Intraoperative Intravitreal triamcinolone acetonide injection during cataract surgery in the prophylaxis and management of macular edema in diabetics

Thesis

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Intravitreal injection of Triamcinolone acetonide during cataract surgery in the prophylaxis and management of cystoid macular edema in diabetics

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KEY WORDS

Phacoemulsification, diabetic macular edema, Intravitreal Triamcinolone injection

ABSRACT

Cataract extraction in diabetic patients is commonly indicated, both for visual rehabilitation and for improved visualization of the fundus. Unfortunately the visual prognosis for diabetic patients undergoing cataract surgery is guarded, mainly because of the risk for worsening retinopathy levels and exacerbation of macular edema

The Aim of this study is to evaluate the efficacy of intravitreal Triamcinolone acetonide injected during cataract surgery in the prophylaxis and management of postoperative macular edema following uneventful cataract surgery in diabetics.

The study included 2 groups, Group A included 15 patients divided into 2 subgroups 1)-Diabetic patients without any excising macular oedema., 2)-Diabetic patients with pre-

existing macular edema. Patients in Group A were subjected to phacoemulsification with Posterior chamber intraocular lens implantation.

Subjects and methods**: Group B included 15 diabetic patients with or without preoperatively existing macular edema including patients with previous macular laser treatment with visually significant cataract. Patients were subjected to Phacoemulsification with PCIOL implantation and Intravitreal triamcinolone injection (dose of 8 mg in 0.2 ml will be injected slowly through the inferior pars plana).**

Results: The results of this study showed that phacoemulsification with intravitreal TA in patients with CSME appears to be a safe intervention to avoid the postoperative exacerbation of the edema in patients with dense cataract precluding macular laser treatment. TA may serve as mean to control postoperative inflammation and prevent exacerbation of the macular edema. Postoperative laser treatment may be needed in some cases to augment the effect of intravitreal TA.

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Dedication

I dedicate this work to my Father to whom I owe everything I have achieved. For his love and support keep pushing me from one achievement to another . To him I am truly grateful.

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LIST OF ABBREVIATIONS

Best corrected visual activity----------BCVA
Carbonic anhydrase inhibitor----------CAI
Clinically significant macular edema---------- CSME
Cystoid macular edema----------CME
Diabetic macular edema----------DME
Early treatment diabetic retinopathy study----------ETDRS
Extracapsular cataract extraction----------ECCE
Foveal Avascular Zone----------FAZ
Fundus Fluorescein angiography----------FFA
Internal limiting membrane----------ILM
Intraocular lens ----------IOL
Intraocular pressure----------IOP
Intravitreal----------IV
Millimeter----------mm
Millileter----------ml
Millimeter mercury----------mmHg
Milliwatt----------mw
Milligram----------mg
Micron----------um
Nanometer----------nm
Non steroidal anti-inflammatory drugs----------NSAID's
Non proliferative diabetic retinopathy----------NPDR
Optical coherence tomography----------OCT
Pars plana vitrectomy----------PPV
Posterior subtenon injection----------SPT
Posterior chamber intraocular lens----------PCIOL
Prostaglandin's ----------PG's
Proliferative diabetic retinopathy----------PDR
Retinal detachment----------RD
Retinal pigment epithelium----------RPE
Standard deviation----------SD
Triamcinolone acetenoid----------TA
Visual acuity----------VA
Vascular Endothelium Growth Factor ----------VEGF

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INTRODUCTION AND AIM OF WORK

Macular edema is the most frequent cause of visual loss among patients with diabetic retinopathy. It may be present at any level of retinopathy ***(Klein A ,et al, 1984)***

The edema is caused primarily by breakdown of the inner blood retinal barrier and increase vascular permeability. Recent Studies suggest that inflammatory mediators such as Prostaglandin's (PG's) and the Vascular Endothelium Growth Factors (VEGF's), are at least partially responsible for the increased vascular permeability

Diabetic maculopathy is classified as focal maculopathy, diffuse macular edema (which can be cystoid), ischemic maculopathy, or mixed.

Cystoid macular edema is a result of accumulation of fluid in the outer plexiform and the inner nuclear layers of the retina, centered about the fovea with secondary formation of cystic spaces that can be identified either ophthalmoscopically,

angiographically, or by the use of Optical coherence tomography. ***(Bresnick GH, 1983).***

Cataract extraction in diabetic patients is commonly indicated, both for visual rehabilitation and for improved visualization of the fundus. Unfortunately the visual prognosis for diabetic patients undergoing cataract surgery is guarded, mainly because of the risk for worsening retinopathy levels and exacerbation of macular edema ***(Pollack et al, 1991).***

An important determinant of the visual outcome after cataract surgery is the severity of the preoperative maculopathy. For patients demonstrating pre-existing maculopathy, the post operative vision is often worsened by the development of a diffuse, exudative form of macular edema, particularly in women and older individuals. Cataract extraction has been shown to exacerbate or cause diabetic macular oedema (DME). Cystoid macular oedema (CME) is another common cause of poor vision in the postoperative period, and approximately 50% of patients with pre-existing maculopathy show evidence of persistent CME especially during the first few postoperative weeks (up to 6 months) ***(Pollack A et al, 1992)***

In addition, up to 50% of eyes with diabetic retinopathy but no prior DME, may develop DME following uncomplicated surgery. 30% or more of these eyes have a final visual acuity of less than 20/40.

Patients undergoing extracapsular cataract extraction experience a higher rate of maculopathy progression when compared with groups undergoing phacoemulsification. The

incidence of angiographic CME following extracapsular cataract extraction (ECCE) is 20 to 30% compared to 10 to 20% with phacoemulsification. CME following extracapsular cataract extraction was typically detected between 2 and 3 months after surgery. In phacoemulsification approach, the shorter recuperation is associated with earlier recognition of CME. Commonly the patient experiences an initial improvement in visual acuity soon after surgery then a decline in acuity as the oedema mounts. ***(Charters L, 1997).***

Treatment of cystoid macular edema is often unsatisfactory. The available treatment options include steroids given posterior subtenon or intravitreally, laser photocoagulation (grid or focal), systemic carbonic anhydrase inhibitors, and Vitrectomy. Unfortunately laser photocoagulation of the macular region failed in improving the visual outcome in a substantial group of patients, which promoted interest in other treatment methods.

Corticosteroids are known for their ability to inhibit the arachidonic pathway of which PG's are products and to down regulate VEGF's.

Stabilization of the blood retinal barrier introduces a rationale for the treatment of diabetic macular oedema. ***(Abelson MB, 1992).***

Triamcinolone acetonide is a corticosteroid that has been used locally as periocular and recently intravitreal injections for the treatment of refractory diabetic macular edema. Intravitreal injection of triamcinolone achieves highest concentration of the drug at its site of action. Animal studies have shown that the intravitreal –injected suspension maintained a depot lasting 4-6

weeks. In addition, triamcinolone has a vitreous half-life of 1.6 days compared to 2.5 hours for dexamethasone. Recent studies showed that intravitreal injection of Triamcinolone acetonide is efficient in decreasing macular edema with a transient effect lasting up to 6 months ***(Jonas JB, et al, 2001).***

Careful clinical examination of the macula with slit lamp biomicroscopy allows diagnosis of macular oedema in most cases. Still, in some cases there is difficulty in identifying macular oedema ophthalomoscopically. In these cases Fluorescein angiography and Optical Coherence Tomography (OCT) are helpful in establishing or confirming the diagnosis in addition to evaluating the degree of vascular leakage and the macular thickness ***(Nussenblatt RB, et al, 1994).***

OCT is a powerful tool for detecting and monitoring a variety of macular diseases including macular edema. It is non-contact and non-invasive imaging technique that uses infrared optical illumination. The use of optical rather than acoustic waves enables higher resolution, cross sectional retinal imaging with a measurement approaching 10 μm which enables OCT of quantifying retinal thickness in eyes with macular edema. Very subtle CME with as little as 50um increase in foveal thickness can also be detected using OCT when compared with preoperative measurements.

Serial OCT examinations have also been uses to track the evolution of macular thickening and resolution of oedema following treatment ***(Hee MR, et al, 1995).***

Fundus Fluorescine angiography (FFA) is a powerful imaging tool that has been widely used to detect integrity of blood retinal barrier, detecting signs of vessel leakage and signs of macular ischemia ***(Yannuzzi ,et al, 1988).***

AIM OF WORK:

To evaluate the efficacy of intravitreal triamcinolone acetonide injected during cataract surgery in the prophylaxis and management of postoperative macular oedema following uneventful phacoemulsification in diabetics.

REVIEW OF LITERATURE

Diabetic macular edema

Diabetic macular edema may be present at any level of retinopathy and occurs in approximately 10 % of all case with diabetes mellitus.

Diabetic macular edema is the most common cause of moderate visual loss in diabetics. The disease is now believed to be multifactorial in origin with a number of systemic factors playing a role in its pathogenesis. The macular edema in cases with underlying systemic disorders tends to be diffuse and often recalcitrant to laser photocoagulation.

Traditional concepts on the pathophysiology of DME have focused on the hypoglycemic damage to the vascular endothelium, thickening of the basement membrane, and death of retinal pericytes leading to breakdown in the inner blood-retinal barrier. **(Regillo CD,et al, 1999)**

Recent researches have identified that leakage of fluid and plasma components from the damaged vasculature is also mediated by the release of soluble vascular and inflammatory mediators, including VEGF and pro-inflammatory cytokines. Tissue hypoxia

resulting from ischemic retina also serves as a powerful stimulus for the release of these mediators **(Mettu PS, Mruthyunjaya P, 2008).**

Diabetic macular edema may present as either localized or diffuse retinal thickening, with or without deposits of intraretinal hard exudates.

Localized (focal) edema refers to a circumscribed area of retinal thickening resulting from discrete foci of leaking microaneurysms.

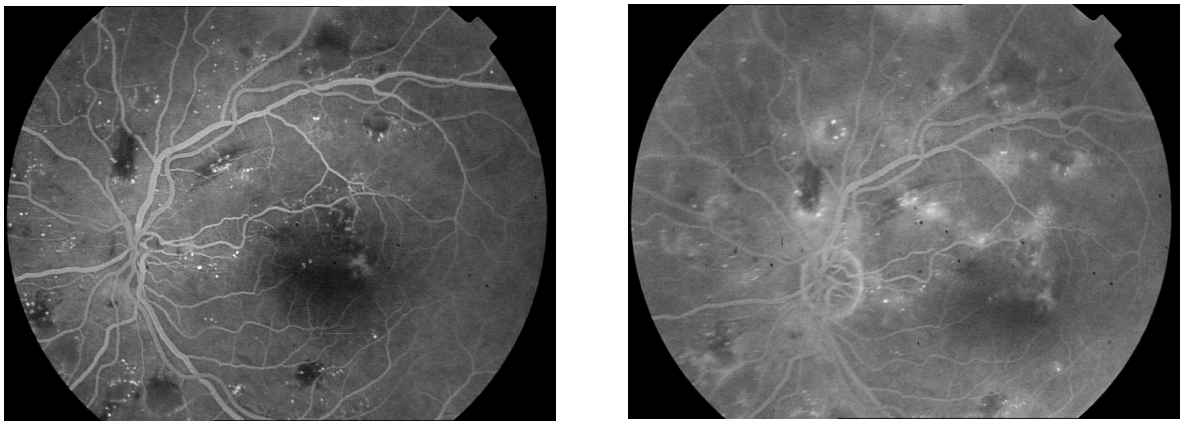

Fig (1) FFA showing non proliferative diabetic retinopathy (NPDR) with focal maculopathy.

Ischemic maculopathy is another source for central vision loss in patients with diabetic retinopathy. It represents closure or non perfusion of perifoveal capillaries and is more often seen in young type I diabetics.

Diffuse edema is more widespread retinal thickening caused by generalized leakage from abnormally permeable and dilated capillaries throughout the posterior pole.