The combination of intravitreal triamcinolone injection and cataract surgery in patients with diabetic retinopathy

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List of Abbreviations

Abbreviation	Full Term
AGEs	Advanced Glycation End products
AR	Aldose Reductase
ARMD	Age-related Macular Degeneration
BCVA	Best Corrected Visual Acuity
CME	Cystoid Macular Edema
CNVM	Choroidal Neovascular Membrane
CSCR	Central Serous Chorioretinopathy
CSME	Clinically Significant Macular Edema
DD	Disc Diameter
DME	Diabetic Macular Edema
DR	Diabetic Retinopathy
ECCE	Extra Capsular Cataract Extraction
ER	Endoplasmic Reticulum
ETDRS	Early Treatment Diabetic Retinopathy Study
FFA	Fundus Fluorescein Angiography
H	Hemorrhage
HPLC	High-Pressure Liquid Chromatography
ILM	Internal Limiting Membrane
IOL	Intraocular Lens
IOP	Intraocular Pressure
IRMA	Intraretinal Microvascular Abnormalities
IV	Intravitreal
IVTA	Intravitreal Triamcinolone Acetonide
LEC	Lens Epithelial Cells
log MAR	Logarithm of the Minimum Angle Of Resolution
Ma	Micro-Aneurysm
mg	Milligram
mm	Millimeter
mmHg	Millimeter Mercury
Mw	Milliwatt
nm	Nanometer
NPDR	Non-Proliferative Diabetic Retinopathy
NSAID's	Non-Steroidal Anti-Inflammatory Drugs
NVD	Neovascularization at Disc
NVE	Neovascularization Elsewhere
OCT	Optical Coherence Tomography
PDR	Proliferative Diabetic Retinopathy
PDT	Photodynamic Therapy
PGD's	Prostaglandins
PPV	Pars Plana Vitrectomy
PRP	Pan Retinal Photocoagulation
PVD	Posterior Vitreous Detachment
RAPD	Relative Afferent Pupillary Defect
RAS	Renin–Angiotensin System
ROS	Reactive Oxygen Species
RPE	Retinal Pigment Epithelium
SD OCT	Spectral Domain OCT
TD OCT	Time Domain OCT

TIMP	Tissue Inhibitor of Metalloproteinase
TRD	Tractional Retinal Detachment
UKPDS	UK Prospective Diabetes Study
um	Micron
UPR	Unfolded Protein Response
VEGF	Vascular Endothelial Growth Factor
VKH	Vogt-Koyanagi-Harada

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Introduction

Diabetic retinopathy (DR) is the most common blinding ocular complication of diabetes mellitus (DM). Blindness usually results from diabetic macular edema, non-resolving vitreous hemorrhage and tractional retinal detachment ***(Macky et al., 2011).***

Diabetic retinopathy is a microangiopathy affecting the retinal precapillary arterioles, capillaries and venules. However, larger vessels may also be involved ***(Kanski & Bowling, 2011).***

Many studies have documented an association between diabetes and cataract, the risk of cataract increases with increasing duration of diabetes and severity of hyperglycemia ***(Raman et al., 2010).***

Cataract surgery in diabetics is indicated for visual improvement and to allow assessment of retinopathy ***(Onakpoya et al., 2009).***

The visual outcome of such surgery however, depends on the severity of retinopathy. Cataract may prevent the recognition or treatment of sight-threatening retinopathy before surgery. After surgery, vision may be impaired by macular edema and deterioration of retinopathy, severe fibrinous uveitis and capsular opacification ***(Chatterjee et al., 2004).***

It is thought that progression of diabetic retinopathy after cataract extraction, caused by cytokines, Including prostaglandin or vascular endothelial growth factor, this is released from blood–ocular barrier after cataract extraction. Breakdown of the blood–ocular barrier in diabetic eyes, particularly in eyes with DR, is known to be greater than that occur in non-diabetic eyes ***(Hayashi et al., 2009).***

Patients with pre-existing proliferative diabetic retinopathy (PDR) and/or macular edema is more likely to progress rapidly after cataract surgery, therefore preoperative panretinal photocoagulation (PRP) and/or grid laser is recommended ***(Javadi & Ghanavati, 2008)***.

The severity of cataract sometimes prevents adequate examination or laser treatment of the retina in patients with diagnosed or suspected severe non-proliferative and proliferative diabetic retinopathy. In this case, pan-retinal photocoagulation is done either during the procedure or in the early post-operative period.

If the patient has diabetic maculopathy and/or more advanced retinopathy, consider intravitreal triamcinolone or anti-VEGF at the end of the procedure to reduce macular edema ***(Rice, 2011).***

Triamcinolone acetonide is glucocoticosteroid with anti-angiogenic and anti-edematous properties.It has been for various intraocular neovascular and edematous diseases, including diabetic macular edema, proliferating diabetic retinopathy ***(Jonas, 2005).***

Giving triamcinolone before surgery as a separate procedure potentiates the progression of lens opacities associated with intraocular steroids, which could have further interference with retinopathy assessment ***(Habib et al., 2005).***

Aim of the Study

The aim is evaluation of intraoperative intravitreal triamcinolone injection during cataract surgery in cases of proliferative diabetic retinopathy associated with macular edema, diagnosed preoperatively by fundus fluorescein angiography and optical coherence tomography on affected and fellow eye.

Fluorescein Angiography

The sodium fluorescein molecule has high degree of fluorescence and the minimal penetrability of the background melanin pigment within the retinal pigment epithelium (RPE). Fluorescein dye proved to be ideal for studying retinal circulation and retinal vasculature ***(Laatikainen, 2004).***

It soon becomes obvious that FA was an important aid in both the diagnosis and study of the pathogenesis of posterior ocular diseases, such as diabetic retinopathy and other retinal vascular diseases and macular diseases, in particular.

Routine fluorescein angiography is performed using a 20% solution of fluorescein, 5 ml of which is rapidly injected into an antecubital vein.

The key point of the technique is the ability of the sodium fluorescein molecule to emit green light (wavelength of 520–530 nm) when it is stimulated by blue light (wavelength of 465–490 nm). After injection, 60% of sodium fluorescein is bound to plasma proteins, particularly to albumin. The free dye passes readily across systemic capillaries and enters the tissues and the retinal capillaries do not leak fluorescein. Loss of integrity of the blood–retinal barrier either in the endothelial cells of the retinal vessels or in the RPE permits leakage of free fluorescein into the extracellular spaces of the surrounding neurosensory retina. New vessels in the retina, choroid and iris leak profusely ***(Laatikainen, 2004).***

The main indication of fluorescein angiography:

Fluorescein angiography is used mainly for the study of abnormal ocular vasculature. The following are the main indications for Fluorescein angiography ***(Bennett, 2001):***

Diabetes mellitus:

- Detecting any significant macular edema which is not clinically obvious;
- Locating the area of edema for laser treatment;
- Differentiating ischemic from exudative diabetic maculopathy;
- Differentiating between intraretinal macroaneurysms (IRMA) and new blood vessels if clinical differentiation is difficult;
- Documentation and follow up.

How dose ocular structures determine the distribution of fluorescein angiography:

Fluorescein cannot diffuse through tight cellular junctions. These are present at two sites within the fundus:

- Retinal blood vessel endothelium
- Retinal pigment epithelium

There are two circulations within the fundus:

➢ *Choroidal circulation:*

The fluorescein freely leaks out of the fenestrated choroidal capillaries, and from there through brunche membrane. However tight junctions between retinal pigment epithelium (RPE) cells prevents dye reaching the retina

➢ *Retinal circulation:*

The retinal blood vessel endothelial cells are joined by tight junctions that prevent leakage of fluorescein into the retina (the blood retinal barrier). Any leakage from the retinal vessels is abnormal capillaries