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POST OPERATIVE ENDOTHELIAL CELL LOSS AND RECOVERY: COMPARATIVE STUDY BETWEEN 3.2MM CONVENTIONAL AND 2.2 MM MICS PHACOEMULSIFICATION

Dr Vijay Mathur — MS Ophthalmology; Professor & Head of Department of Ophthalmology, Anterior Segment Micro-surgeon, Command Hospital (WC), Chandimandir.

Dr PK Chaturvedi* — MS Ophthalmology; Anterior Segment Micro-surgeon, Command Hospital (WC), Chandimandir. *Corresponding Author

Dr Nidhi Manglik — MS Ophthalmology; Consultant Ophthalmology; SVS Marwari Hospital, Kolkata.

ABSTRACT Cataract surgery using newer phacoemulsification techniques has crossed the barriers of being just a visual rehabilitative procedure. The control over the inescapable iatrogenic changes in the resultant corneal optics by successfully reducing the size of the required incision from 3.2mm to 2.2mm has placed it a level higher in reaching target refraction. In response increased surgical time and difficult intraocular surgical manipulation has emerged as recognized drawbacks. Therefore this study was conducted to compare the post op changes in corneal endothelial cell count, corneal thickness and endothelial recovery between both procedures. It was found that conventional 3.2mm phacoemulsification and coaxial 2.2mm micro-incision phacoemulsification had no significant difference in long term changes in corneal endothelium, making 2.2mm phacoemulsification an ideal procedure. Therefore expertise of duet orchestral employment of 2.2mm corneal incision with the driving advanced software may provide a better suited method in eyes with uncompromised corneas.

KEYWORDS : Phacoemulsification, endothelium, corneal thickness

Introduction

Understanding the corneal wound mechanics and its effect on the optical properties of this dynamic transparent media has turned cataract surgery into refractive procedure rather than simply clearing the obstruction in visual axis . Micro- incision Cataract Surgery (MICS) has become the rule to minimize post- operative astigmatism.[1,2] It is complimented by newer generation of Intra-ocular lenses (IOLs) designed for implantation through these micro-incisions of 2.2 mm, resulting in reduction of surgically induced astigmatism (SIA), corneal aberrations, and a morphologically stable wound.[3,4,5] Newer generation of phacoemulsification machines with improved fluidics and advanced software allow surgeons to perform this employing least of ultrasonic power.[6] It translates into increased surgery time but less ultrasonic energy dissipation for MICS as compared to conventional coaxial Phacoemulsification.[7,8] Reduced postoperative corneal astigmatism is a consistent outcome of MICS, thereby establishing it as another step forward to tackle unavoidable iatrogenic changes in astigmatism (SIA); a promise to reach closer to preoperative set target refraction.

This study was done to compare the changes in corneal endothelial cell count, corneal thickness and endothelial recovery between patients undergoing conventional 3.2mm phacoemulsification and coaxial 2.2mm micro-incision phacoemulsification.

Materials and Methods

This study was a Prospective randomized controlled trial. A total of 250 patients aged between 50 to 80 years with visually significant cataract undergoing cataract surgery were included in the study. Informed consent was obtained from all the patients prior to enrollment. Patients with cataract with nuclear sclerosis grade 2 to grade 4 and no other ocular disease were included; patients with any prior ocular surgery or disease were excluded from the study. They were randomly divided into two groups 'A' and 'B' of 125 patients each. Group A underwent 3.2mm incision Co-axial phacoemulsification whereas Group B underwent 2.2mm Micro incision Co-axial phacoemulsification. Foldable posterior chamber intra- ocular lens (PCIOL) was implanted in all patients. A comprehensive scrupulous pre operative ocular examination was carried out which included best corrected visual acuity (BCVA), with special reference to the corneal transparency, grading of cataract (the cataract was graded as per LOCS III classification). Specular microscopy with pachymetry for endothelial cell count and corneal thickness was carried out one day prior to surgery with non-contact specular microscope (Topcon SP 2000P; Topcon Corporation, Switzerland) using fixed frame technique. They underwent cataract surgery by the same surgeon with no changes in pre op medications, surgical technique, ocular visco-elastic devices, intra-operative fluids, type of intra ocular lens implanted and post operative medications. Post-operative unaided visual acuity evaluation, complete Slit lamp examination, pachymetry and specular microscopy were repeated on 7th, 28th and 42nd post-operative days. The parameters were collected, tabulated and subjected to statistical analysis using Microsoft excel software and SPSS version 11.0.1. A p value of < 0.05 was taken as significant.

Results

All the patients selected for this study were between 50-80 years of age. The mean age of patients in group A was 64.24 years and that of group B was 64.91 years. The mean pre operative endothelial cell count in Group A was 2527.44 (±339.08)/mm^2 and in Group B it was 2494.06 (±88.65)/mm^2. The difference of the above between the two groups was statistically insignificant (p-value 0 .470). The difference in the post operative mean endothelial cell counts between the two groups was found to be significant on 7th post operative day with mean count of 1995.22 (±390.86)/mm^2 in Group A and 2219.89 (±404.22)/mm^2 in Group B (p-value 0.0). The mean endothelial cell counts on the 28th post operative day were 2158.7 (±387.81)/mm^2 in Group A and 2275.08 (±395.3)/mm^2 in Group B (p-value 0.404); on 42nd post op day they were 2272.36 (±373.06)/mm^2 in Group A and 2322.72 (±383.83)/mm^2 in Group B (p-value 0.294) and were statistically insignificant (Figure 1).

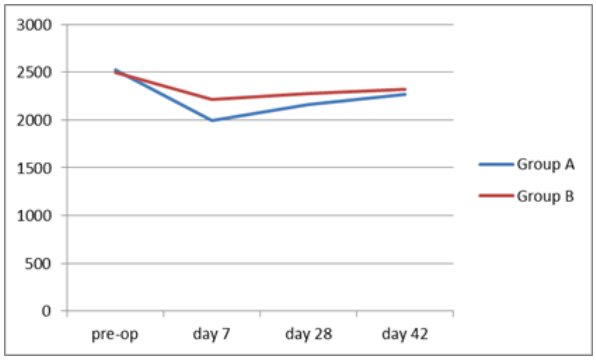

Figure 1. Mean endothelial cell count of Group A and Group B, at various pre-op and post op follow-ups.

Pre- operative corneal thickness in the two groups it was found to be 511.37 (±18.75) µm in Group A and 507.15 (±29.51) µm in Group B; the difference was statistically insignificant (p-value 0.178). The difference in corneal thickness was found to be significant on 7th post-operative day with thickness of 533.01 (±20.58) µm in Group A and 526.1 (±32.47) µm in Group B (p-value 0.046). The corneal thickness on 24th post- operative day was 522.53 (±20.68) µm and 520.04 (±31.53) µm in group A and Group B respectively (p- value 0.460) ; on

42nd post- operative day it was 515.83 ±21.82 µm and 512.68 ±31.16 µm in Group A and Group B respectively (p- value 0.355) and were statistically insignificant. (Figure 2)'

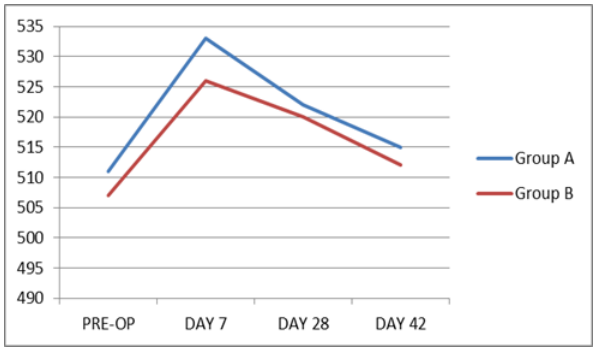

Figure 2: Mean corneal thickness in microns of Group A and Group B, at various pre-op and post op follow-ups.

The mean endothelial cell loss was also found significant on 7th post operative day to be 21.5% in Group A and 11% in Group B. This recovered to 14.6 % and 10.09% on day 24 and 42 respectively in Group A. In Group B the recovery was 8.7% and 6.8% on day 24 and 42. (Table 1)

Table 1: Mean endothelial cell loss on post operative follow-up.

	GROUP A		GROUP B	
	MEAN CELL LOSS	% CELL LOSS	MEAN CELL LOSS	% CELL LOSS
Day 7	532	21.5	275	11
Day 28	369	14.6	219	8.7
Day 42	255	10.09	172	6.8

Discussion

The study group had patients with ages ranging from 51 to 80 years. This corroborates with the age profile and longevity profile of our country.[9] The mean age of patients of group A was 64.24 years and that of group B was 64.91 years and there was no significant difference.

The pre-operative endothelial cell counts in group A and B were 2527/mm^2 and 2494/mm^2 respectively. On postoperative day 7, we find that the endothelial cell loss in Group A was more when compared to Group B. On statistical analysis the difference was found to be statistically significant. (p= 0.0). This finding does not corroborate with study done by Rita et al in 2006 which shows no significant change in the endothelial cell count even during immediate or early post op period [10]. The mean endothelial cell loss was therefore more in conventional 3.2mm phacoemulsification group than in coaxial 2.2mm MICS group on 7th, 28th, 42nd postoperative days. Our results do not support the earlier studies that postulated significant increase in endothelial cell loss with reduction in incision size due to longer surgical time and difficult instrument manipulation. This difference may be attributed to better fluidics available with the newer phacoemulsification machines. Comparing the corneal thickness between the two groups, the result paralleled the endothelial cell count. The corneal thickness was more in group A cases and was statistically significant on postoperative day7 (p= 0.0). The corneal thickness was more in group A when compared to Group B on both 28th and 42nd postoperative day also, but was statistically insignificant. Ventura et al have published in 2001 that the corneal thickness reflects the functional capacity of the endothelium, which is able to maintain corneal dehydration over a large variation of viable residual endothelial cells. Endothelial cells recover after cataract surgery to near normal functional capacity, leading to normal corneal thickness to pre- operative levels.[11]. Therefore, the post operative corneal thickness due to corneal oedema is more in conventional 3.2mm phacoemulsification group than in coaxial 2.2mm micro-incision phacoemulsification group. The above finding does not uphold the result of similar study conducted by Woon et al which concluded no significant difference in CCT and endothelial cell loss between MICS and traditional size incision coaxial phacoemulsification [12]. However, on the contrary similar findings have been noted in a study by Elkady et al which concluded reduced endothelial cell loss and corneal thickness change in MICS (1.8mm incision) when compared with Mini incision phacoemulsification through 2.2mm incision [4].

Conclusion:

In this study, we conclude that there has been a greater endothelial cell loss and increase in corneal thickness due to corneal oedema following 3.2mm conventional phacoemulsification as compared to coaxial 2.2mm phacoemulsification and the difference was significant in the early post operative period. However there is statistically insignificant difference found 06 weeks after surgery reflecting morphological and physiologic endothelial recovery. Hence, 3.2 mm and 2.2 mm phacoemulsification surgeries are equally efficacious and safe with regards to endothelial cell loss. But in special cases with compromised endothelium coaxial 2.2mm phacoemulsification may be a safer option.

References:

1. El Kady B, Alió J, Ortiz D, Montalbán R. Corneal aberrations after microincision cataract surgery. J Cataract Refract Surg 2008; 34:40-5.
2. Yao K, Tang X, Ye P. Corneal astigmatism, high order aberrations, and optical quality after cataract surgery: Micro incision versus small-incision. J Refract Surg 2006; 22:S1079-82.
3. Jiang Y, Le Q, Yang J, Lu Y. Changes in corneal astigmatism and high order aberrations after clear corneal tunnel phacoemulsification guided by corneal topography. J Refract Surg 2006; 22:S1083-8.
4. Elkady B, Piñero D, Alió JL. Corneal Incision Quality in Microincisional Cataract Surgery (MICS) vs. Micro coaxial Phacoemulsification. J Cataract Refract Surg 2009; 35:466-74.
5. Berdahl JP, De Sta feno JJ, Kim T. Corneal wound architecture and integrity after phacoemulsification: Evaluation of coaxial, micro incision coaxial, and micro incision bimanual techniques. J Cataract Refract Surg 2007; 33:510-5.
6. Shah PA, Yoo S. Innovations in phacoemulsification technology. Curr Opin Ophthalmol 2007; 18:23-6.
7. Weikert MP. Update on bimanual micro incisional cataract surgery. Curr Opin Ophthalmol 2006; 17:62-7.
8. Hoffman RS, Fine IH, Packer M. New phacoemulsification technology. Curr Opin Ophthalmol 2005; 16:38-43.
9. Praveen MR, Vasavada AR, Ghodadra B, Edelhauser HF. Corneal endothelial morphologic features in cataract and clear lens in an Indian population. Am J Ophthalmol. 2007 Dec;144(6):914-920
10. Rita Mencucci, MD, Claudia Ponchietti, MD, Gianni Virgili, MD, FabrizioGiansanti, MD, Ugo Menchini, MD Corneal endothelial damage after cataract surgery: Micro incision versus standard technique. J Cataract Refract Surg 2006 Aug; 32(8), 1351-1354.
11. AC Sobbottka Ventura, R Walti, M Bohnke. Corneal thickness and endothelial density before and after cataract surgery. Br J Ophthalmol 2001; 85:18-20.
12. Woon Hyung Ghim, MD, Yong Kyun Shin, MD and Kyong Jin Cho. J Korean Ophthalmol Soc. 2015 Jan;56(1):19-24.