



Visual Outcome after Phacoemulsification and Intraocular Lens Implantation in Diabetics

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Abstract

Background: *The prevalence of diabetes mellitus is on a rise with its prevalence ranging from 2-30 % worldwide. The objectives of our study was conducted to investigate the effect of phacoemulsification cataract surgery with PC-IOL implantation on the visual outcome in the diabetic patients.*

Methods: *The study was conducted among diabetic individuals who were scheduled for phacoemulsification surgery with foldable IOL implantation at the said department. Diabetic individuals with any degree of cataract, Individuals who agreed for phacoemulsification surgery with foldable IOL implantation. A questionnaire was developed before the study to capture socio-demographic and clinical details. Diabetic individuals with any degree of cataract with indication for the surgery were recruited for the study. The patients were operated and were later followed up at 1 week, 1 month and 3 month interval.*

Results: *The mean age at surgery of group A subjects was 46 ± 8.7 years while for group B, the mean age at surgery was 49 ± 5.5 years. There was male preponderance in both the group with 10 males in group A while 7 males in group B. The mean duration of diabetes mellitus among both the groups varied with the mean duration of 8 ± 4.3 years in group A while 12 ± 3.4 years for group B. Group A subjects with no NPDR, mild or moderate NPDR had an increased best corrected visual acuity post-surgery at 1 week, 1 month and 3 month follow-up period. Similarly in group B subjects with severe NPDR, the best corrected visual acuity post-surgery at 1 week, 1 month and 3 month follow-up period was better than the pre-operative visual acuity readings.*

Conclusion: *The final visual outcome was improved in the majority of examined eyes.*

Keywords: *Phacoemulsification, NPDR, Diabetic eye, Cataract Surgery.*

Introduction

The prevalence of diabetes mellitus is on a rise with its prevalence ranging from 2-30 % worldwide⁽¹⁾. Cataract is one of those conditions usually affecting patients suffering from diabetes mellitus. The formation of cataract usually depends on the duration of diabetes, age of the

patient and control of blood sugar⁽²⁾. Diabetic patients develop cataract earlier than non-diabetic patients and presence of cataract may decrease their visual acuity, make examination of retina harder for the doctor and photocoagulation of NPDR more difficult. Therefore, it is advisable to perform cataract surgery for better visual

rehabilitation and for diagnostic and therapeutic reasons, even if there is a potential risk of aggravating the retinopathy⁽³⁾. One thing to mention here is that cataract surgery in diabetic patients with little or no retinopathy has almost same prognosis as similar surgery in non-diabetic individuals. However, the higher degrees of associated retinopathy can present with disturbing results⁽⁴⁾. Due to the changing scenario of cataract surgery from intracapsular cataract extraction to extra capsular cataract extraction (ECCE) and advanced improvements in intraocular lens (IOL) implantation technology, the indications for cataract surgery in patients with diabetes have highly increased⁽⁵⁾. Furthermore, advancement of small incision surgeries like phacoemulsification technique have resulted in less intra-operative and post-operative complications and has an added advantage over the past techniques to allow quick recovery of vision after the procedure^(3,6).

After a thorough literature search, there is scarcity of data on the outcome of modern cataract surgery on the visual acuity of diabetic patients. Moreover, a recent study on diabetes mellitus⁽⁷⁾ has estimated a rise in diabetes prevalence in the Srinagar city of J&K State. It becomes quite necessary to conduct a study on such patients to know the outcome of cataract surgery and IOL implantation. With this purpose, this prospective study was conducted to investigate the effect of phacoemulsification cataract surgery with PC-IOL implantation on the visual outcome in the diabetic patients. The finding of our study will be useful for surgeons to conduct such procedures with accuracy and confidence and may aid patients to make decisions regarding opting for the surgery.

Methods

Study Design & Setting: This cohort study was carried out at the postgraduate Department of ophthalmology, Government Medical College, Srinagar.

Study Period & Study Unit: The study was conducted for a period of 1 year (June 2016-May 2017) with additional 8 months of data entry and

analysis of data. The study was conducted among diabetic individuals who were scheduled for phacoemulsification surgery with foldable IOL implantation at the said department.

Sample Size: Arbitrarily we included 30 such individuals in our cohort, who underwent the surgery in the data collection period and who gave informed consent for being the part of the study.

Inclusion Criteria: Diabetic individuals with any degree of cataract, Individuals who agreed for phacoemulsification surgery with foldable IOL implantation

Exclusion Criteria: Individuals with history of glaucoma, uveitis or age related macular degeneration were excluded.

Questionnaire: A questionnaire was developed before the study to capture socio-demographic⁽⁸⁾ and clinical details.

Procedure: Diabetic individuals with any degree of cataract with indication for the surgery were recruited for the study. The patients were advised necessary investigations and were later dated for the surgery. On the day of surgery, a routine ophthalmological examination was performed before the surgery. The patients were operated and were later followed up at 1 week, 1 month and 3 month interval. The follow up included the best corrected visual acuity by using snellen's chart, applanation tonometry, bio microscopy, and fundal examination by direct and indirect ophthalmoscopy.

Statistical Analysis: Data was presented as measures of central tendency. Categorical variables were analysed using Chi-square test.

Ethical Issues: The study didn't have any ethical issues related to human or animal experiments. The confidentiality of the participants was maintained as per study protocol.

Results

Clinical characteristics of patients with diabetes mellitus operated for cataract surgery (phacoemulsification with IOL implantation) have been described in Table 1. A total of 30 patients were recruited for the study over the period of 1

year. The study participants were grouped into two groups. Group A including those with no/mild/moderate non-proliferative diabetic retinopathy (NPDR) while group B had subjects with severe NPDR/PDR on initial examination. A total of 18 subjects were grouped in group A while 12 subjects with severe NPDR were grouped in group B. The mean age at surgery of group A subjects was 46 ± 8.7 years while for group B, the mean age at surgery was 49 ± 5.5 years. There was male preponderance in both the group with 10 males in group A while 7 males in group B. There was also increased number of right eye laterality in both the groups. The mean duration of diabetes mellitus among both the groups varied with the mean duration of 8 ± 4.3 years in group A while 12 ± 3.4 years for group B. Majority (66.6%) of the patients in group A were on treatment with oral hypoglycemic agents while (75%) of subjects from group B were on Insulin therapy. All the recruited subjects were advised dietary and lifestyle modification in addition to the drug therapy by their treating physicians.

All the subjects in our study were already diagnosed cases of type 2 diabetes mellitus before the start of the study. Among the group B subjects almost (58%) were having history of previous intraocular procedures done.

Best corrected visual acuity (VA) in diabetic patients with different stages of NPDR, before and after surgery has been described in Table 2. Group A subjects with no NPDR, mild or moderate NPDR had an increased best corrected visual acuity post-surgery at 1 week, 1 month and 3 month follow-up period. Similarly in group B subjects with severe NPDR/PDR, the best corrected visual acuity post-surgery at 1 week, 1 month and 3 month follow-up period was better than the pre-operative visual acuity readings. The subjects with severe NPDR/PDR had significantly worse visual acuity than eyes with mild to moderate NPDR preoperatively and 1 week, 1 months, and 3 month follow-up period after surgery. The association was statistically significant with p-values < 0.05 .

Table 1: Clinical characteristics of patients with diabetes mellitus operated for cataract surgery (phacoemulsification with IOL implantation).

Variable	Diabetic Retinopathy	
	No/Mild/Moderate NPDR (Group A)	Severe NPDR/PDR (Group B)
Number of Eyes	18	12
Age at Surgery		
Mean	46 ± 8.7	49 ± 5.5
Range	45-70	45-74
Sex		
Male	10	7
Female	8	5
Laterality		
Right Eye	11	8
Left Eye	7	4
Duration of Diabetes		
Mean	8 ± 4.3	12 ± 3.4
Range	5-12	8-16
Treatment		
Insulin + OHA	6	9
OHA	12	3
Diet /Lifestyle modification	18	12
Diabetes		
Type 1	0	0
Type 2	18	12
History of Intraocular procedure		
Intraocular Surgery	0	0
Laser Photocoagulation	0	5
Anti-VEGF	0	2

Table 2: Best corrected visual acuity (VA) in diabetic patients with different stages of NPDR, before and after surgery.

Group	Visual Acuity			
	Preoperative	Postoperative		
		1 week	1 month	3 month
No/Mild/Moderate DR	0.4 (0.01-0.8)	0.8(0.3-1.0)	1.0(0.3-1.0)	1.0(0.1-1.0)
Severe NPDR/PDR	0.15 (0.01-0.5)*	0.4 (0.1-0.7)*	0.4 (0.1-1.0)*	0.5 (0.1-1.0)*

*Significantly difference of severe DR with no/mild/moderate group (Kruskal–Wallis ANOVA, $p < 0.05$).

DR: Diabetic Retinopathy

All values of VA are given as median (range)

Discussion

This cohort study was carried out at the postgraduate Department of ophthalmology, Government Medical College, Srinagar. The study was conducted for a period of 1 year (June 2016-May 2017) with additional 8 months of data entry and analysis of data. The study was conducted among diabetic individuals who were scheduled for phacoemulsification surgery with foldable IOL implantation at the said department. Diabetic individuals with any degree of cataract with indication for the surgery were recruited for the study. The patients were advised necessary investigations and were later dated for the surgery. On the day of surgery, a routine ophthalmological examination was performed before the surgery. The patients were operated and were later followed up at 1 week, 1 month and 3 month interval. The follow up included the best corrected visual acuity by using snellen's chart, applanation tonometry, bio microscopy, and fundal examination by direct and indirect ophthalmoscopy.

In the present study the visual acuity after phacoemulsification was improved in a majority of the operated eyes and had a visual acuity of 0.5 or better 3 months postoperatively. A total of 18 subjects were grouped in group A while 12 subjects with severe NPDR/PDR were grouped in group B. The mean age at surgery of group A subjects was 46 ± 8.7 years while for group B, the mean age at surgery was 49 ± 5.5 years. There was male preponderance in both the group with 10 males in group A while 7 males in group B. There was also increased number of right eye laterality in both the groups. The mean duration of diabetes

mellitus among both the groups varied with the mean duration of 8 ± 4.3 years in group A while 12 ± 3.4 years for group B. Majority (66.6%) of the patients in group A were on treatment with oral hypoglycemic agents while (75%) of subjects from group B were on Insulin therapy. All the recruited subjects were advised dietary and lifestyle modification in addition to the drug therapy by their treating physicians. All the subjects in our study were already diagnosed cases of type 2 diabetes mellitus before the start of the study. Among the group B subjects almost (58%) were having history of previous intraocular procedures done. Our results are similar to those reported by Antcliff RJ et al⁽⁹⁾ and T. Toyama et al⁽¹⁰⁾. According to another report by Henricson et al.⁽¹¹⁾ similar result were obtained after 2 years after cataract surgery where both ECCE and phacoemulsification procedures were used. We also evaluated retinopathy 3 months after surgery, and very less number of the examined eyes showed a progression in NPDR/PDR. The results of our study are not in accordance with the previous reports where retinopathy deteriorated in 23.4% of eyes 1 year after phacoemulsification⁽¹²⁾. It is known that diabetic eyes have more complications after cataract surgery than non-diabetic eyes, particularly more pronounced postoperative inflammation⁽¹³⁻¹⁵⁾ and a poorer visual acuity.^(16,17) Many authors have tried to identify risk factors for visual prognosis and progression of NPDR/PDR following cataract surgery in diabetic eyes. Diabetic eyes have many disturbances within the anterior segment, such as a bigger lens,⁽¹⁸⁾ a steeper anterior lens curvature, and a shallower anterior chamber, especially in

eyes with diabetic retinopathy.^(19,20) These changes may make surgery more difficult.

The advantage of phacoemulsification is that this technique with a small incision reduces the postoperative breakdown of BAB⁽⁶⁾. Therefore, significantly less fibrinoid reaction is found in the anterior chamber of diabetic eye during first postoperative week after phacoemulsification, compared with ECCE⁽²¹⁾. The surgical procedure also may contribute to the progression of diabetic retinopathy⁽²²⁾ and deterioration of pre-existing diabetic maculopathy⁽¹⁷⁾.

According to our results and other studies, we believe that visual acuity after cataract surgery depends on the severity of diabetic retinopathy at the time of surgery^(23,24). We conclude that the final visual outcome was improved in the majority of examined eyes. The activity of diabetic retinopathy at the time of surgery appears to be a major factor causing the progression of retinopathy after cataract surgery.

Conflict of Interest: None

Source of Funding: None

References

1. Cunliffe IA, Flanagan DV, George ND, et al. Extracapsular cataract surgery with lens implantation in diabetics with and without proliferative retinopathy. *Br J Ophthalmol* 1991; 75: 9–12.
2. Pollack A, Leiba H, Bukelman A. The course of diabetic retinopathy following cataract surgery in eyes previously treated by laser photocoagulation. *Br J Ophthalmol* 1992; 76: 228–331.
3. Zheng L, Merriam JC, Zaider M. Astigmatism and visual recovery after “large incision” extracapsular cataract surgery and “small” incisions for phacoemulsification. *Trans Am Ophthalmol Soc* 1997;95:387–410; discussion 410–5
4. Flanagan DW. Progression of diabetic retinopathy following cataract surgery: can it be prevented? (Editorial). *Br J Ophthalmol* 1996; 80: 778–779.
5. Percival P. Use of heparin-modified lenses in high-risk cases for uveitis. *Dev Ophthalmol* 1991;22:80–3.
6. Zetterström C, Lundvall A, Olivestedt G. Exfoliation syndrome and heparin surface modified intraocular lenses. *Acta Ophthalmol Scand* 1992;70:91–5
7. Sheikh MS, Sheikh IS, Khan SMS, Mir S. Prevalence of type 2 diabetes mellitus among adult population of District Srinagar. *Int J Diabetes Dev Ctries* [Internet]. 2019; Available from: <http://link.springer.com/10.1007/s13410-018-0704-4>.
8. Sheikh Mohd Saleem. Modified Kappuswamy scale updated for year 2018. *Indian J Res*. 2018;7(3):6–7.
9. Antcliff RJ, Poulson A, Flanagan DW. Phacoemulsification in diabetics. *Eye* 1996;10:737–41.
10. Toyama T, Ueta T, Yoshitani M, Sakata R, Numaga J. Visual acuity improvement after phacoemulsification cataract surgery in patients aged ≥ 90 years. *BMC Ophthalmol*. 2018;18(1):280. Published 2018 Oct 29. doi:10.1186/s12886-018-0950-8
11. Henricsson M, Heijl A, Janzon L. Diabetic retinopathy before and after cataract surgery. *Br J Ophthalmol* 1996;80:789–93.
12. Wagner T, Knaflitz D, Rauber M, et al. Influence of cataract surgery on the diabetic eye: a prospective study. *Ger J Ophthalmol* 1996;5:79–83
13. Cunliffe IA, Flanagan DW, George ND, et al. Extracapsular cataract surgery with lens implantation in diabetics with and without proliferative retinopathy. *Br J Ophthalmol* 1991;75:9–12.
14. Krupsky S, Zalish M, Oliver M, et al. Anterior segment complications in diabetic patients following extracapsular cataract extraction and posterior chamber

- intraocular lens implantation. *Ophthalmic Surg* 1991;22:526–30.
15. Zaczek A, Zetterström C. Aqueous flare intensity after phacoemulsification in patients with diabetes mellitus. *J Cataract Refract Surg* 1998;24:1099–104.
16. Benson WE, Brown GC, Tasman W, et al. Extracapsular cataract extraction with placement of a posterior chamber lens in patients with diabetic retinopathy. *Ophthalmology* 1993;100:730–8.
17. Pollack A, Leiba H, Bukelman A, et al. The course of diabetic retinopathy following cataract surgery in eyes previously treated by laser photocoagulation. *Br J Ophthalmol* 1992;76:228–31.
18. Brown N, Hungerford J. The influence of the size of the lens in ocular disease. *Trans Ophthalmol Soc UK* 1982;102:359–63.
19. Sparrow JM, Bron AJ, Phelps Brown NA, et al. Biometry of the crystalline lens in late onset diabetes: the importance of diabetic type. *Br J Ophthalmol* 1992;76:428–33.
20. Sparrow JM, Bron AJ, Brown NA, et al. Auto fluorescence of the crystalline lens in early and late onset diabetes. *Br J Ophthalmol* 1992;76:25–31
21. Muller-Jensen K, Rorig M, Hagele J, et al. (Effect of cataract technique and duration of surgery on fibrin reaction after IOL implantation.) (French) *Ophtalmologie* 1997;94:38–40.
22. Levin ML, Kincaid MC, Eifler CW, et al. Effect of cataract surgery and intraocular lenses on diabetic retinopathy. *J Cataract Refract Surg* 1985;14:642–9.
23. Dowler JG, Hykin PG, Lightman SL, et al. Visual acuity following extracapsular cataract extraction in diabetes: a metaanalysis. *Eye* 1995;9:313–7.
24. Hykin PG, Gregson RM, Hamilton AM. Extracapsular cataract extraction in diabetics with rubeosis iridis. *Eye* 1992;6:296–9.