shown in Table 1. Mean pre-operative BCVA was  $1.016 \pm 0.17$  while post-operative BCVA was  $0.742 \pm 0.25$ . The difference between baseline and follow up visual acuity was statistically significant ( $p = 0.045$ ). On 40<sup>th</sup> post-operative day, visual outcome showed improvement in 82.19% patients, no change in 10.96% and deterioration in 6.84% cases. A total of 45 (61.6%) cases underwent surgery by MSICS while 28 (38.3%) had phacoemulsification. Silicon oil removal was done in 20 eyes (27.4%).

Most common intraoperative complication was posterior capsular plaque (28.7%). Other intra-operative complications encountered during surgery are listed in Table 2.

Most common postoperative complication was retinal detachment (13.7%). Frequency of other post-operative complications are listed in Table 3.

## DISCUSSION

Cataract is the most important cause of visual morbidity<sup>4</sup>. It can be caused by many factors amongst which intraocular surgery and pars plana vitrectomy accounts for a significant proportion of cases. Cataract formation or its acceleration after PPV is reported to be 80%, usually within 2 years<sup>7</sup>. Since cataract is the most common complication following vitrectomy<sup>5</sup>, there is an increas-

**Table 1: Preoperative and post-operative visual acuity**

Snellen's (Log MAR )	Pre-Op BCVA, n(%)	Post-Op BCVA, n(%)
6/12 (0.30)	0	4 (5.48)
6/18 (0.48)	0	8 (10.96)
6/24 (0.60)	8 (10.96)	19 (26)
6/36 (0.78)	4 (5.48)	27 (37)
6/60 (1)	16 (21.92)	6 (8.22)
5/60 (1.08)	30 (41.09)	2 (2.74)
4/60 (1.18)	13 (17.81)	2 (2.74)
3/60 (1.30)	2 (2.74)	3 (4.11)
2/60 (1.48)	0	2 (2.74)
Total	73 (100)	73 (100)

Note: BCVA = Best corrected visual acuity; Log MAR = Logarithm of the minimum angle of resolution

**Table 2: Intra-operative complications**

Intra-Operative Complications	Frequency	Percentage
Post. Capsular Plaque	21	28.7
Zonulysis	3	4.1
Non-dilating Pupil	12	16.4
Post. Capsular Tear	6	8.2
Fluctuating Anterior Chamber Depth	12	16.4

**Table 3: Post-operative complications**

Post-Operative Complications	Frequency	Percentage
Corneal edema	4	5.5
Hyphema	8	11
Hypotony	6	8.2
Retinal Re-detachment	10	13.7
Cystoid Macular Edema	7	9.6

ing subset of patients with vitrectomy induced cataracts who presents to vitreoretina unit. The use of tamponading agents and intraoperative lens touch contributes mainly to development of such cataracts<sup>9</sup>. Lens touch usually occurs as result of peripheral vitreous shaving in phakic patients. Visual outcome is also affected by biometry problems in these patients. We tried to overcome these problems by proper assessment preoperatively of each case. Biometry was done for both eyes and correction factors were applied for silicon oil if required. Patients were put preoperatively on topical steroids and NSAID's.

Cataract surgery can be carried out by different procedures like phacoemulsification and manual small incision cataract surgery (MSICS) with comparable results. We performed both phacoemulsification and manual small incision cataract surgery depending on surgeons' preference. Axer-Siegel et al found both phacoemulsification and extracapsular cataract extraction through sclerocorneal tunnel to be safe and effective procedures<sup>10</sup>. In a study by Cole et al the patients age at cataract surgery ranged from 25 to 84 years (mean 62.9 ±11.4 years)<sup>11</sup>. Our study had patients with mean age of 45 ±7 years. Most of the patients in our study were males (64.4%). This was probably because most of the traumatic retinal detachments occur in male and also due to ease of access to health facility for males in our society.

Mean preoperative visual acuity in our study was 1.016 ±0.17 log MAR. This is in contrast to most of the studies carried out abroad where patients had better vision preoperatively because vitreoretinal pathologies present earlier as well as cataract surgeries are done earlier there<sup>11</sup>. Mean preoperative visual acuity in a study reported by Sachdev et al<sup>7</sup> was 0.74 log MAR which improved to 0.36 log MAR postoperatively as compared to 0.742 log MAR in our study. Mean postoperative visual acuity was 0.2 log MAR in one study<sup>12</sup>. This difference in mean postoperative visual acuity may be due to the nature of cases that we receive e.g. long standing retinal detachments and macula off detachments.

In our study, visual acuity improvement was seen in 82.19% patients. This improvement was statistically significant in our study (p 0.045). This is comparable to the results of Pinter et al<sup>13</sup> in which 87% cases showed improvement and Kim et al<sup>14</sup> who reported 80% improvement. However, our results are inferior to the reported improvements by Biro et al<sup>15</sup> (95%), Cole et al<sup>11</sup> (90%) and Sachdev et al<sup>7</sup> (95%). In our study only 5.48% had final vision of 6/12 which is quite less than those reported by Sachdev et al<sup>7</sup> (62%), Chang et al<sup>16</sup> (77%) and Cole et al<sup>11</sup> (73%). Reasons for this difference is late presentation of cases in our setup. Moreover, surgical techniques employed at the time of pars plana vitrectomy, quality of vitrectomy cutters, instrumenta-

tion and viewing system limitations also contribute to compromised visual outcome. Macula status was the main limiting factor of final visual outcome in our study as patients who had prior macula off detachments, ERM or scar had less improvement than other cases. Most of the postoperative vision in our study was in the range of 6/24 (26.02%) & 6/36 (36.98%) while 16.44% had vision of 6/18 or better. Vision deterioration was seen in 6.84% cases. Kim et al<sup>14</sup> reported worsening of vision in 10% cases. Deterioration was not reported in any case in one series<sup>17</sup>. This was because they reported only one case of retinal re-detachment in their 39 cases.

Cataract surgery is important in these patients not only for improving vision but also helps in future monitoring of posterior segment disease. Management of these cataracts is slightly different from normal age related cataracts because of a number of limiting factors in terms of fibrosed conjunctiva, compromised corneal endothelium, poor pupillary dilatation, unusually deep anterior chamber, zonular weakness, pre-existing posterior capsular rent and retinal co-morbidities<sup>18</sup>. Cataract surgery in the vitrectomised eye presents special challenges, which potentially have higher rates of intraoperative complications<sup>9</sup>. Final visual outcome is limited by the nature of posterior segment disorder. Cataract extraction in previously siliconized eyes offer a challenging situation for the ophthalmologist. Different types of intra-operative and post-operative complications are expected in such patients. A study by Hocauglu et al<sup>19</sup> showed intraoperative complications as: posterior capsular plaque in 9.7% cases, posterior capsule rupture in 5.5% cases, loss of nuclear material into vitreous in 3.3% cases and zonular dialysis in 2.3%<sup>19</sup>. In another study by Titiyal et al<sup>20</sup> posterior capsular plaque (PCP) was observed in 41.67% of silicone oil patients and pupillary abnormalities in 31.25% of siliconized eyes. In our study, posterior capsular plaque was found in 21 cases (28.71%), non-dilating pupils in 12 cases (16.44%), fluctuating anterior chamber depth in 12 cases (16.44%) and zonulysis in 3 cases (4.11%). Posterior capsular tear was higher in phacoemulsification patients compared to MSICS patients.

Silicone oil removal is usually performed at the time of cataract removal if no more tamponade is required or oil has caused complications. We removed silicon oil in those cases (27.4%) where it had emulsified. Removal of oil also brings about refractive improvement<sup>21</sup>. Removal of silicone oil is also linked with a number of complications resulting in visual loss in up to 32% of patients<sup>22</sup>. Most common causes are re-detachment (6–25%), cystoid macular edema (12%), epiretinal membranes (12%) and hypotony (16%)<sup>21</sup>. In our study, retinal re-detachment after silicone oil removal was observed in 13.7% cases. Retinal re-detachment was the most common complication observed in the phacoemulsifi-

cation as well as MSICS groups. Retinal re-detachment usually occurs as a result of reopening of old breaks, formation of new breaks during oil removal, inadequate laser, multiple previous retinal surgeries, incomplete vitreous base shaving and proliferative vitreoretinopathy<sup>23,24</sup>. Retinal re-detachment occurred in 6% cases in a study by Abu El-Asrar<sup>25</sup>. Prophylactic 360° laser seems to be responsible for this low rate of re-detachment in their cases. Hyphema was observed in 8 cases (11%) and all of them had scleral tunnel surgery. This type of hyphema usually requires no surgical intervention<sup>26</sup>. we also observed these cases of hyphema and it responded well to topical medications. Cystoid macular edema was observed in 7 cases (9.6%). Hypotony occurred in 6 cases on first post-operative day and were observed and responded well in 2 weeks.

## CONCLUSION

Our study concludes that cataract surgery improved visual outcome in eyes that have undergone pars plana vitrectomy previously. Siliconized eyes can offer challenging situations to the operating ophthalmologist in the operation theatre. Removal of silicon oil at the same time carries a higher risk of post-op complications especially retina re-detachment.

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#### CONTRIBUTORS

TS and SJ proposed the idea, made plan for the study and critically analyzed the manuscript. TS, MZK and AA carried out the study, did literature search, data collection and statistical analysis performed the statistical analysis. All authors contributed significantly to the submitted manuscript.