# The Effect Of Capsular Rupture And Vitreous Loss During Cataract Surgery on Post Operative Visual Acuity

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**Abstract**

**Background:** The goal of this study was to determine the best corrected visual acuity after cataract surgery complicated with capsular rupture and vitreous loss.

**Aim of work:** to determine the effect of capsular rupture and vitreous loss during cataract surgery on post operative visual acuity.

**Methods:** This study included 40 patients had cataract surgeries their ages range from 50 to 65 years divided into 2 groups. The first group included 20 patient whose cataract surgery had no complications  14 cases (70%) were females and 7 cases (30%) were males,8 cases(40%) had ECCE and 12 cases(60%) had Phaco, The mean age was $58.10 \pm 4.29$ years. The second group included 20 patient whose cataract surgery complicated with capsular rupture and vitreous loss, 12 cases (60%) were females and 8 cases (40%) were males, 8cases (40%) had ECCE and 12 cases (60%) had phaco,The mean age was $58.20 \pm 3.69$ years. By measuring BCVA 8 weeks after surgery the BCVA at phaco group the uncomplicated cases had mean  $0.40 \pm 0.12$ ,the complicated cases had mean  $0.22 \pm 0.14$.The p value is 0.003  . AT the EXTRA cases ,the uncomplicated cases with mean   $0.48 \pm 0.29$  and the complicated cases had mean   $0.21 \pm 0.06$ . The p value is 0.033.

**Results:** It was found that BCVA at patients with PCR and vitreous loss is less than other patients whose cataract surgery had no complication .

**KeyWords:** Capsular rupture, vitrous loss, Visual acuity.

## Introduction:

Vitreous loss is one of the most common complications of cataract surgery which can lead to severe visual disability and sometimes blinding complications such as retinal detachment (1). Early detection of vitreous loss can prevent more severe consequences such as nucleus drop into the vitreous cavity. Posterior capsular tears may occur at any stage of the operation including hydrodissection, phacoemulsification, irrigation and aspiration of cortical material, and intraocular lens (IOL) implantation (2). Incarcerated vitreous strands within the surgical wound may predispose to epithelial and fibrous ingrowth, as well as introduction of microorganisms into the eye. Furthermore, retinal traction by vitreous strands increases the risk of cystoid macular edema and retinal detachment. Contact between vitreous strands and the corneal endothelium may lead to corneal decompensation (3). Several ocular and systemic risk factors for vitreous loss have been

recognized. Local factors consist of deep-set eyes, narrow palpebral fissures, high myopia, glaucoma, previous pars plana vitrectomy, and history of vitreous loss in the fellow eye. Systemic conditions include severe obesity, Marfan syndrome, diabetes mellitus, and systemic hypertension. Surgical experience is another important factor influencing the incidence of vitreous loss (4). Pupil distortion, iris damage, synechia, and subjective complaints related to the eye were significantly more common in patients with a capsule complication (5). Preoperative conditions associated with a capsule complication were previous trauma, white and brunescent/hard cataract, and phacodonesis. The intraoperative factors of loose zonules, the use of trypan blue, and miosis. By preoperatively identifying cataract cases with the identified risk factors and allocating them to surgeons with the longest experience, the number of capsule complications could be kept low. Operating early in the course of the disease to prevent the cataract from becoming a surgical risk and improving training of junior surgeons should further reduce the frequency of capsule complications (6). Risk factors for a poor visual outcome included older age, presence of coexisting ocular pathology, ECCE, implantation of an anterior chamber intraocular lens, and vitreous loss requiring anterior vitrectomy (7). The causes of rupture of the posterior capsule usually involve touch of surgical instruments and can be caused at any stage of the procedure. Capsular block from excessive hydrodissection can cause a capsular rupture even prior to phacoemulsification. Other more common causes of capsular rupture are touch from the phacoemulsification probe or second instruments during the phacoemulsification of the lens or from irrigation/aspiration instruments during cortical cleanup. Touch from instruments may also cause an anterior rhexis tear, which can then extend posteriorly to create a posterior capsular tear. More rare causes of posterior capsular rupture include trauma during intraocular lens insertion and puncture from loose cannulas during hydration of wounds or intracameral injections at the conclusion of surgery. There is hardly a stage of surgery at which a posterior capsular rupture cannot occur.

The decision about the position of IOL placement depends on the size of the posterior capsular defect. If it is a small focal defect, the lens can still be placed carefully in the bag, made safer if a posterior capsulorrhexis is performed. If there is any doubt and definitely in all cases of a large defect, the IOL needs to be placed in the sulcus. While no

optimal IOL exists for sulcus placement in such a situation, the currently available three-piece foldable lenses suffice. Prolapsing the optic of the IOL through the anterior rhexis (optic capture) can help centration and reduce problems such as iris chafing and pigment (8).

## Patients and Methods

This comparative study performed in Al-Fayoum Ophthalmic hospital involving 40 cases subdivided into 2 groups: 20 cases treated surgically with no capsular complications (12 cases phaco ,8 ECCE) and 20 cases(12cases phaco,8 ECCE) in which capsular tear and vitreous loss took place .It was conducted through 2 months( between April 2018 through June 2018, Verbal consent were obtained.

Written consent was obtained from every patient before being involved at the study after giving them sufficient information about the research and ensuring that there is no explicit or implicit coercion Approval was obtained from the IRB (International review Bord) in Beni-Suef University before starting data collection

## Inclusion criteria :

Age of patient:
 between 50 to 65 years old
Type of cataract:
 nuclear 3 or more with or without post subcapsular or dense posterior subcapsular with or without nuclear cataract or white cataract .

## Exclusion criteria:

Any other causes of low postoperative vision e.g:
-corneal opacity
-Post operative high astigmatism more than 3 D
-glaucoma
-Aphakia
-Astigmatism caused by corneal sutures
-Macular dystrophy, Macular hole, CNV ,DME.
-Dropped nucleus.

## Pre operative assessment:

All participants were subjected (before and after the surgery) for ophthalmological examination:
Vision assessment with Log MAR
Refraction
Anterior segment examination on slit lamp
Routine fundus examination by 90D lens
Best corrected visual acuity

## The Operative ( PHACO and EXTRA) steps :

Peribulbar or
retrobulbar anaesthesia.
Wire speculum application.
2 side ports by IVR at phaco cases and corneal incision at extra cases.
Staining of the ant capsule by trypan blue.
Main wound by keratome 2,4 at phaco cases
Capsular rhexis by cystotome or rhexis forceps

Hydrodissection and rotation to the nucleus.

At phaco, Phacoemulsification to the nucleus using stop and chop technique.

At extra, delivery to the nucleus.

Bimanual I\A to the residual cortex.

Implantation of IOL ( foldable single or 3 pieces IOL at phaco cases and hard IOL at extra)

Closure to the wound by corneal stitches (6\0) at extra cases.

I\A and hydration to the wound.

**Management of capsular rupture and vitreous loss :**

At cases complicated with PCR and vitreous loss anterior vitrectomy was done by vitrector or scissor.

**Post operative treatment:**

Topical and systemic antibiotics, topical steroid.

**Follow up visits:**

The uncorrected and best corrected visual acuity were measured weekly during each visit for the first 3weeks and then 8 weeks after the surgery.

**Statistical methods:**

Approval was obtained from the IRB (International review Bord) in Beni-Suef University before starting data collection

Data were coded and entered using the statistical package SPSS version 25. Data was summarized using mean and standard deviation for quantitative variables and frequencies (number of cases) and relative frequencies (percentages) for categorical variables. Comparisons between groups were done using unpaired t test. Repeated measures ANOVA was used to compare between different readings of UCVA and BCVA within each group. For comparing categorical data, Chi square ($\chi2$) test was performed. Exact test was used instead when the expected frequency is less than 5.

P-values < 0.05 were considered as statistically significant. P-values >0.05 were considered as statistically insignificant.

**Results:**

The total number of subjects meeting our critira was 40 who underwent best corrected visual acuity assessment after cataract surgery ( Phaco ,ECCE) in El Fayoum Ophthalmic Hospital.

The studied patients were of two groups, the first group underwent cataract surgery without complications (control) and the second group whose cataract surgery complicated with capsular rupture and vitreous loss (study).The 2 groups are divided into 2 subgroups patient who had phaco surgery and patient who had extra. All patients were aged 50-65 years old.

**The first group**

Consisted of 20 patient who had cataract surgery without capsular complications (12 patient underwent phaco surgery, 8 patients underwent ECCE).

**The second group**

Consist of 20 patient who had cataract surgery complicated with

capsular rupture and vitreous loss (12 patient underwent phaco , 8 patients underwent ECCE). The patients were chosen randomly from EL Fayoum ophthalmic Hospital.

## Table (1): count and percentage of each group

| | | Count | % |
|---|---|---|---|
| groups | uncomplicated cataract surgery | 20 | 50.00% |
| | cataract surgery complicated with capsular rupture and vitreous loss | 20 | 50.00% |

## Table (2): distribution according age group

| | uncomplicated cataract surgery | | cataract surgery complicated with capsular rupture and vitreous loss | | P value |
|---|---|---|---|---|---|
| age | Mean | Standard Deviation | Mean | Standard Deviation | |
| | 58.10 | 4.29 | 58.20 | 3.69 | 0.937 |

P value >0.005 (no significant difference)

## Table (3): Distribution according to gender groups

| | | uncomplicated cataract surgery | | cataract surgery complicated with capsular rupture and vitreous loss | | P value |
|---|---|---|---|---|---|---|
| | | Count | % | Count | % | |
| gender | female | 14 | 70.0% | 12 | 60.0% | 0.507 |
| | male | 6 | 30.0% | 8 | 40.0% | |

P value>0.005 (No significant difference)

## Table (4):Type of surgery

| | | Count | % |
|---|---|---|---|
| Type of surgery | ECCE | 16 | 40.00% |
| | PHACO | 24 | 60.00% |

## Table 5: UCVA in PHACO

| | Uncomplicated | | Complicated | | P-value |
|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | |
| **Uncorrected VA** | | | | | |
| Before surgery | 0.05 | 0.02 | 0.09 | 0.06 | **0.032*** |
| At 1st week | 0.25 | 0.13 | 0.07 | 0.04 | **<0.0001*** |
| At 2nd week | 0.29 | 0.13 | 0.10 | 0.05 | **<0.0001*** |
| At 3rd week | 0.29 | 0.13 | 0.11 | 0.05 | **<0.0001*** |
| After 8 weeks | 0.31 | 0.12 | 0.14 | 0.06 | **<0.0001*** |
| **P-value** | **<0.0001*** | | **0.001*** | | |

\*Significant

## Fig(1):UCVA at phaco group
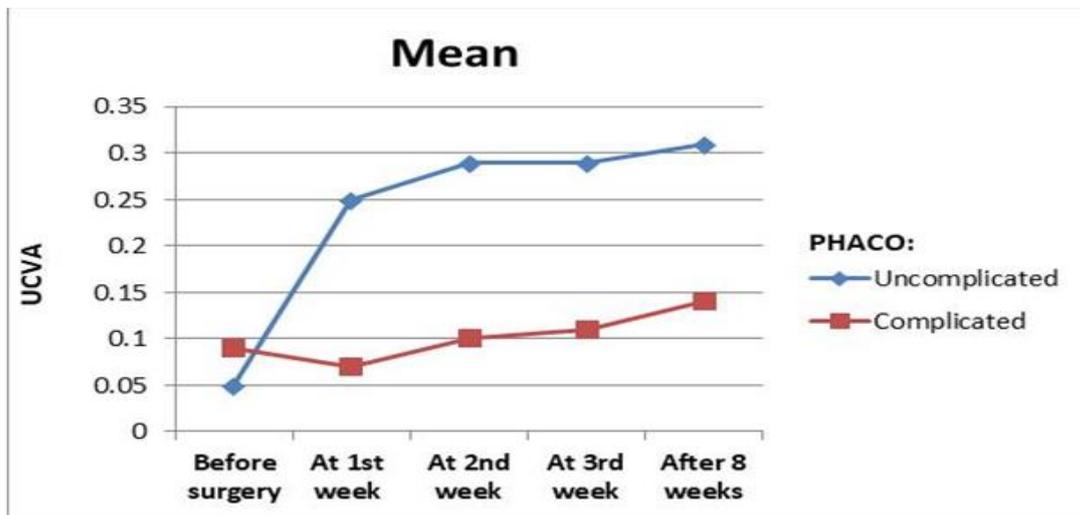


## Table 6: BCVA in PHACO

| | Uncomplicated | | Complicated | | P-value |
|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | |
| **Best corrected VA** | | | | | |
| Before surgery | 0.1 | 0.05 | 0.15 | 0.12 | 0.176 |
| At 1st week | 0.33 | 0.1 | 0.12 | 0.11 | **<0.0001*** |
| At 2nd week | 0.38 | 0.14 | 0.19 | 0.16 | **0.005*** |
| At 3rd week | 0.40 | 0.12 | 0.20 | 0.15 | **0.002*** |
| After 8 weeks | 0.40 | 0.12 | 0.22 | 0.14 | **0.003*** |
| **P-value** | **<0.0001*** | | 0.062 | | |

\*Significant

**Fig 2:BCVA in phaco**
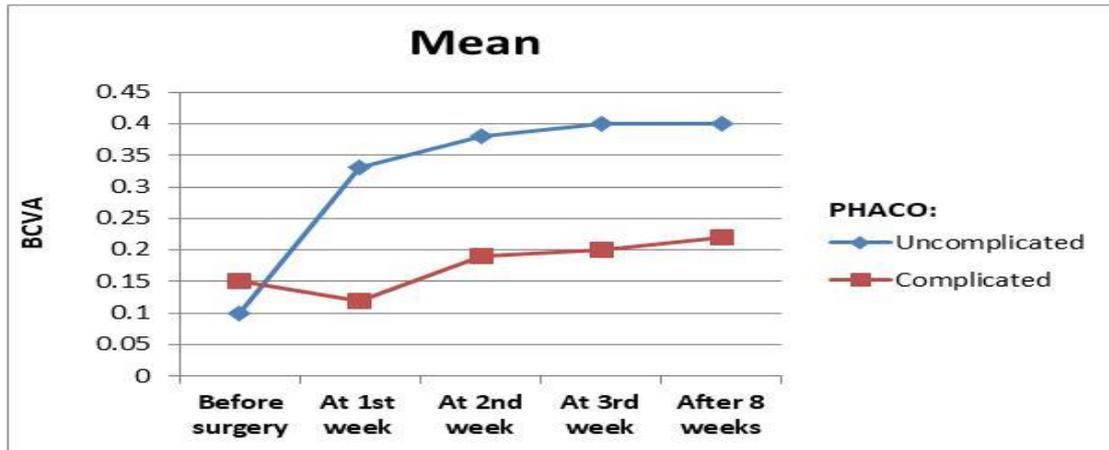


**Table 7: UCVA in EXTRA**

| | Uncomplicated | | Complicated | | P-value |
|---|---|---|---|---|---|
| | **Mean** | **SD** | **Mean** | **SD** | |
| **Uncorrected VA** | | | | | |
| Before surgery | 0.04 | 0.01 | 0.03 | 0.01 | 0.149 |
| At 1st week | 0.09 | 0.07 | 0.07 | 0.05 | 0.601 |
| At 2nd week | 0.12 | 0.11 | 0.09 | 0.05 | 0.425 |
| At 3rd week | 0.15 | 0.11 | 0.09 | 0.05 | 0.200 |
| After 8 weeks | 0.40 | 0.31 | 0.11 | 0.03 | **0.036*** |
| **P-value** | **<0.0001*** | | **<0.002*** | | |

*Significant

**Fig3:UCVA at EXTRA GROUP**
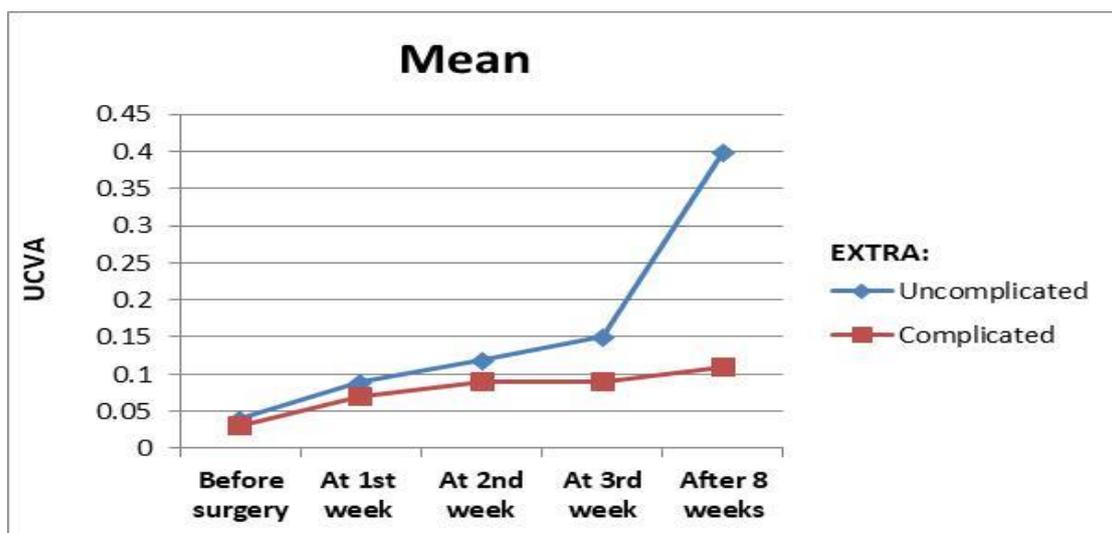
## Table 8: BCVA in EXTRA

| | Uncomplicated | | Complicated | | P-value |
|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | |
| **Best corrected VA** | | | | | |
| Before surgery | 0.039 | 0.01 | 0.035 | 0.01 | 0.224 |
| At 1st week | 0.11 | 0.12 | 0.07 | 0.05 | 0.372 |
| At 2nd week | 0.24 | 0.13 | 0.10 | 0.07 | **0.018*** |
| At 3rd week | 0.27 | 0.15 | 0.10 | 0.07 | **0.016*** |
| After 8 weeks | 0.48 | 0.29 | 0.21 | 0.06 | **0.033*** |
| **P-value** | <0.0001* | | <0.0001* | | |

*Significant

### Fig 4:BCVA in Phaco group
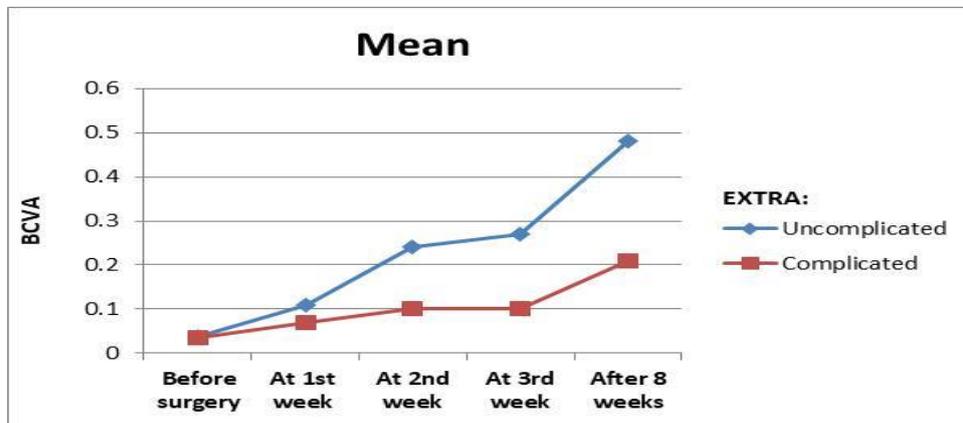


## Discussion

A PC tear is the commonest operative complication of extracapsular cataract surgery that can affect the postoperative visual acuity. In (1997) at study by ( Desai P.,etal ) (9)the outcome was 4.4% of eyes had a PC tear at the time of surgery, which match with our study.

In (2009) Study by (Björn Johansson, et al) (10), from the cohort of patients originally selected for inclusion, cases with a capsule complication (study group) and cases without a complication (control group) were examined. The study group comprised 171 patients and the control group, 198 patients. Patients with a capsule complication had a significantly worse visual outcome and a doubled risk for no improvement in preoperative visual acuity ,which match with our study.

In our study ,20 cases with a capsule complication (study group) and 20 cases without a complication (control group)

were examined . The 2 groups were divided into 2 subgroups ( phaco cases and extra cases) .UCVA and BCVA were measured before surgery ,1,2,3 and 8 weeks after the operation .8 weeks after the operation the BCVA at phaco group the uncomplicated cases had mean +\- 0.40 SD +\-0.12 ,the complicated cases had mean +\- 0.22 SD +\-0.14.The p value is 0.003 . AT the EXTRA cases ,the uncomplicated cases with mean +|- 0.48 SD +|- 0.29 and the complicated cases had mean +\- 0.21 SD +\- 0.06 . The p value is 0.033.

In (2003) other study by (Fiona., etal) (11), Posterior capsule rupture occurred in 155 (1.9%) of 8230 consecutive eyes that had extracapsular cataract extraction (ECCE) or phacoemulsification. Thirteen cases were excluded from analysis for missing data or insufficient follow-up. Of the remaining 142 eyes, 100 (70.4%) achieved a best corrected visual acuity (BCVA) of 6/12 or better between 6 weeks and 3 months postoperatively, that does not match our study.

In (2001) other study by (Alexander., et al) (12) , From a total of 1533 cases, 1420 (92.6%) eyes had complete follow up data. Posterior capsule rupture occurred in 59 (4.1%) cases. Eyes with posterior capsule rupture were 3.8 times more likely to have a final best spectacle corrected visual acuity less than 6/12 . At this study by comparing the outcome of eyes that had a PC tear during cataract extraction with eyes that did not, we have confirmed the detrimental effect of a PC tear on postoperative visual acuity. After adjustment for the possible confounding effects of age and grade of surgeon, PC tear remains a significant risk factor for poor a visual result (a corrected visual acuity of <6/12). The odds ratio of 3.8 suggests that in eyes without any ocular comorbidity identified preoperatively the risk of poor visual outcome was 3.8 times higher in eyes that had a PC tear, compared with those that had no complications at surgery, which match with our study.

In (2004) other study by (Sumru Onal., et al) (13) a final visual acuity of 0.8 or more was more common in eyes with uncomplicated phacoemulsification surgery (chi-square = 16.25, P= .03),which match with our study. Complications such as retinal detachment (odds ratio = 11.70, P< .05), cystoid macular edema (odds ratio = 26.33, P< .01), increased intraocular pressure (odds ratio = 14.54, P < .05), and decentration of the intraocular lens (odds ratio = 32.79, P = .00 1) were more frequency observed in eyes with capsular tear.

In (2009) other study by (Gunnar, et al) (14), data on

cataract surgery cases with a capsule complication (study group) or with no complication (control group) in 2003 were extracted from the Swedish National Cataract Register. The risk for RD after cataract surgery increased significantly when a capsule complication occurred, leading to poor final visual acuity in most cases, which match with our study.

## Conclusion

It was found that PCR and vitreous loss has a negative effect on BCVA after cataract surgery

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