

Visual Acuity in Patients Undergone Cataract Surgery with CTR of Zonular Dehiscence.

Ahmed AHMK¹, Nesa Z²

¹Abu Hena Mostafa Kamal Ahmed, Assistant Professor, Department of Ophthalmology, Shaheed Ziaur Rahman Medical College, Bogura, Bangladesh.

²Zabun Nesa, Assistant Professor, Department of Ophthalmology, Abdul Malek Ukil Medical College, Naokhali, Bangladesh

Corresponding Author: Abu Hena Mostafa Kamal Ahmed.

Abstract:

Introduction: Zonular dehiscence is not rare for cataract surgeon. Many surgeons are now performing phacoemulsification with CTR. With the help of CTR, they are performing phacoemulsification, implanting IOL, and helping patients to restore vision. A traumatic cataract with segmental zonular lysis (with remaining strong zonules) may need to be handled differently from a case of pseudo exfoliation with generalized zonular weakness. After insertion of a CTR, phacoemulsification with foldable acrylic PC IOL implantation was performed. Posterior capsule rupture, vitreous loss, best corrected visual acuity (BCVA), intraocular pressure (IOP) in the pre- and postoperative periods and postoperative IOL decent ration were recorded.

Aim of the study: To assess the visual acuity in patients undergone cataract surgery with CTR of zonular dehiscence.

Material & Methods: This prospective observational study was conducted at the department of cataract, National Institute of Ophthalmology & Hospital, Dhaka, during the period of July 2009-December 2009 on cataract patients with zonular dehiscence less than 1800. In the study, 30 cases were included according to the following exclusion and inclusion criteria. Sampling technique was non-randomized and purposive. We followed the closed chamber technique, which was achieved only by phacoemulsification. Data were analyzed by appropriate tests. A probability 'p' value of 0.5 or less was considered as statistically significant. Study patients were explained in details about the disease process, benefits of evaluation, methods and risks of evaluation techniques and then written consent will be taken before conducting the study maintaining the principles of Helsinki declaration.

Results: Among 30 patients, age below 40 years was in 14 (46.67%) cases and age \geq 40 years was in 16 (53.33%). Mean age was 39.50 ± 11.59 (SD) years. Male patients were 20 (66.67%) and female patients were 10 (33.33%). Pre-operatively, out of 30 cases, 03 (10%) cases had V/A 6/36, 04 (13.33%) cases had V/A 6/60, 09 (30%) cases had 5/60-3/60 and the rest 14 (46.67%) had V/A $<$ 3/60 – hand motions. Post-operatively after 3 months, 09 (30%) cases achieved V/A 6/12 or better, 12(40%) cases achieved V/A 6/18 – 6/24, 03 (10%) cases achieved 6/36 and 06 (20%) achieved 6/60 or worse.

Conclusion: Fifteen eyes (71.42%) had a final visual acuity of 6/12 or better in their study. Six eyes had a final best-corrected visual acuity of worse than 6/12 because of coexisting fundus pathology. In our study, poor vision was due to co-existing posterior segment pathologies.

Keywords: Cataract Surgery, Zonular Dehiscence, Acuity, Visual, Phacoemulsification.

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I. Introduction

Zonular dehiscence is not rare for cataract surgeon. Many surgeons are now performing phacoemulsification with CTR. With the help of CTR, they are performing phacoemulsification, implanting IOL, and helping patients to restore vision. No study is available here to observe CTR related post-operative ocular conditions as well as amount of visual recovery after CTR. To understand zonulopathy, it is helpful to categorize it according to both the extent of zonular dialysis (number of clock hours) and the severity of generalized zonular instability¹⁻³. This distinction is very important as specific zonular cases each have their own underlying pathogenesis or a combination of causes. For example, a traumatic cataract with segmental zonular lysis (with remaining strong zonules) may need to be handled differently from a case of pseudo exfoliation with generalized zonular weakness. The choice of cataract extraction and end capsular support device relies greatly on this distinction. The most frequent causes of zonular insufficiency that benefit from CTR implantation include pseudo exfoliation, traumatic lens displacement, iatrogenic zonular damage, Marfan's syndrome⁴,

homocystinuria, hyper mature cataracts, post-vitrectomy and filtration patients⁵. Other less-frequent situations include aniridia, retinitis pigmentosa⁶, intraocular neoplasms, Weil–Marchesani syndrome and microspherophakia⁵. CTR implantation has also been successfully performed in cases of congenital lens coloboma; however, there have been no long-term studies⁷. Liu *et al*⁸ investigated the safety of capsular tension ring implantation during phacoemulsification in the sub-luxated lens. Capsular tension ring was implanted in 13 cases (14 eyes) of sub-luxated lens after continuous curvilinear capsulorhexis during phacoemulsification. They concluded that capsular tension ring implantation is safe in the patient of lens subluxation during phacoemulsification. It can prevent the IOL decent ration and decrease the vitreoretinal complication. Georgopoulos *et al*⁹ reported their results and evaluated the long-term effect of capsular tension ring (CTR) insertion in eyes with large traumatic zonular dialysis that underwent phacoemulsification with posterior chamber (PC) intraocular lens (IOL) implantation. This prospective study included 17 eyes of 17 consecutive patients with cataract and large traumatic zonular dialysis (range 80-160 degrees determined pre-or intraoperatively). After insertion of a CTR, phacoemulsification with foldable acrylic PC IOL implantation was performed. Posterior capsule rupture, vitreous loss, best corrected visual acuity (BCVA), intraocular pressure (IOP) in the pre- and postoperative periods and postoperative IOL decent ration were recorded. They concluded that in cases of cataract associated with large traumatic zonular dialysis, implanting a CTR before or during phacoemulsification with an in-the-bag PC IOL is relatively safe technique with a high success rate. The CTR was found to be efficient in preventing IOL decent ration in eyes with traumatic zonular deficiency.

II. Methodology And Materials

This prospective observational study was conducted at the department of cataract, National Institute of Ophthalmology & Hospital, Dhaka, during the period of July 2009-December 2009 on cataract patients with zonular dehiscence less than 180°. In the study, 30 cases were included according flowing exclusion and inclusion criteria. Sampling technique was non-randomized and purposive. We followed the closed chamber technique, which was achieved only by phacoemulsification. Our surgical paradigms included a 3-plane valvular incision, injection of viscoelastic in anterior chamber before removing any instrument from the eye, bimanual irrigation and aspiration and 2-port anterior chamber vitrectomy. Superior-temporal location was preferred irrespective of the site of sub-luxation. Before initiating capsulorhexis the anterior chamber was deepened with injection viscoelastic. A side entry was made at 2 and 3 o' clock positions away from the main incision using a 15-degree paracentesis knife. An initial small anterior capsulorhexis was attempted and then a definitive large rhexis (I & D rhexis) was performed after capsulorhexis and before hydro dissection. After capsulorhexis, CTR 12.0 mm diameter ring (Morcher type 14) was introduced. Then, thorough, gentle but careful multi-quadrant hydro dissection was performed. Phacoemulsification was performed using power appropriate for the grade of cataract, low vacuum and aspiration setting with minimal bottle height. After phacoemulsification in bag, PCIOL was implanted in all cases. Data were collected in a pre-designed data collection sheet. Data were analyzed by appropriate tests. A probability 'p' value of 0.5 or less was considered as statistically significant. Study patients were explained in details about the disease process, benefits of evaluation, methods and risks of evaluation techniques and then written consent will be taken before conducting the study maintaining the principles of Helsinki declaration.

- **Inclusion Criteria:** Patients with
 - Either sex
 - Zonular dehiscence < 180°
 - Very hard cataract having the risk of intra-operative zonular dehiscence.
- **Exclusion Criteria:** Patients with zonular dehiscence more than 180°, corneal opacity, shallow A/C.

III. Results

Among 30 patients, age below 40 years was in 14 (46.67%) cases and age \geq 40 years was in 16 (53.33%). Mean age was 39.50 ± 11.59 (SD) years (Table I). Figure I shows the distribution of sex among study subjects. Male patients were 20 (66.67%) and female patients were 10 (33.33%). Table II shows the distribution of causes of subluxation among study subjects. Out of 30 cases, 14 (46.67%) were traumatic subluxation and 16 (53.33%) were non-traumatic subluxation. Among non-traumatic subluxations, 09 (30%) were hereditary ectopia lentis, 04 (13.33%) were pseudo exfoliation syndromes and 03 (10%) were hypermature cataract related. Table III shows the distribution of pre-operative and post-operative visual acuity measured by Snellen acuity chart. Pre-operatively, out of 30 cases, 03 (10%) cases had V/A 6/36, 04 (13.33%) cases had V/A 6/60, 09 (30%) cases had 5/60-3/60 and the rest 14 (46.67%) had V/A < 3/60 – hand motions. Post-operatively after 3 months, 09 (30%) cases achieved V/A 6/12 or better, 12(40%) cases achieved V/A 6/18 – 6/24, 03 (10%) cases achieved 6/36 and 06 (20%) achieved 6/60 or worse. Figure II shows the distribution of pre- and post-operative log MAR acuity of study cases. Mean pre-operative V/A was 1.38 ± 0.41 (SD) and after 3 months mean post-operative V/A was 0.58 ± 0.35 (SD).

Table I: Shows the distribution of age among the study subjects.

Age group	No. of patient (%)	Mean age \pm SD
Age below 40 years	14 (46.67)	39.50 \pm 11.59
\geq 40 years	16 (53.33)	
Total	30 (100)	

Figure I: Pie chart showing sex distribution

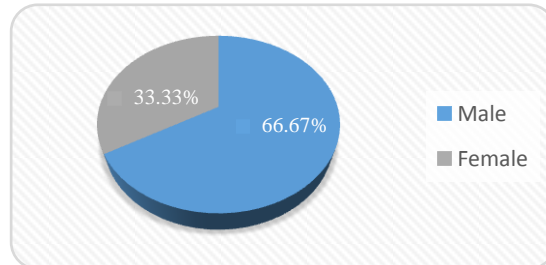


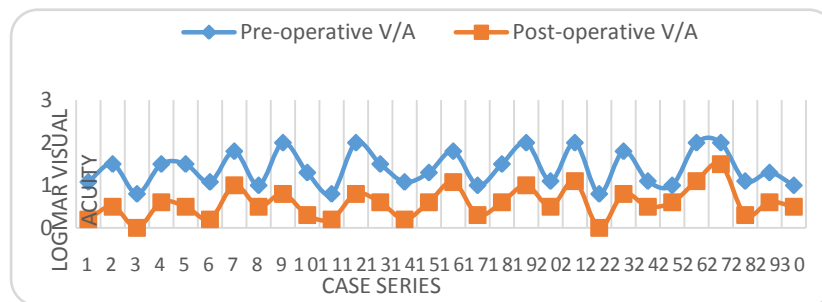
Table II: Shows the distribution of causes of subluxation among study subjects.

Causes of subluxation	No. of patient (%)
Traumatic	14 (46.67)
Non-traumatic:	16 (53.33)
Hereditary ectopia lentis	09 (30)
Pseudo exfoliation syndrome	04 (13.33)
Hypermaturation cataract	03(10)

Table III: Shows the distribution of pre-operative and post-operative visual acuity

V/A	Pre-operative No. of patient (%)	Post-operative No. of patient (%)
6/12 or better	00	09 (30)
6/18-6/24	00	12 (40)
6/36	03 (10)	03 (10)
6/60	04 (13.33)	02 (6.67)
5/60-3/60	09 (30)	03 (10)
< 3/60 – Hand motion	14 (46.67)	01 (3.33)

Figure II: Line graph showing pre-operative and post-operative visual acuity



IV. Discussion

Among 30 patients, age below 40 years was in 14 (46.67%) cases and age \geq 40 years was in 16 (53.33%). Mean age was 39.50 \pm 11.59 (SD) years. Praveen *et al*¹⁰ reported that mean age was 39.15 \pm 16.33 (range 5-74). Trauma appears more in relatively younger age. Congenital ectopia lentis often manifest after 2nd to 3rd decade. That is the reason average age in the current study was around 40 years, which is comparable with other relevant studies. Out of 30 subjects 20 (66.67%) were male and 10 (33.33%) were female. Males appear more prone to ocular trauma than females. Again, traumatic sub-luxation is the commonest cause. Therefore, a male preponderance has been reported by many studies¹¹⁻¹⁴. Praveen *et al*¹⁰ reported 75% male and 25% female in their study. In the present study, 14 (46.67%) were traumatic subluxation and 16 (53.33%) were non-traumatic subluxation. Among non-traumatic sub-luxations, 09 (30%) were hereditary ectopia lentis, 04 (13.33%) were pseudo-exfoliation syndromes and 03 (10%) were hypermature cataract related. Praveen *et al*¹⁰ evaluated the outcome of phacoemulsification in eyes with subluxated cataract. This retrospective study comprised 22 eyes of

20 consecutive patients with subluxated cataracts of varying aetiology. They found that traumatic subluxation was the commonest (55%). Pre-operatively, out of 30 cases, 03 (10%) cases had V/A 6/36, 04 (13.33%) cases had V/A 6/60, 09 (30%) cases had 5/60-3/60 and the rest 14 (46.67%) had V/A < 3/60 – hand motions. Post-operatively after 3 months, 09 (30%) cases achieved V/A 6/12 or better, 12(40%) cases achieved V/A 6/18 – 6/24, 03 (10%) cases achieved 6/36 and 06 (20%) achieved 6/60 or worse. In our study, mean pre-operative V/A was 1.38 ± 0.41 (SD) and after 3 months mean post-operative V/A was 0.58 ± 0.35 (SD). Praveen *et al*¹⁰ reported that 55.55% eyes had post-operative BCVA of 6/12 - 6/6 while 2 eyes (7.40%) had BCVA of 6/18. The remaining 4 eyes (14.81%) had less than 6/24 BCVA due to pre-existing posterior segment pathology. Du *et al*¹⁵ showed that one month postoperatively, the best-corrected visual acuity (BCVA) was 0.4 in 4 eyes, 0.5-0.8 in 5 eyes and over 0.8 in 2 eyes. Jacob *et al*¹ studied to determine the safety and efficacy of capsular tension ring (CTR) insertion in eyes with zonular dialysis of less than 150 degrees having phacoemulsification with posterior chamber intraocular lens (PC IOL) implantation.

LIMITATIONS OF THE STUDY

1. Study period was very short.
2. Sample size was comparatively small.

V. Conclusion And Recommendations

Fifteen eyes (71.42%) had a final visual acuity of 6/12 or better in their study. Six eyes had a final best-corrected visual acuity of worse than 6/12 because of coexisting fundus pathology. In our study, poor vision was due co-existing posterior segment pathologies. For the patients of zonular dialysis, the CTR can preserve the integrity of the capsular bag, provide the necessary capsular space while giving counter-traction, reduce asymmetric capsular forces, stabilize the vitreous base, facilitate phacoemulsification, aspiration of cortex and IOL implantation, prevent the postoperative IOL decentration and allow a quicker visual recovery. The CTR is a useful device that effectively supplements the currently available cataract surgery armamentarium, and develops the application of posterior chamber IOL implantation. Further prospective study with larger sample and longer follow up period is recommended.

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Ethical approval: The study was approved by the Institutional Ethics Committee

References

- [1]. Jacob S, Agarwal A, Agarwal A, et al. Efficacy of a capsular tension ring for phacoemulsification in eyes with zonular dialysis. *J Cataract Refract Surg* 2003; 29:315–321.
- [2]. Bayraktar S, Alton T, Kucuksumer Y, Yilmaz OF. Capsular tension ring implantation after capsulorhexis in phacoemulsification of cataracts associated with pseudo exfoliation syndrome. Intraoperative complications and early postoperative findings. *J Cataract Refract Surg* 2001; 27:1620–1628.
- [3]. Gimbel HV, Sun R, Heston JP. Management of zonular dialysis in phacoemulsification and IOL implantation using the capsular tension ring. *Ophthalmic Surg Lasers* 1997; 28:273–281.
- [4]. Kohnen T, Baumeister M, Buhren J. Scheimpflug imaging of bilateral foldable in-the-bag intraocular lens implantation assisted by a scleral –sutured capsular tension ring in Marfan’s syndrome. *J Cataract Refract Surg* 2003; 29: 598–602.
- [5]. Osher RH. History and experience with capsular tension rings. In: *Cataract and Refractive Surgery Today*. January 2005. pp. 1–5.
- [6]. Hayashi K, Hayashi H, Matsuo K, et al. Anterior capsular contraction and intraocular lens dislocation after implant surgery in eyes with retinitis pigmentosa. *Ophthalmology* 1998; 105:1239–1243.
- [7]. Mizuno H, Yamada J, Nishiura M, et al. Capsular tension ring use in a patient with congenital coloboma of the lens. *J Cataract Refract Surg* 2004; 30: 503–506.
- [8]. Liu Y, Liu Y, Wu M. Clinical use of capsular tension ring during phacoemulsification in subluxated lens. *Zhonghua Yan Ke Za Zhi*.2002 May; 38(5):262-4.
- [9]. Georgopoulos GT, Papaconstantinou D, Georgalas I, Koutsandrea CN, Margetis I, Moschos MM. Management of large traumatic zonular dialysis with phacoemulsification and IOL implantation using the capsular tension ring. *Acta Ophthalmol Scand*. 2007 Sep; 85(6):653-7.
- [10]. Praveen MR, Vasavada AR, Singh R. Phacoemulsification in subluxated cataract. *Indian Journal of Ophthalmology*2003;Volume: 51 (2) Page: 147-154.
- [11]. Parrish RK II. Anatomy, physiology, and pathology of the crystalline lens. In: *Bascom Palmer Eye Institute's Atlas of Ophthalmology*. 1999:241.
- [12]. Albert DM, Jakobiec FA. Pathology of the lens. In: *Principles and Practice of Ophthalmology*. 2000:2225-2239.
- [13]. Nelson LB, Maumenee IH. Ectopia lentis. *Surv Ophthalmol*. Nov-Dec 1982; 27(3):143-60.
- [14]. Nirankari MS, Chaddah MR. Displaced lens. *Am J Ophthalmol*. Jun 1967; 63(6):1719-23.
- [15]. Du XH, Yao K, Wan XH. Application of capsular tension ring in cataract surgery for zonular dialysis. *Zhonghua Yan Ke Za Zhi*.2003 Jan; 39(1):33-5.

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