

Comparative Evaluation of Visual Outcome of Cataract Surgery in Patients with Type-II Diabetes Mellitus with Those without Diabetes in a Rural Medical College & Hospital

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Abstract

Aim: To compare the postoperative complications and the visual outcome after cataract surgery in patients with Type-II Diabetes mellitus (DM) and those without DM operated at a rural medical college & hospital.

Material & Methods: This observational analytical prospective study was carried out in the department of ophthalmology at a rural medical & college. Two hundred and fifty patients in the age range 50 years to 70 years undergoing cataract surgery in the hospital from 1st November 2016 to 31st October 2017 were selected for the study. The patients were followed up to 30th April 2018. These patients were divided into two groups for comparison as we had to test the hypothesis that visual outcome after cataract surgery is better in nondiabetics as compared to diabetics. The present study conducted among 125 diabetic and 125 nondiabetic cataract surgery patients operated in a rural hospital.

Results: Preoperatively in present study 67 diabetics (53.6%) had visual acuity less than 6/60 and 62 non diabetic patients (49.6%) had visual acuity less than 6/60. This was statistically significant (P = 0.009). Only two patients in the diabetic group had diabetic retinopathy. Visual acuity improvement was significantly more in nondiabetics as compared to diabetics. (P=0.001)

Conclusion: Visual outcome after cataract surgery in diabetics depends on pre-existing ocular and /or systemic problems. Good outcome in diabetics can be achieved by meticulous preoperative workup and management of associated problems like diabetic retinopathy along with good glycaemic control.

Keywords: Visual Outcome, Cataract Surgery, Diabetes Mellitus.

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Introduction

Patients suffering from diabetes are two to five times more likely to develop cataract. [1] Cataractous changes progress very fast in diabetics. [2]

It is also noted that cataract develops at an earlier age in diabetics. In addition to cataract vision is affected in diabetics by other mechanisms too. Diabetes causes microangiopathy which manifests as diabetic retinopathy, nephropathy and neuropathy. Newer studies have shown that retinal neurodegeneration also occurs along with or may precede retinal vasculopathy. Retinal neurodegeneration caused by diabetes clinically manifests as reduction in retinal nerve fibre layer, ganglion cell layer and also Muller cells. It also affects colour vision and other aspects like spatial frequency and changes on electrophysiology. Diabetes not only affects the retina but also cornea, tear film and lens which lead to changes in the optical quality of the diabetic eye. [1]

In the age group 20 – 79 years approximately 424.9

million people around the world suffer from diabetes mellitus. In India the diabetic population is 72.9 million. [3]

In developing countries like India large proportion of patients with diabetes do not consult ophthalmologists unless the vision is grossly affected. They mostly present with advanced cataract. This precludes retinal assessment before cataract surgery with unsatisfactory visual outcome in cases of pre-existing retinal changes. [4]

Surgery is the treatment of choice for cataract. Intraoperative difficulties in diabetics include increased endothelial and iris pigment epithelial fragility, increased vascular leakage and inflammation, fibrin deposition, and increased vulnerability to operating microscope light injury. Postoperative problems may include increased risk of synechiae formation and pupillary block, cystoid macular oedema, increased risk of vitreous haemorrhage and

rapid development of capsular thickening. [5] Cataract surgery is known to increase the incidence of diabetic retinopathy. [6]

Many problems are encountered during cataract surgery and recovery phase in diabetic patients. Thorough preoperative assessment and treatment of diabetic retinopathy and associated problems, meticulous and precise surgical techniques, and appropriate postoperative medications, leads to excellent visual recovery just like other cataract patients. [7].

An observational, analytical, prospective study was therefore undertaken for a period of eighteen months. This was to compare the postoperative complications and the visual outcome after cataract surgery in patients with Type-II Diabetes mellitus (DM) and those without DM operated at a rural medical college & hospital.

Material & Methods

This observational analytical prospective study was carried out in the department of ophthalmology at a rural medical college hospital from 1st November 2016 to 30th April 2018 after approval by the Ethics Committee. Patients with type II diabetes mellitus and those without diabetes having cataract irrespective of its morphology were included. Patients with type I DM and those having glaucoma or any other ocular or systemic disorder that may affect the visual acuity were excluded.

Two hundred and fifty patients in the age range 50 years to 70 years undergoing cataract surgery in the hospital from 1st November 2016 to 31st October 2017 were selected for the study. The patients were followed up to 30th April 2018.

These patients were divided into two groups for comparison as we had to test the hypothesis that visual outcome after cataract surgery is better in nondiabetics as compared to diabetics. One hundred and twenty five patients were diagnosed cases of type 2 Diabetes mellitus and the rest who did not have Diabetes mellitus comprised the control group. In the selected patients relevant history was recorded and detail ocular and systemic examination was done. In the history presence of diabetes, duration of diabetes, type of diabetes and treatment history was recorded. In all diabetics record of blood sugar and HbA1c was obtained. History of any other ocular or systemic illnesses or surgery was noted. Complete blood count, urine examination for sugar, albumin and pus cells, blood sugar level estimation, HIV and HbSAg testing was done preoperatively in all patients.

A written informed consent was obtained. Oral tablet Norfloxacin 400 mg b.i.d. was prescribed for five days starting from previous night of surgery. Eyelashes of the eye to be operated were trimmed. Injection Tetanus Toxoid 0.5ml intramuscular was given and subcutaneous xylocaine sensitivity test was

done. Adequate mydriasis was achieved by using Tropicamide (0.8%w/v) and Phenylephrine hydrochloride (5%w/v) eye drops instilled prior to surgery. Bromfenac sodium 0.09% w/v eye drops were instilled every 30 minutes one hour prior to surgery. All surgeries were performed under peri-bulbar anesthesia with 4 ml of lignocaine hydrochloride 2% with 1:200000 Adrenaline + 2 ml of Bupivacaine 0.5%. In all patients povidone iodine 5 % eyedrops were instilled after anaesthesia.

Manual small incision cataract surgery with posterior chamber intra ocular lens (PCIOL) implantation was performed in all patients. Surgical complications were noted and managed. Depending upon the extent of PCR, either in the bag posterior chamber IOL, or sulcus fixated posterior chamber IOL (PCIOL), iris claw lens or anterior chamber IOL (ACIOL) were implanted. In all patient's subconjunctival gentamycin and dexamethasone was injected at the end of surgery. Pad and bandage given after instilling chloramphenicol ointment. Tablet paracetamol 325 mg and ibuprofen 400mg was prescribed.

Postoperatively antibiotic steroid eye drops (Chloramphenicol IP 4mg, Polymyxin B Sulphate BP 5000IU, Dexamethasone Sodium Phosphate IP 1mg, Phenylmercuric Nitrate IP 0.001%w/v) were instilled one hourly on first postoperative day and subsequent frequency of instillation depended on ocular inflammation. When required oral anti-inflammatory drugs were prescribed. Patients were made aware about complications if any and advised to come for follow up as and when required.

Visual acuity testing and ocular examination on the first postoperative day and findings documented. Subsequent visual acuity recording and ocular examination findings were documented one week, three weeks, three months and six months after surgery.

Statistical Analysis: The findings were subjected to analysis. Statistical Analysis was done by using SPSS Software version 26.0 (IBM, Chicago, USA). Chi square test was applied to find significant association between diabetes & visual acuity. Significance level was fixed at <0.05 .

Results

The present study conducted among 125 diabetic and 125 non diabetic cataract surgery patients operated in a rural hospital. Patients were in age range of 50 years to 70 years with mean age for diabetics 59.03 ± 10.978 and nondiabetics 60.16 ± 10.58 . (Table 1).

Preoperatively in present study 67 diabetics (53.6%) had visual acuity less than 6/60 and 62 non diabetic patients (49.6%) had visual acuity less than 6/60. This was statistically significant ($P = 0.009$). Only

two patients in the diabetic group had diabetic retinopathy. We had excluded patients with any other obvious ocular problem that is likely to reduce the visual acuity in both the groups. (Table 2)

Table 3 & 4 reveals visual acuity after cataract surgery in diabetics and non-diabetics group at day 1 & one week, three week & 3 month. Visual acuity improvement was significantly more in nondiabetics as compared to diabetics when visual acuity was examined on day one postoperative day, one week postoperative, three weeks postoperative, three months or in some cases six months post operatively. There was statistically significant difference found in visual acuity between diabetic & non-diabetic group. (P<0.001) In the present study

relative risk of postoperative visual acuity <6/60 in diabetics was estimated as 10.

Table 5 & 6 reveals Comparison of visual acuity between baseline and on day 1, 1 week, 3 weeks, 3 months in diabetics group. There was statistically significant improvement was seen in visual acuity among both the group from baseline to day 1, 1 week, 3 weeks, 3 months but improvement was significantly more in non diabetic group. (P<0.001)

Table 7 & 8 reveals intraoperative & post operative complication in diabetic & Non-Diabetic groups. In our study 25 (20%) diabetic patients and 17 (13.6%) non diabetic patients developed corneal edema post operatively.

Table 1: Demographic distribution of cases in diabetics and non-diabetics group according to age.

Age (Yrs)	Diabetic	Non-Diabetic	Total
50 – 60	73	68	141
61 – 70	52	57	109
Total	125	125	250
Chi-square Value	0.410		
Significance 'P' Value	0.52(NS)		

Table 2: Comparison of visual acuity before cataract surgery in diabetics and non-diabetics group

BCVA	Diabetic	Non-Diabetic	Total
6/6 – 6/12	0	0	0
6/18 – 6/60	58	63	121
<6/60	67	62	129
Total	125	125	250
Chi-square Value	9.340		
Significance 'P' Value	0.009(S)		

Table 3: Comparison of visual acuity after cataract surgery in diabetics and non-diabetics group at day 1 & one week.

BCVA	BCVA ON DAY 1		BCVA ON WEEK 1	
	Diabetic	Non-Diabetic	Diabetic	Non-Diabetic
6/6 – 6/12	2	16	2	16
6/18 – 6/60	84	93	84	93
<6/60	39	16	39	16
Total	125	125	125	125
Chi Square Value	9.34		29.96	
Significance 'p' value	0.009(S)		<0.001	

Table 4: Comparison of visual acuity after cataract surgery in diabetics and non-diabetics group at three week & 3 month.

BCVA	BCVA ON 3 week		BCVA ON 3 Month	
	Diabetic	Non Diabetic	Diabetic	Non-Diabetic
6/6 – 6/12	4	24	5	37
6/18 – 6/60	87	96	90	85
<6/60	34	5	30	3
Total	125	125	125	125
Chi Square Value	36.29		48.61	
Significance 'p' value	<0.001		<0.001	

Table 5: Comparison of visual acuity between baseline and on day1, 1 week, 3weeks, 3 months in diabetics group

BCVA	Baseline	On day1	On 1wk	On 3wks	On 3mths
6/6 – 6/12	0	1	2	4	5
6/18 – 6/60	58	75	84	87	90
<6/60	67	49	39	34	30
Total	125	125	125	125	125
Chi-square	-	47.62	44.02	35.72	29.44
P Value	-	<0.0001	<0.0001	<0.0001	<0.0001

Table 6: Comparison of visual acuity between baseline and on day1, 1 week, 3weeks, 3 months in non-diabetics group

BCVA	Baseline	On day1	On 1wk	On 3wks	On 3mths
6/6 – 6/12	0	5	16	24	37
6/18 – 6/60	63	91	93	96	85
<6/60	62	29	16	5	3
Total	125	125	125	125	125
Chi-square	-	29.16	18.76	9.33	6.84
P Value	-	<0.0001	<0.0001	0.009	0.033

Table 7: Distribution of cases according to intra operative complications in diabetics and non diabetics group

Intra op complication	Diabetic (n=125)	Non Diabetic (n=125)	Z Value	P value
PCR	8 (6.4)	4 (3.2)	1.19	0.24
Vitreous loss	10 (8)	3 (2.4)	2.01	0.044
Iridodialysis	2 (1.6)	2 (1.6)	0	1
Retained lens matter	3 (2.4)	2 (1.6)	0.45	0.65
Pre existing PCO	4 (3.2)	3 (2.4)	0.38	0.70
Retinal problems	2 (1.6)	0	1.43	0.15

Table 8: Distribution of cases according to post operative complications in diabetics and non diabetics group.

Post op complication	Diabetic (n=125)	Non Diabetic (n=125)	Z Value	P value
Corneal edema	25 (20)	17 (13.6)	1.36	0.17
Retained lens matter	3 (2.4)	2 (1.6)	0.45	0.65
Iris prolapse	3 (2.4)	2 (1.6)	0.45	0.65
Hyphema	3 (2.4)	2 (1.6)	0.45	0.65
IOLmalposition	2 (1.6)	1 (0.8)	0.58	0.56
Vitreous problems	7 (5.6)	4 (3.2)	0.93	0.35
Cystoid macularedema	2 (1.6)	0	1.43	0.15
PCO	4 (3.2)	3 (2.4)	0.38	0.70
PC rent	2 (1.6)	4 (3.2)	0.83	0.41
No complications	80 (64)	95 (76)		

Discussion:

Outcome of cataract surgery depends on pre-existing ocular problems as well as intra-operative and post-operative complications. Despite advances in cataract surgery, presence of diabetes is associated with more complications as compared to nondiabetics. [8]

Our study compares visual outcome in 125 diabetic and 125 non diabetic cataract surgery patients operated in a rural hospital. In our study we only compared diabetic and nondiabetic cataract patients in the age range of 50 years to 70 years (mean age for diabetics 59.03 ± 10.978 (SD 5.489) and nondiabetics 60.16 ± 10.58 , Similar study by Raj Kumar Gupta

compares 50 subjects in the age range 30 to 60 years (mean age for diabetics 52.3 and non diabetics 54.1). [9]

Pre operatively in our study 67 diabetics (53.6%) had visual acuity less than 6/60 and 62 non diabetic patients (49.6%) had visual acuity less than 6/60. This was statistically significant ($P = 0.009$). Only two patients in the diabetic group had diabetic retinopathy. We had excluded patients with any other obvious ocular problem that is likely to reduce the visual acuity in both the groups. In a study by Oluwatoyin H. Onakpoya et al [4] the preoperative best corrected visual acuity (BCVA) was <3/60 in all patients (100%) in diabetic group and in 22 (95.7%)

patients in non-diabetic group where both the study groups had advanced cataract.⁴Eight (6.4%) diabetic patients and four (3.2%) non diabetic patients had posterior capsular rent.

In an article published by Tom Barrie it is stated that intra-operatively there is an increased risk of posterior capsular rupture in diabetic patients as compared to nondiabetics.[10] Vitreous loss was significantly high in diabetic patients. Ten (8%) diabetic patients and three (2.4%) non diabetic patients had vitreous loss (P = 0.044). Tom Barrie has reported vitreous loss as a complication more common in diabetic patients as compared to non diabetic patients. [10]

Iridodialysis was noted in two (1.6 %) patients in each group which was repaired. Parikshit Gogate has reported that iridodialysis can occur in MSICS due to trauma to the base of iris. [11]

There were three diabetics (2.4%) and two non-diabetics (1.6%) in our study group who had retained lens matter. Shlomit Schaal et al have reported retained lens matter as a complication of cataract surgery in 0.18% to 1.1% patients. This can lead to severe inflammation and vision threatening complications like cystoid macular edema, glaucoma, uveitis and corneal decompensation. [12] But no such vision threatening complication occurred in our cases who had retained lens matter.

In our study 25 (20%) diabetic patients and 17 (13.6%) non diabetic patients developed corneal edema post operatively. Soichi Morikubo et al reported that post cataract surgery patients with diabetes showed increased damage to corneal endothelial cells leading to slower recovery from corneal edema as compared to non-diabetic patients. This was attributed to the corneal endothelium of eyes of diabetic patients having low reserve ability than corneal endothelium of eyes of non-diabetic patients. They also stated that eyes of diabetic patients were under more metabolic stress as compared to non-diabetic patients. [13]

Cystoid macular edema was seen in two (1.6%) diabetic patients in our study. These patients had a pre-existing moderate grade of non proliferative diabetic retinopathy and suffered posterior capsular rent with vitreous loss. Cheng et al and Pollack A et al also found presence of cystoid macular oedema significantly more in eyes with diabetic retinopathy than without retinopathy and pre operative presence of diabetic retinopathy significantly affected the post operative onset and persistence of CME.[14, 15]

In present study group PCO was noted in four diabetics and three non diabetics (p = 0.70). M R Praveen et al too have stated that there was no difference noted in diabetics and non diabetics in the development of PCO in their study of four years.

[16] In our study we found that 5 (4%) diabetic patients and 37 non diabetic patients (29.6%) patients had BCVA in the range 6/6 to 6/12 at the end of three months which was statistically significant (P < 0.0001).

Straatsma BR et al have also reported lesser number of diabetics improving to 6/12 or better than non diabetics. [17] Abdul Rashid Shaikh et al found that 87.5% of diabetic patients and 92% of non diabetics had visual acuity \geq 6/12 on first post operative day. [18]. However in our study only one patient (0.8%) in the diabetic group and five (4%) patients of the non diabetic group had vision improvement of \geq 6/12 on the first postoperative day. This could be due to corneal edema that developed post operatively and took longer time to resolve.

Conclusion

Visual outcome after cataract surgery in diabetics depends on pre-existing ocular and /or systemic problems. Good outcome in diabetics can be achieved by meticulous preoperative workup and management of associated problems like diabetic retinopathy along with good glycaemic control. Prevention and management of intraoperative complications also play a role in the visual outcome. Regular postoperative follow up can achieve timely management of arising problems that can threaten vision.

References

1. Kelkar A, Kelkar J, Mehta H, Amoaku W. Cataract surgery in diabetes mellitus: A systematic review. Indian journal of ophthalmology. 2018 Oct;66(10):1401.
2. Pollreisz A, Schmidt-Erfurth U. Diabetic cataract—pathogenesis, epidemiology and treatment. Journal of ophthalmology. 2010 Jun 17; 2010.
3. Onakpoya OH, Bekibele CO, Adegbehingbe SA. Cataract surgical outcomes in diabetic patients: case control study. Middle East African journal of ophthalmology. 2009 Apr; 16(2):88.
4. Don Minckler, MD, Arthur Astorino, MD, A.M. Peter Hamilton (FRCS, FRCOphth) Cataract surgery in patients with diabetes Volume 105, Issue 6, Pages 949–950 June 1, 1998
5. Pollack, A., Dotan, S., and Oliver, M. Course of diabetic retinopathy following cataract surgery. Br J Ophthalmol. 1991; 75: 2–8)
6. Uday Devgan, MD, FACS, FRCS (GLASG) cataract Surgery in Diabetic Patients Excellent outcomes can be achieved in these patients with appropriate attention to details. Retina Today July/August 2010
7. Haddad NM, Sun JK, Abujaber S, Schlossman DK, Silva PS. Cataract surgery and its complications in diabetic patients. In Seminars in ophthalmology 2014 Sep 1 (Vol. 29, No. 5-6, pp. 329-337). Taylor & Francis. Raj Kumar Gupta. Evaluation of

8. Raj Kumar Gupta. Evaluation of Outcome of Cataract Surgery in Diabetic and Non- Diabetic Patients: A Comparative Study at a Tertiary Care Teaching Hospital. *Int J Med Res Prof.* 2017; 3(3):422-25. DOI:10.21276/ijmrp.2017.3.3.088
9. Barrie T. Ocular complications of diabetes after cataract extraction. *The British journal of ophthalmology.* 1993 Apr;77(4):198.
10. Gogate PM, Small incision cataract surgery: complications and mini review. *Indian Journal of Ophthalmology:* 2009;57(1): 45-49
11. Shlomit Schaal, Brooke LW Nesmith, Mark A Ihnen, Motasem Al-Latayfeh Current Medical and Surgical Management of Retained Lens Fragments After Cataract Extraction *US Ophthalmic Review,* 2014;7(2):95-9.
12. Morikubo S, Takamura Y, Kubo E, Tsuzuki S, Akagi Y. Corneal Changes After Small-Incision Cataract Surgery in Patients With Diabetes Mellitus. *Archives of ophthalmology.* 2004 Jul 1;122(7):966-9.
13. Cheng H, Franklin SL. Treatment of cataract in diabetics with and without retinopathy. *Eye.* 1988 Nov 1;2(6):607.
14. Pollack A, Leiba H, Bukelman A, Oliver M. Cystoid macular oedema following cataract extraction in patients with diabetes. *British journal of ophthalmology.* 1992 Apr 1;76(4):221-4.
15. Praveen MR, Vasavada AR, Shah GD, Shah AR, Khamar BM, Dave KH. A prospective evaluation of posterior capsule opacification in eyes with diabetes mellitus: a case-control study. *Eye.* 2014 Jun;28(6):720
16. Straatsma BR, Pettit TH, Wheeler N, Miyamasu W. Diabetes mellitus and intraocular lens implantation. *Ophthalmology.* 1983;90(4):336-343.
17. Shaikh AR, Mirani AH, Memon MS, Fahim MF. Visual outcome after phacoemulsification with lens implant in diabetic and non-diabetic patients; A comparative study. *Pakistan journal of medical sciences.* 2017 May;33(3):691.