Assessment of Visual Prognosis of Phacoemulsification in Zonular Dehiscence at Pre, Intra and Post-Operative Period

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ABSTRACT

Background: Zonular dehiscence (ZD), referred to as the presence of deficient zonular support for the lenticular capsule, might be the result of several causes and be detected only at the time of cataract surgery. The aim of this study was to evaluate variety of visual outcome of pre-, intra-, and postoperative features of eyes with ZD regardless of the etiology detected during Phacoemulsification.

Methods: A single center descriptive case series study was performed at Combined Military Hospital, Dhaka to identify patients' visual outcome who underwent cataract surgery whose procedure was described intraoperatively as being complicated by various extent of ZD from January 2021 to

July 2021. Patient characteristics, intraoperative clinical findings, visual and refractive outcomes and postoperative complication were recorded. Use of CTR routinely in phacoemulsification regardless of whether zonular dehiscence is present to reduce the risk of delayed IOL dislocation or capsular contraction.

Results: ZD was identified intraoperative in 30 eyes of patients. Among 30 patients 60% surgery was done in the right eye and 40% were in left eye. Among 67% cases the degree of Zonular dehiscence

was <90˚ & for 33% of cases was between 90 -180. Intraoperative complication i.e. posterior capsule rupture occurred in 6.67% patients and dropped nucleus occurred in 3.33% patients. 33.3% eyes had AC IOL, 40% eyes had PCIOL with CTR and 20% eyes had sulcus IOL.

Conclusions: ZD is a serious complication of cataract surgery requiring prompt intraoperative diagnosis and proper management. While it tends to worsen cataract surgery outcomes, the implantation of CTRs during the surgical procedure seems to be associated with better postoperative visual and refractive results. Incidence of zonular dialysis is low, surgeons should consider using a Capsular Tension Ring (CTR) upon the extent of ZD during phacoemulsification. This device helps manage the surgical challenges associated with the dialysis, which translates into improved best-corrected visual acuity (BCVA) over the early and intermediate follow-up periods.

Keywords: Cataract, Phacoemulsification, Zonular dehiscence, posterior capsular rupture, Capsular tension ring

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INTRODUCTION

Phacoemulsification, a standard cataract surgery can be safely performed which is provided with healthy zonules of Zinn that appropriately support the lens. Following the surgery intraocular lens fixation is performed into capsular bag.

In the presence of zonular dialysis or zonular weakness or subluxated lens is a greater surgical challenge. Zonular dialysis may be inherited, acquired or iatrogenic. Presence of zonular dialysis has commonly been reported in numerous etiologies[1,2] in order of frequency zonular degeneration of Pseudoexfoliation Syndrome(PXF)[3–6], eye injury[6,7], high myopia[6], history of vitrectomy surgery, fibro elastic tissue pathologies in Marfan's disease[6,8] or homocystinuria.[9] Variety of adverse outcome in zonular dialysis including early or late in the bag IOL dislocation and progressive asymmetrical capsular contraction resulting in IOL decentration.[10,11]

Capsular Tension Ring (CTR) acting as a supportive device both intra and post operatively, stabilize the capsular bag and consolidate weak zonules during all stages of surgery, including phacoemulsification but have advantage and disadvantages.[2,11,12]

Mechanical forces induced by nuclear sculpting or IOL insertion can be redistributed by CTR more over it induces centripetal pressure reducing capsular fold, pre venting forward movement of the posterior capsule and thereby countering progressive contractile capsular force postoperatively.[11,13] Even though during CTR implantation, compression is often required which itself may introduce further zonular damage.[11,14]Full cortical aspiration is prevented by CTR by trapping the cortex with in capsular fornix.[11] In contempt of these finding, medium to long term outcome data in the use of CTR are lacking.

Therefore, the aim of our study was to report the incidence and visual outcome of patient with zonular dialysis undergoing Phacoemulsification. Therefore, the aim of our study was to report the incidence and visual outcome of patient with zonular dialysis Phacoemulsification that carried out at eye department of CMH, Dhaka.

MATERIAL & METHOD

This observational case series was conducted in the department of Ophthalmology of Combined Military Hospital Dhaka from January 2021 to July 2021. Purposively selected 30 patients had cataract with zonular dialysis who underwent Phacoemulsification surgery were included in the study with an aim to assess the visual outcome of Pre, Intra and Postoperative period.Prior to the study, formal ethical clearance was obtained from the Director General of Medical Services and informed written consent were taken from the patients who underwent phacoemulsification surgery for zonular dialysis. Data were collected from the patients who included sociodemographic information, clinical features, disease duration, thorough physical examination following standard protocol. A complete baseline evaluation of affected eye was performed for each patient by an ophthalmologist. All patients were subjected to routine hematological (complete blood count) and biochemical (Urine routine examination, Random blood glucose, serum creatinine) investigations. Total treatment procedure was explained to each patient along with the possible outcome and hazards related to the surgery i.e. Phaco with Capsular tension ring (CTR) procedure. After the surgery, all the patients were discharged with an advice of predetermined follow-up schedule i.e., after 07 days and 30 days following surgery. During each visit, complete ophthalmologic evaluation was performed. All collected

information were stored in separate data record form. Data analysis was carried out by using Statistical Package for Social Science (SPSS) version 23 (IBM Corp., Armonk, NY). Frequencies, percentage, mean and standard deviation (SD) were used for descriptive statistics. Chi-square test was conducted to determine the association between categorical variables. A two-tailed p<.05 was considered statistically significant.

RESULTS

This was a prospective observational study was done in Department of Ophthalmology, Central Military Hospital (CMH), Dhaka. The number of study subject was 30, among them 36.7% were male and 63.3% were female with mean age 65.60±2.896 (SD) years.

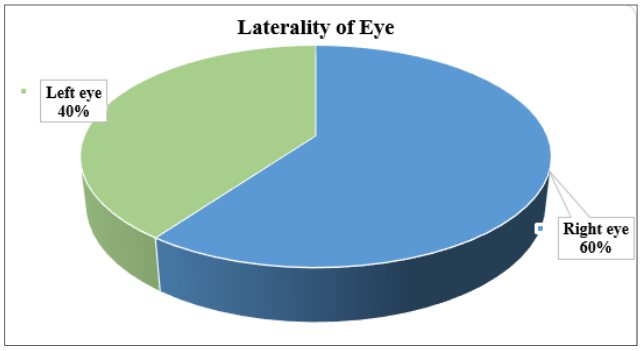


Fig-1: Distribution of the study population by the eye side (n=30)

Among 30 patients, 60% surgery was done in the right eye and 40% were in left eye.

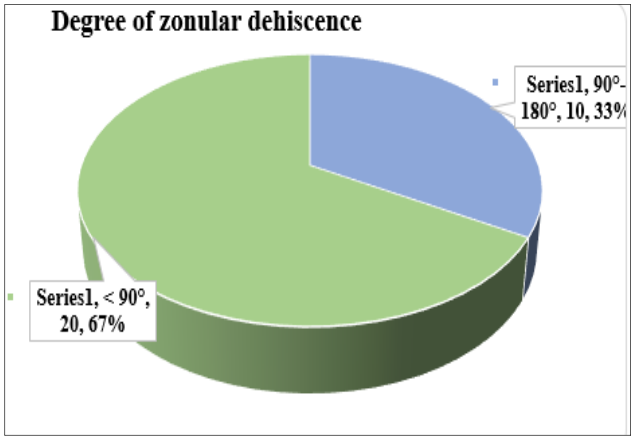


Fig-2: Distribution of the study subjects by the degree of zonular dehiscence (n=30). Among 67% cases the degree of zonular dehiscence was < 90° and for 33% of the cases zonular dehiscence was between 90°- 180°.

PXF was among 40.0% of the cases and high myopia was in also 40.0% cases. 23.3% patients had h/o trauma. Marfans syndrome was in 13.3%, 6.7% cases had vitrectomy surgery. Diabetic retinopathy was among 6.67% cases.

TABLE-I: Common causes of zonular dehiscence (n=30)

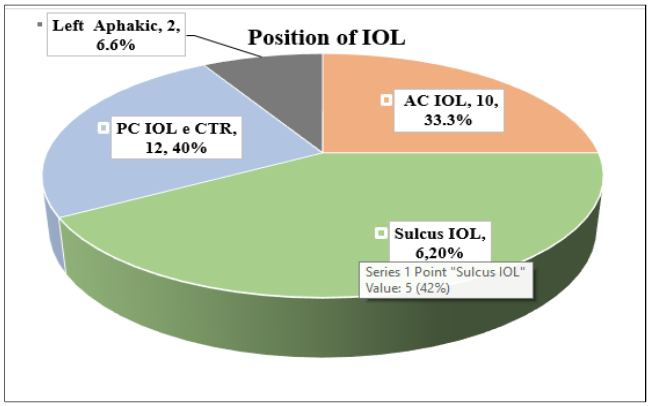
Causes*	Frequency (n)	Percentage (%)
PXF	8	26.6
High Myopia	7	23.3
Traumatic	7	23.3
Marfans syndrome	4	13.3
*Vitrectomy surgery	2	6.7
Diabetic Retinopathy	2	6.67

PXF-Pseudoexfoliation.

***Multiple response considered.**

TABLE-II: Associated Ocular Complications With Zonular Dialysis (N=30)

Variables	Frequency (n)	Percentage (%)
Vitreous Loss (VL)	12	40.0
Glaucoma	3	10.0
Uveitis	3	10.0



AC IOL- Anterior chamber intra ocular lens, PC IOL- Posterior chamber intra ocular lens, VL- Vitreous Loss.

Figure-3: Position of IOL (n=30)

33.3% eyes had AC IOL, 40% eyes had PC IOL with CTR and 20% eyes had sulcus IOL.
Posterior capsule rupture occurred in 6.67% cases, dropped nucleus occurred in 3.3% cases.

TABLE-III: Distribution of the study cases by intra-operative complications (n=30)

Variables	Frequency(n)	Percentage (%)
Posterior capsule rupture		
Yes	2	6.67
No	28	93.33
Dropped nucleus		
Yes	1	3.3
No	29	96.7

At 1-month post-operative follow up, corneal edema was in 3.3% cases, mild irititis was present among 13.3% cases. IOL (Intraocular lens) dislocation was in 10.0% cases and 3.3% had raised IOP. For 6.6% cases posterior capsular opacification was seen.

TABLE-IV: Distribution of the study cases by the post-operative complications at 1 month (n=30)

Complications*	Frequency(n)	Percentage (%)
Corneal edema		
Yes	1	3.3
No	29	96.7
Mild irritiis		
Yes	4	13.3
No	26	86.7
Raised IOP	1	3.3
Yes	29	96.7
No		
Posterior capsular opacification	2	6.67
Yes	28	93.33
No		
IOL dislocation		
Yes	3	10.0
No	27	90.0

***Multiple response considered.**

VA (Visual Acuity) was <6/60 for 70% of total before surgery. At the 7th POD, VA was between (>6/18-6/60) for 80% cases and at 1-month post-operative follow up VA was between (6/6-6/18) for 76.7% of total cases.

TABLE-V: Distribution of the study population by the pre-operative and post-operative VA (Visual Acuity) ranged from light perception (n=30)

VA	Pre-operative n (%)	Post-operative (7th day) n(%)	Post-operative (1 month) n(%)	p-value
<6/60	21(70.0)	4(13.3)	2(6.7)	0.001
>6/18-6/60	5(16.7)	24(80.0)	5(16.7)	0.001*
6/6-6/18	4(13.3)	2(6.7)	23(76.7)	0.001

***p-value was determined by chi-square test and it was significant at <0.05.**

DISCUSSION

Zonular weakness is the main factor for intra-operative complications. According to this study intraoperatively posterior capsular rupture was seen in 6.67% patients and dropped nucleus occurred in 3.33%patient. A similar study conducted in India in which the posterior capsule rupture occurred in 1.3%patients.[16]A Study in Korea showed intra-operatively posterior capsule rupture among 4.8% of total cases and dropped nucleus in 2.1%.[15]

Among the post-operative complications followed by phacoemulsification with CTR in zonular dialysis there are some post-operative complications. One of the most common post-operative complications is posterior capsular opacification.[17] In this study, posterior capsule opacification was seen among 10.0% of the study cases at the 7th POD and among 6.67% cases at the 1 month post-operative follow-up. Jacob et al., (2003) showed that post–operatively posterior

capsular opacification was occurred in 7.5% of the cases. Persistent corneal edema was in 9.52% cases by Jacob et al, whereas in this study corneal edema was in 13.3% at the 7th POD and in 3% at the 1 month follow up. In this study mild irrititis was in 23.3% patients, whereas by Jacob et al., mild iritis was in 23.80% of total study cases post-operatively.[18]

IOL dislocation was seen among 3.33% of the total study cases(n=30) followed by phacoemulsification with CTR in zonular dialysis. However some studies suggested that CTR insertion will not exclusively prevent IOL dislocation. IOL dislocation followed by CTR insertion was in 8% of the study cases.

At the 7th POD raised IOP was seen among 4 eyes of the total (n=30), and at 1 month follow up raised IOP was seen in 1 eye of total. According to jacob et al, 14.28% developed raised IOP that responded well to medical therapy.[18]

At the post-operative 1 month follow up the fundus examination showed ARM (age-related maculopathy) in 2 eyes, Diabetic retinopathy (DR) in 2 eyes, AMD (age-related macular degeneration) in 5 eyes. Optic atrophy, macular edema and macular scar were found among 3, 4 and 5 patients respectively. ARM,DR and ADM were somehow responsible in causing failure of achieving VA between (6/6-6/18).

In this study, pre-operative VA (Visual Acuity) was <6/60 (worse) in 70.0%of the total study cases (n=30), within >6/18-6/60(borderline) was among 16.7% patients and near normal (6/6-6/18) was seen in 13.3% of total cases(n=30). At the 7th POD, VA was <6/60 in case of 13.3% patients and <6/18-6/60(borderline) was in 80.0% of the cases. VA between (6/6-6/18) was in 6.7%cases. At the 1-month post-operative follow up, <6/60(worse) VA was in 6.7% of the total and within (6/6-6/18) VA was in 76.7% of the total cases followed by phacoemulsification with CTR in zonular dialysis. There are multiple visual outcome with phacoemulsification surgery with CTR in zonular dialysis. A result showed that phacoemulsification with CTR in zonular dialysis improves the VA in patients who had a poor vision before the operation. Due to small sample size and short time follow up the results may not show the actual scenario.

Limitations of the study

- This was a single center study
- Small sample size
- Long term follows up was beyond the scope of the study

Further larger multicenter randomized clinical trial with longer follow up is recommended

Conclusion

Our study suggests that improved early and medium-term visual outcomes can be obtained with the use of CTR in all cases of zonular dialysis detected during phacoemulsification surgery. These results correspond with the findings of previous studies with slight variations. However, patients' selection, detailed history and examination are necessary before considering the patient for cataract surgery.

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