

CATARACT SURGERY AND PROGRESSION OF DIABETIC RETINOPATHY

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ABSTRACT

Patient with diabetes mellitus have a higher prevalence of lens opacity¹ and cataract development at an earlier age than non diabetic.² Cataract in diabetes mellitus decreases the visual acuity, makes posterior segment evaluation and laser treatment difficult. Several studies have shown that there is progression of diabetic retinopathy after cataract surgery. In all studies, criteria for progression of diabetic retinopathy are:

- a) progression of any form/type or stage of diabetic eye (DE), nonproliferative diabetic retinopathy (NPDR) or proliferative diabetic retinopathy (PDR) to any advanced, recurrent form/ type or stage of NPDR or PDR and
- b) development of new clinically significant macular edema (CSME) and/or worsening/ recurrent of preexisting CSME defined by Early Treatment Diabetic Retinopathy Study (ETDRS).

- More severe the preexisting diabetic retinopathy (DR), much worse the DR after cataract extraction. The progression of DR after cataract extraction is severe in Intracapsular Cataract Extraction (ICCE) than Extracapsular Cataract Extraction (ECCE) with Intraocular Lens (IOL) and Sutureless Small Incision Cataract Surgery (SICS) and Phacoemulcification.
- Progression of DR increases with complicated cataract surgery, like posterior capsular rupture (PCR), vitreous loss and prolonged surgery.
- The first 6 months period is crucial as a minimum period of follow up to detect progression of DR.
- There are other several local and systemic risk factors for the progression of DR, like hypertension, renal failure, ischemic heart disease, high cholesterol and triglyceride level, pregnancy etc.

Key Words: *Diabetic retinopathy, cataract surgery, risk factors.*

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CATARACT SURGERY AND DIABETIC RETINOPATHY

Various reports indicates that DR worsens after cataract surgery^{3,9} but Sebestyen¹⁰ found concurrent progression in the other eye also - Similar reports, after prospective study¹¹ on 205 eyes concluded that worsening of DR seems to be correlated with the natural course of the vascular disease. This study included the cases without preoperative diabetic retinopathy, untreated bilateral diabetic retinopathy and more advanced retinopathy with laser treatment.

TYPES OF CATARACT SURGERY

Now there is rapid progression on cataract from ICCE to manual phaco(SICS) and phacoemulsification. In the same way, the IOL technology also progressed from ordinary IOL to heparin coated IOLs which causes less post operative inflammation.

The ICCE and ECCE requires a large incision more trauma during nucleus delivery and more damage to blood retinal barrier in comparison to Phaco, which are responsible for more significant post operative inflammation and progressed diabetic retinopathy as well as decreased visual acuity.

Several studies had been done to show relationship between different surgical technique and progression of diabetic retinopathy which concluded that progression of DR is more in ICCE than ECCE with IOL^{4,12} and SICS and Phaco.¹³

Progression of DR increased with complicated cataract surgery (PCR, vitreous loss)^{4,13} and prolonged surgery¹³ etc.

GLYCEMIC CONTROL BEFORE CATARACT SURGERY

Various reports showed high risk factor for progression of DR is preoperative hyperglycemic (Increased glycelated hemoglobin level) condition.^{14,15,16}

PREEXISTING DIABETIC RETINOPATHY AND CATARACT SURGERY

Most of the studies showed progression in DR after cataract surgery in preexisting DR. In more severe preoperative DR, much worse DR was found post operatively.^{3,4,5,14,15,17,18}

MINIMUM PERIODS OF FOLLOW UP

There are several prospective^{5,11,17} and retrospective^{10,13,15} studies in which the first 6 month was determined as a minimum period of follow up : at weekly or fortnightly for first 3 month and 4 weekly for the next 3 month.

CYSTOID MACULAR EDEMA

Cystoid macular edema (CME) is most common after cataract extraction in diabetic patients than in nondiabetic patients^{19,20} due to synergistic effects (which is described below) and more severe CME in eyes with DR changes than those of with out DR changes.^{19,21,22} Nondiabetic patients were also included in several studies as a control for comparison of visual outcome with diabetic patients without DR and with DR changes after cataract extraction. It shows similar visual outcome in non diabetic patient and diabetic patient without DR changes eyes.

OTHER RISK FACTOR

The other risk factors for the progression of diabetic retinopathy are:

a) General

? Age

? Sex

? Duration of diabetes mellitus

? Modes of diabetes control

? Weight

? Pregnancy

b) Local factors and nature of diabetic eye etc.

c) Systemic factors

? Hypertension

? Ischemic heart disease

? Raised Cholesterol / triglycerides level

? Renal failure

? Ocular infection and inflammation

Age and duration of Diabetes Mellitus

DR increases with age and duration of DM.^{23,24} In IDDM the progression of DR was much more than NIDDM,^{4,6,16,23,25} where as it was just reverse in another study.¹⁷

Sex

In female the progression of DR was more significant than male Jaffe & Burton.^{3,17}

Local Factors

Local factors which might accounts for the sudden vasculopathic deterioration after cataract extraction are⁵:

a) The absence of an angiogenic inhibitory factor which is present in the lens.

b) Postoperative intraocular inflammation mediated by leukotrienes.

c) Reduced secretion of vaso inhibitory substances

d) Increased synthesis of the endothelium that functions as an angiogenic agent within the iris stroma.

Nature of Diabetic Eyes

In diabetic eyes the anterior segment is also affected e.g. bigger lens, steeper anterior lens curvature, more pronounced miosis, more permeable iris vessels and diabetic vasculopathy etc which collectively causes more traumatized cataract surgery and increased postoperative inflammation. Hence the local factors and the nature of the diabetic eye synergistically affect the progression of maculopathy and diabetic retinopathy.⁵ As mentioned in a retrospective study,²⁶ that visual outcome of cataract surgery in diabetics is largely determined by the degree of maculopathy. Phaco and ECCE give similar visual results.

Other nonsurgical inflammations like sarcoid uveitis, HIV infection, endophthalmitis^{27,28} etc. play an important role in the progression of DR.

Systemic Factors

There are several systemic conditions / diseases²⁵ like hypertension, elevated cholestecol and triglycerides, renal diseases, cardiovascular diseases, which might affect the course of DR. Such cases were also included in various studies.^{3,5,13,14,26,30} M. Hericson et. al.¹⁴ and Robert N Johnson et. al.³⁰ mentioned no significant difference in progression of DR. The reports of United Kingdom Prospective Diabetic study (UKPDS)³¹ accord with previous observational studies in type I, diabetes^{32,33} and demonstrate both hypertension as a risk factor for DR and beneficial effect of tight blood pressure control. In type I and II diabetes target blood pressure should be ? 130/80 mmHg. The presence

of high-normal blood pressure resulted in a prospectively higher occurrence of retinopathy and of progression of preexisting retinopathy.³⁴

There was a significant trend for increasing severity of DR and retinal hard exudates with increasing cholesterol in IDDM.³⁵ Glycated hemoglobin and diastolic blood pressure were significant descriptors of the severity of retinopathy in younger-onset-patients. Weber et. al.³⁶ found a positive relationship for triglyceride but not for cholesterol.

SUMMARY AND RECOMMENDATIONS

Most of the studies were done in small number of samples and majority of them showed progression of DR after cataract surgery. It also showed an important role of other risk factors in progression of DR.

But still there are some debatable and unanswered questions in which future study, done in large number of samples, can give more reliable answers. Some of the important debatable questions are:

1. What is the cause of progression of DR after cataract extraction? Is it natural course of the diabetic vascular disease or cataract extraction itself or a combination of these factors?
2. Role of strict control of blood pressure and blood sugar etc. in prevention of progression of DR (before and after cataract surgery). Only few studies^{30,14} have mentioned about non significant progression of DR with controlled Hypertension.
3. Sex distribution: Only Jaffe and Burton^{3,17} have shown that women are more at risk for progression of DR after cataract surgery than men.
4. Incidence of progression of DR after cataract extraction in IDDM and NIDDM.

DR is one of the major causes of incurable blindness. Proper management of diabetic patient

and DR before and after cataract surgery is helpful to preserve the vision from its deterioration and some of the important recommendations are summarized as follows:

1. It is better to postpone cataract surgery as late as possible till the patient demands clear vision or surgeon have difficulty in fundus examination or laser treatment due to cataract.
2. If laser is indicated it is better to perform this treatment before cataract surgery and if it is not possible, do laser after cataract extraction.
3. Preoperative good control of blood sugar (glycated hemoglobin level) and hypertension (> 130/80 mm of Hg) is necessary.
4. It is better to perform cataract surgery by an experienced surgeon.
5. Regular follow up after cataract surgery to evaluate progression of DR and for early laser treatment if indicated.

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