International Journal of Medical Ophthalmology

E-ISSN: 2663-8274
P-ISSN: 2663-8266
www.ophthalmoljournal.com
IJMO 2021; 3(1): 87-90
Received: 04-11-2020
Accepted: 08-12-2020

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Evaluation of outcomes of cataract surgery in diabetic and non-diabetic patients

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DOI: https://doi.org/10.33545/26638266.2021.v3.i1b.66

Abstract
Background and Aim: Poor visual outcome after cataract surgery in diabetics associated with the severity of pre-existing retinopathy and diabetic maculopathy prior to the surgery. Higher incidence of diabetes in developing countries such as India necessitates an assessment of the outcome of cataract surgery in diabetic patients. Hence this study is planned to asses and compare outcome of cataract surgery in diabetics.
Material and Methods: The present study was done to compare outcome of cataract surgery in 70 diabetics as compared to 70 non-diabetics attending department of Ophthalmology of tertiary care institute of Gujarat for the duration of one and half year. A prospective study was done Age, sex, surgical technique, follow up, pre- and postoperative best corrected visual acuity (BCVA) and post-op complications were evaluated.
Results: The mean age group of patients in diabetic group was 55.7±6.5 and 58.3±6.4 in non-diabetic group. Out of 70 patients in the diabetic group, 42 had good glycaemic control (FBS:70-100mg/dl). Remaining 28 patients had high blood sugar levels (>100mg). Hypertension though the most frequent co-morbid disease in both the groups, it's more frequent amongst diabetics as seen in this study, that is 26 compared with 16 of the nondiabetic patients. On comparing the pre-operative and post-operative visual acuity in both the groups the p value in diabetics as compared to in the Non-diabetic group was statistically significant. ($p \leq 0.05$)
Conclusion: Pre-operative diabetic retinopathy status is a major determinant of post-operative visual recovery. Monitoring postoperative progression of diabetic retinopathy severity after uneventful intraocular lens implantation may enhance visual outcome. There is a higher incidence of post-operative complications among diabetics, which can be managed conservatively.

Keywords: diabetic blood sugar, maculopathy, diabetic retinopathy, visual outcome

Introduction
Cataract is one of the leading causes of blindness across the world and is largely squeal of diabetes. It is one of the most common complications of diabetes in the eye and up to 20% of all cataract procedures are performed for diabetic patients [1]. Diabetic retinopathy is defined as progressive dysfunction of the retinal vasculature caused by chronic hyperglycaemia resulting in structural damage to the neural retina. Microaneurysms are the first ophthalmoscopically demonstrable alteration in diabetic retinopathy and are measured as the hallmark of NPDR [2]. Cataract in patients with diabetes leads to decreased visual acuity and poses difficulty in examination of the retina adequately. Hence, it is advantageous to perform cataract surgery for diagnostic and therapeutic benefits, even if there is possible associated risk of aggravating the retinopathy. Cataracts occur at an early age in diabetics compared to non- diabetics and 2-5 times more common in diabetic patients. So cataract surgery in diabetics is often done earlier. Apart from visual improvement, diabetic patients need cataract surgery for the assessment and treatment of posterior segment pathology. In India approximately 20% of all cataract surgery is done in diabetics [3].
Poor visual outcome after cataract surgery in diabetics associated with the severity of pre-existing retinopathy and diabetic maculopathy prior to the surgery. In diabetics, there is increased incidence of pigment dispersion and fibrinous reaction in the anterior chamber, development of posterior synechiae, increased risk of capsule rupture and vitreous loss. Diabetic patients are more prone to postoperative complications such as neovascular glaucoma, macular edema, severe inflammation, vitreous hemorrhage, synechiae to IOL, retinal detachment and corneal decompensation. Diabetic are more prone to develop posterior capsule opacification postoperatively

Current surgical techniques Small Incision cataract surgery (SICS) and phacoemulsification have an advantage over previously followed cataract surgeries that they allow quicker recovery of vision and lesser post-operative inflammation. The modern techniques of cataract surgery have improved results [4, 5]. Recent studies have reported favourable visual acuity after cataract surgery in diabetic patients [6-8] Cataract surgery in diabetes has good results, with high reliability and a slightly higher rate of complications than non-diabetic patients. Causes for poor visual acuity after surgery are poor preoperative visual acuity, advanced stages of diabetic retinopathy and old age [9]

Higher incidence of diabetes in developing countries such as India necessitates an assessment of the outcome of cataract surgery in diabetic patients. Hence this study is planned to asses and compare outcome of cataract surgery in diabetics.

Material and Methods

The present study was done in the 70 patients attending department of Ophthalmology of tertiary care institute of Gujarat for the duration of one and half year.

Inclusion criteria were: Patients with type 2 diabetes mellitus and Age group 40- 65 years

Exclusion criteria were: Patients with traumatic or complicated cataract, Secondary glaucoma and uncontrolled diabetes.

All patients were admitted to the hospital one day prior to surgery. Consent was obtained from patients after explaining about the study in detail and institutional ethical committee approval was taken. All these patients underwent pre-operative evaluation and complete ophthalmic examination, including a thorough history with required demographic data. Systemic evaluation was also carried out.

Ophthalmic examination included 1. Best corrected visual acuity. 2. Slit lamp examination and grading of cataract done according to LOCS III 3. IOL calculation using srk ii/t formula. 4. Posterior segment evaluation using indirect ophthalmoscopy, b- scan and oct if required. 5. Blood investigations: Rbs, Fbs, Ppbs, HbA1c, HIV and HBsAg was done.

In all patients small incision cataract surgery with posterior chamber intraocular lens implantation under peri-bulbar anaesthesia was done.

Under aseptic precautions eye was draped, a wire speculum was placed and superior rectus bridle suture was passed and clamped on to the towel. A fornix based conjunctival flap was made. Superficial sclera vessels were cauterized. A 6mm straight incision was made on the scleral 1.5 to 2mm away from the limbus. Sclero-corneal tunnel was made. A side port entry was made with paracentesis knife. Capsule is stained using trypan blue dye through the side port. A continuous curvilinear capsulorhexis was performed. Anterior chamber was entered with angled keratome Hydro-dissection was performed. Nucleus prolapsed into the anterior chamber and delivered out using either sandwich technique. Cortical matter aspired with simcoe cannula, a PMMA IOL was implanted in the capsular bag. Anterior chamber was formed with ringer lactate, side port opening was sealed by stromal hydration. Subconjunctival 0.2ml (40mg/ml) Gentamycin and 0.3ml (4mg/ml) Dexamethasone, total 0.5CC was given at end of procedure. Pressure pad was applied at end of surgery. At all subsequent visits, patients were subjected to the slit-lamp examination, fundus examination and visual acuity recording.

Statistical analysis

The recorded data was compiled and entered in a spreadsheet computer program (Microsoft Excel 2007) and then exported to data editor page of SPSS version 15 (SPSS Inc., Chicago, Illinois, USA). For all tests, confidence level and level of significance were set at 95% and 5% respectively.

On the first post-operative day, all the patients were subjected to detailed slit lamp examination and fundus examination. Visual acuity was assessed. On discharge all patients were put on corticosteroid and antibiotic combination eye drops 6 times per day, which was then tapered over a period of 6 weeks. The patients were asked to review at 1 week and 1 month from the date of surgery. At all subsequent visits, patients were subjected to the slitlamp examination, fundus examination and visual acuity recording. At all subsequent visits, patients were subjected to the slit-lamp examination, fundus examination and visual acuity recording Standardization Uveitis Nomenclature (SUN) working group. Posterior capsular opacification (PCO) was done by EPCO (Evaluation of PCO) grading.

Results

The study group consists of 70 eyes of diabetics and 70 eyes of non-diabetics that underwent small incision cataract surgery with posterior chamber intraocular lens implantation under peri- bulbar block. The mean age group of patients in diabetic group was 55.7±6.5 and 58.3±6.4 in non-diabetic group. In this study, in diabetic group 30 (42.85%) were males and 40 (57.14%) were females. Among non-diabetic 25 (35.71%) were males and 45 (64.28%) were females. Out of 70 patients in the diabetic group, 42 had good glycaemic control (FBS:70-100mg/dl). Remaining 28 patients had high blood sugar levels (>100mg). Their blood sugar levels controlled eventually and they were operated (Table 1). Majority of patients 38 were recently diagnosed diabetics with duration of disease being less than 3 years. There were about 11 patients with duration of disease being more than 10 years. Hypertension though the most frequent co-morbid disease in both the groups, it's more frequent amongst diabetics as seen in this study, that is 26 compared with 16 of the nondiabetic patients. The mean best corrected pre-operative visual acuity in both the groups was calculated in logMAR units. The mean preoperative best corrected visual acuity in the diabetic group was 1.64±0.92 and in non-diabetic group was 1.70±0.74. The final visual outcome was recorded using snellen's visual acuity chart and the values were converted to log MAR units for statistical analysis. Majority of the patients 40 in the diabetic group and 46 in the non-diabetic group had visual acuity of 6/12 or better at the end of 4 weeks of follow up. The mean post-operative best corrected visual acuity in log MAR units in the diabetic group was 0.35±0.28 and in the non-diabetic group was 0.29±0.24 on comparing the post op values in both the groups the p value was not statistically significant. ($p>0.05$) On comparing the pre-operative and post-operative visual acuity in both the groups the p value in diabetics as compared to in the Non-diabetic group was statistically significant. ($p\leq0.05$)

Table 1: Distribution of cases according to FBS

FBS	N	Percentage (%)
Normal (70-100)	42	60
High (>100)	28	40
Total	70	100

Table 2: Distribution of complications between study groups

Complications	DM Group		NDM Group	
	N	Percentage (%)	N	Percentage (%)
Acr	8	11.4	7	10
Corneal edema	10	14.2	5	7.14
Cystoid macular edema	5	7.14	2	2.85
Pco	11	15.7	4	5.71
Pigment dispersion	5	7.14	3	4.28
Striate keratopathy	6	8.5	4	5.71
Vitreous loss	3	4.28	3	4.28

Discussion

In diabetic patients, cataract is one of the major causes of blindness in developing countries. However, the exact pathogenesis of diabetic cataract development is not known. There is associated higher risk of development of complications in diabetic patients undergoing cataract surgery. However, exact incidence of these complications is still unknown [10-12]

In this study, highest numbers of patients were in the age group of 51-60 years that is in both diabetic and non-diabetic group. The mean age group of patients in diabetic group was 55.7±6.5 and 58.3±6.4 in non-diabetic group. Framingham and other eye studies indicate a 3-4 fold increased prevalence of cataract in patients with diabetes under 65 years and up-to a two-fold excess prevalence in patients above 65 years. In this study, in diabetic group 30 (42.85%) were males and 40 (57.14%) were females. Among non-diabetic 25 (35.71%) were males and 45 (64.28%) were females. The higher number of male cohort could be due to low general turn out of female patients to hospitals in this part of the world. Age and sex do not seem to have any influence on the post-operative visual outcomes or complication ratio after surgery in our study.

Out of 70 patients in the diabetic group, 42 had good glycaemic control (FBS:70-100mg/dl). Remaining 28 patients had high blood sugar levels (>100mg). Their blood sugar was controlled and they were operated. Majority of patients were recently diagnosed diabetics with duration of disease being less than 3 years. The risk for cataract formation and diabetic retinopathy is more in patients with longer duration of diabetes and in those with poor metabolic control. 5In the Chennai Urban Rural Epidemiology Study (CURES) Eye Study [13], it has been reported that there is high prevalence of Diabetic Retinopathy (DR) in those with more than 15 years of DM. Some other studies have also shown similar results [14]

Hypertension though the most frequent co-morbid disease in both the groups, its more frequent amongst diabetics as seen in this study. A similar high incidence was seen in study by Onakpoya H Oluwatoyin *et al.* [15] in which hypertension was seen in 60.9% compared with 26.1% in non-diabetic group. The other systemic co-morbidities in our study were ischemic heart disease Asthma and Hypothyroid.

In this study, majority of the patients had poor preoperative visual acuity. Lara-Smalling A *et al*. described preoperative risk factors associated with visual outcomes for diabetic patients undergoing cataract surgery and appropriate nursing interventions for these patients. Literature review of risk factors and cataract surgery outcomes in terms of complications, visual acuity, and visual functioning of diabetic patients was undertaken. Preoperative risk factors and postoperative complications, including inflammation and cystoid macular edema (CME), were also examined. To emphasize evidence of best practices, the role of the nurse as educator and advocate was further explored in terms of their impact on diabetes management of the patient to improve visual results. Previous studies have shown similar results concluding the pre-operative diabetic retinopathy status to be the most important prognostic factor following cataract extraction surgery in diabetics [16, 17]

In this study corneal edema was found in 10 and 5 of the cases in diabetic and non-diabetic groups respectively. Larsson *et al.* [18] have shown that diabetes has been associated with structural changes in corneal endothelial cells such as polymegathism and pleomorphism. The cornea has been reported to be thicker in eyes of diabetic patients than in eyes of non-diabetic subjects. In a similar study, Dowler JG *et al*., reported that if macular oedema is present at the time of cataract surgery, it would adversely influence post-operative visual outcomes [19], however none of the diabetic patients in this study cohort had macular oedema at the time of cataract.

Squirrell D *et al*., found that progression of diabetic retinopathy or macular oedema following cataract surgery were not affected by the diabetic status. In both the study and control groups, the progression of diabetic retinopathy was determined by pre-operative glycaemic control (HbA1c) [16].

Longer duration of surgery is associated with increased post-operative inflammation. Fibrinous exudates & posterior synaechiae was not found in our study compared to previous study. None of the patients in our study had anterior segment neovascularization, as reported in previous studies. On comparing the preoperative and post-operative visual acuity in both the groups the p value (<0.001) was statistically significant indicating that both the groups had good visual outcomes following surgery. This indicates that cataract surgery in diabetics without retinopathy led to favorable and comparable visual outcomes to that of non-diabetics.

Conclusion

Pre-operative diabetic retinopathy status is a major determinant of post-operative visual recovery. Monitoring postoperative progression of diabetic retinopathy severity after uneventful intraocular lens implantation may enhance visual outcome. In this comparative study, the pre-operative best corrected visual acuity was compared to the post-operative best corrected visual acuity in both the groups and the P value was statistically significant (p=0.01). Small incision cataract surgery in diabetics without diabetic retinopathy yields similar visual outcomes as non-diabetics. There is a higher incidence of postoperative complications among diabetics, so extra care should be taken intra-operatively and during post-op follow up.

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