Research article

Incidence of Cystoid Macular edema after keratoplasty
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Abstract

Aim: To evaluate the change in central macular thickness and to determine the incidence of cystoids macular edema (CME) in postkeratoplasty patients with Optical Coherence Tomography (OCT).

Introduction: CME is a known complication of ocular surgery. The postoperative visual outcome of keratoplasty patients is governed by various factors like astigmatism, graft clarity, cystoid macular edema, and postoperative glaucoma. With evolution of Optical coherence tomography topographic evaluation of retina is possible up to 10-μm axial resolution

Method: A prospective study included 23 eyes, out of which 20 eyes underwent penetrating keratoplasty (PK) and 3 eyes underwent Descemet’s Stripping Endothelial Keratoplasty (DSEK). Postoperative central Macular Thickness (CMT) analysis was done with OCT at 1, 2 and 3 month interval. CMT > 250μ, loss of foveal contour and presence of cystoids space over macula were considered as Cystoid Macular Edema (CME).

Results and conclusion:
Incidence of CME after 1 month of PK was 30%, 20% at 2 month and 10% at 3 month. One out of 4 DSEK patient developed CME. In PK group, change in CMT between 1 and 2 month was significant (p value 0.03) but there was no statistically significant difference after 2 month (p value 0.38). In DSEK group, at 1 month interval there was no statistically significant difference in CMT change (p value 0.66 and 0.33P). There was no statistically significant difference found in age matched patients of Pseudophakic bullous keratopathy compared from PK and DSEK group. Higher CMT at 1, 2 and 3 month in post triple procedure but it was not significant in comparison to other PK cases. There was a significant change in CMT between 1 month and 2 month post PK surgery, but not beyond that. CMT change in uncomplicated post Triple Surgery is same as post PK. There was no significant change in CMT in DSEK group. CMT change in PK is also related to indication of surgery. No direct relation between visual acuity and CME

Introduction:
Cystoid macular edema (CME) is a pathological response of retina to various ocular and systemic factors like ocular inflammatory disease, ocular surgeries, vascular disease etc. It leads to accumulation of extracellular fluid in between Henle’s layer and inner nuclear layer. The postoperative visual outcome of keratoplasty patients is governed by various factors like astigmatism, graft clarity, cystoid macular edema, and postoperative glaucoma.1

Traditional methods for evaluating macular edema, such as slit lamp biomicroscopy, stereoscopic photography, and fluorescein angiography, are relatively insensitive to small changes in retinal thickness and are qualitative at best.2 With evolution of Optical coherence tomography (OCT) (Stratus OCT 3, Carl Zeiss Meditec, Inc., Dublin, CA) tomographic evaluation of retina is possible up to 10-μm axial resolution.3 The advantages of OCT include high reproducibility and accuracy.

The macular thickness map scan protocol on the OCT3 was used to obtain 6 consecutive macular scans, 6 mm in length, centered on the fovea, at equally spaced angular orientations.

The reported normal average foveal thickness for Indian eyes is 149.16 +/- 21.15 micron.4 Another studies published normal foveal thickness (mean thickness in the central 1000-m diameter area) and central foveal thickness (mean thickness at the point of intersection of 6 radial scans) on the OCT3 as 212 ± 20 and 182 ± 23 micron, respectively.5

Materials and methods:
A prospective study conducted for 23 eyes of 23 patients who underwent penetrating keratoplasty (PKP) and Descemet’s stripping endothelial keratoplasty (DSEK) from August 2012 to March 2013 at C.H. Nagri Eye Hospital. We have excluded the patients with diabetes.

20 out of 23 eyes underwent PKP and 3 patients underwent DSEK. Preoperative work up for these patients included systemic evaluation for factors affecting macular thickness like diabetes mellitus, hypertension etc.

Thorough anterior segment examination was done including best corrected visual acuity (BCVA) measurement; slit lamp biomicroscopy, intraocular pressure (IOP) measurement with applanation tonometry. Any lid and ocular surface pathologies were treated first. Posterior segment evaluation was done for both eye of patient, with the help of B-scan
when fundus evaluation was not possible due to media opacity. Preoperative OCT scan was not possible due to media opacity (corneal and lenticular).

All patients of PKP were given intravenous mannitol 20% (1g/Kg body weight) one hour before the surgery. All surgeries were performed under peribulbar anesthesia.

Standard surgical technique of penetrating keratoplasty was followed. 0.5mm larger donor graft was sutured on recipient bed with 16 interrupted 10-0 monofilament nylon sutures.

Cataract extraction was combined with keratoplasty (Triple procedure) wherever required. After trephination of recipient cornea, anterior capsulotomy was performed followed by lens extraction and IOL implantation. Donor graft is sutured after maintaining the anterior chamber.

In DSEK, limbus to limbus manual dissection of corneal button was done at the depth of nearly 350 micron. A donor disc containing partial thickness stroma, Descemet’s membrane and endothelium was trephinated from the corneal button. A thorough Descemet’s scoring was done with the help of reverse Sinskey hook. The graft was inserted in the anterior chamber in a taco-like fashion and unfolding and attachment to host stroma was done by large air bubble technique. Any interface fluid was removed by massaging the corneal surface and venting incision if required.

Postoperatively all patients received topical antibiotic, topical and systemic steroid, topical cycloplegic and antiglaucoma drugs wherever required. At every visit BCVA measurement and IOP measurement was done.

The postoperative central macular thickness analysis was done with the help of OCT scan at the end of 1st, 2nd and 3rd month. The central macular thickness (CMT) is defined as the average thickness of central 1mm area. CMT more than250 micron, loss of normal foveal contour and cystoid changes in central macula were considered as evidence of cystoids macular edema in this study. The statistical analysis was performed using Mann Whitney test and t test.

**Results:**

Total 23 eyes included in this study, 20 underwent PK and 3 DSEK. PK with IOL implantation was performed for 3 patients. The mean age of PK group was 43.7+/−20.65 years (range15 - 75 years) and of DSEK group was 67.75+/−6.8 years (range 60-76 years).

All DSEK surgery was performed for pseudophakic bullous keratopathy (PBK). 7 out of 20 patients underwent PK for PBK, another 7 for corneal opacity, 2 for keratoconus and 4 for corneal ulcer.

The average CMT for DSEK group at end of 1month was 255.5+/−15micron, at end of 2months was 238.75+/−29micron and at end of 3months was 229+/−37micron. The change in CMT in DSEK group at 1 month interval was not significant (p value 0.66 and 0.33).

For PK group the average CMT at end of month 1, 2 and 3 were 246.85+/−44 micron, 216.55+/−45micron and 204.2+/−43 micron respectively. Statistically the change in CMT between 1st and 2nd month was found to be significant (p value 0.03 –Unpaired t test) but not between 2nd and 3rd month (p value 0.38 – Unpaired t test). The change in macular thickness between 1st and 3rd month was again very significant (p value 0.004 – unpaired t test).

When only patients of PBK were compared from PK group with DSEK group, the mean age of PK group was 63.14+/−13.0 years and of DSEK group were
67.75+/-.6.8 years. The statistical difference in age group between two group was not significant (p value 0.84 – Mann Whitney test). The average CMT was 240.75+/- 26.36 micron for DSEK group and 241.28+/-44.86 micron for PK group. The statistical difference in CMT between these two groups was not significant (p value 0.66 – Mann Whitney test).

Patients who underwent PK with IOL implantation had higher CMT at end of 1st(Triple - 283.66 +/- 52.91, PK - 240.35+/-41.42, p value 0.26 – Mann Whitney test), 2nd (Triple-249 +/-68 .54 PK -210.82 +/-40, p value 0.36 – Mann Whitney test)and 3rd month (Triple-223.66 +/-81.68 PK -200.76 +/-36.88, p value 0.99– Mann Whitney test) but this difference was not significant at any point of study when compared with other PK cases.

The incidence of cystoid macular edema after 1 month of PK was 30% which came down to 20% at the end of 2nd month and 10% after 3 months. None of these patients had diabetes or other systemic or ocular pathology (except for the primary indication of PK) to account for this CME. One of the 4 patients of DSEK developed cystoids macular edema.

In our study we did not find any direct relation between visual acuity and CME. Other factors like postoperative astigmatism and graft clarity play an important role.

Discussion
CME is a known complication of ocular surgery. The mechanisms by which postoperative CME has been postulated to occur include vitreomacular traction, vascular compromise, and intravitreal cytokine release from ischemia and inflammation.6

The reported incidence of postkeratoplasty CME varies in different studies.7-12 Koytak13 et al reported 43.2% patients of PK had more than 10% increase in macular thickness in their study in the follow up period of 6 months but only 10.8% of them had the CMT more than 250 micron.

In this study, the incidence of cystoid macular edema after 1 month of PK was 30% which came down to 20% at the end of 2nd month and 10% after 3 months. None of these patients had diabetes or other systemic or ocular pathology (except for the primary indication of PK) to account for this CME. Postoperative CME is a known complication of DSEK.14 In this study 1 of the 4 patients of DSEK developed cystoids macular edema.

Genevois15 et al has found that macular edema after keratoplasty seemed to be less frequent than expected (9.6%) and associated mainly with combined surgery. They evaluated 62 patients who underwent corneal transplantation till 3 month postoperatively. The higher incidence of CME post PK in our study, as compared to this study could be related to primary indication (corneal ulcer in 20% cases in our group) and as the preoperative OCT scan was not possible in these patients, pre-surgical CME cannot be ruled out.

Acar et al16 compared the postoperative macular thickness changes using OCT in eyes that underwent deep anterior lamellar keratoplasty (DALK) and PK. They found that although mean macular thickness increases and peaks around 1 month and returns back to normal levels at 6 months after PK and it does not change after DALK.

The CMT change between 1st and 2nd month of postPK was significant but not beyond that. In DSEK group, there was no significant change in CMT. This difference in CMT between two groups (PK and DSEK) may be attributed to difference in surgical procedure or the primary indication. When age matched patients of PBK were compared from both the group, the CMT change was not significant. So, this significant change in CMT in PK group has also relation with the primary indication of surgery. Koenig et7 al has reported a very low incidence of CME (1/17) in PBK patients who underwent PK.

In this study, though the CMT was higher in patient undergoing triple procedure, it was not significantly different from PK group. This is in contrast to results published by Genevois et al15, who reported a higher incidence of CME in patient of combined procedure. Vitreous disturbance is an important factor in pathology of CME. None of the patient of triple procedure in this study had vitreous loss. Kramer has also reported a higher incidence of CME (33%) in Combined Penetrating Keratoplasty eyes with vitrectomy, than those without vitrectomy(4%) as cataract surgery complicated by vitreous loss, and Keratoplasty combined with cataract surgery including vitreous manipulation, are significant predisposing factor in development of chronic CME. Hitchings et al18 considered vitreous disturbance a factor instrumental in persistence of CME but not in its inception.

There are certain limitations of this study, the most important being its small sample size especially for DSEK group. Lack of preoperative OCT scan is another limitation as preoperative increase macular thickness cannot be ruled out.
References:


