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Editorial

Internal Aberrations, Sterhl Ratio, Modulation Transfer Function after Femtosecond Laser Assisted Cataract Surgery

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Received: April 08, 2020; **Published:** July 30, 2020

The aberrations of the optical system determine the quality of an image. Wavefront analysis is one method of depiction of image quality and aberrations and henceforth is mainstream in assessing aberrations on optical quality [1]. Strehl ratio, point spread function (PSF), and modulation transfer function (MTF) are determined parameters of the quality of an optical system and same applies for human eye [1-3]. The PSF indicates the extent of blurring of the retinal image. Modulation transfer function is a function of spatial frequency. An important measure of the quality of an image is its Strehl ratio, which represents the ratio of the central irradiances of the PSF with and without the aberration [3]. The present study was carried out to compare High order aberrations, Sterhl ratio, MTF and corneal aspheric aberration function after femtosecond laser assisted cataract surgery (FLACS) and traditional phacoemulsification. The Group 1 included 32 eyes FLACS by Alcon Lensex and Group 2 included 40 eyes of traditional phacoemulsification. Cases with corneal scar, history of laser or refractive surgeries, trauma, any retinopathy were excluded. AcrySof SA60AT or SN60WF (Alcon Laboratories Inc) were implanted in both groups. The IOL power was calculated using the SRK/T formula by IOL Master 500 (Carl Zeiss Meditec, Dublin, CA, version5.2.1).

Statistical analysis was performed by comparing two samples at a time using the Student t test for analysis of intraocular optical quality parameters in both study groups by STATA11 (USA). Total, corneal, and internal optical aberrations were measured using I Trace (Tracey Technologies, Hoya Ltd). All scans were taken in dilated pupil 3 weeks postoperatively. By integrating corneal topography with wavefront aberrometry, the I Trace provides a unique analysis that subtracts corneal from total aberrations in order to isolate the internal aberrations of the eye. The I trace Scan provides the MTF curves from 0 to 30 cycles per degree (cpd), obtained from aberrations for the 4.5-mm optical zone. The spatial frequencies selected were 5, 10, 15, 20, 25, 30 cpd. Main outcomes included Total internal aberrations, Strehl ratio, MTF and corneal aspheric aberration function. No statistically significant differences were found between corneal aspheric aberration function in FLACS and Traditional phaco (0.28 Vs 0.21) $p = 0.35$. There was no significant difference between best corrected distance visual acuity in both groups ($p > 0.05$). Higher order aberration (HO Total) were significantly lower in FLACS compared to traditional phaco (0.14 Vs 0.47) $p = 0.02$. The FLACS group had significantly lower values of coma ($p = 0.03$) and significantly higher Strehl ratios ($p = 0.041$) and MTF values at 5, 10, 15, 25, 30 cycles per degree ($p = 0.0013$, $p = 0.02$, $p = 0.034$, $p = 0.033$, $p = 0.044$ respectively) (Figure 1 and 2 depicting examples of itrace in Flacs and traditional phaco). Alio., et al. in their study by Nidek OPD scan in capsulorhexis done by FLACS and manual capsulorhexis in traditional phacoemulsification found statistically significant increase in Strehl ratio and MTF values at all studied cpds, lower values of intraocular vertical tilt (Z1−1) and coma aberrations (Z3−1) ($P < 0.05$) [4]. The limitations of our study includes small number of eyes, different capsulorhexis sizes and only Alcon SA60AT, SN60WF lenses were included so the results can vary with different lenses, different capsulorhexis size. I trace measures upto 30 cpd only so results at higher spatial frequency can be different and varying size of pupil could give varied values in same subject. With present study series we concluded that FLACS induces significantly less internal aberrations and higher MTF compared to traditional phacoemulsification in this subset of cases.

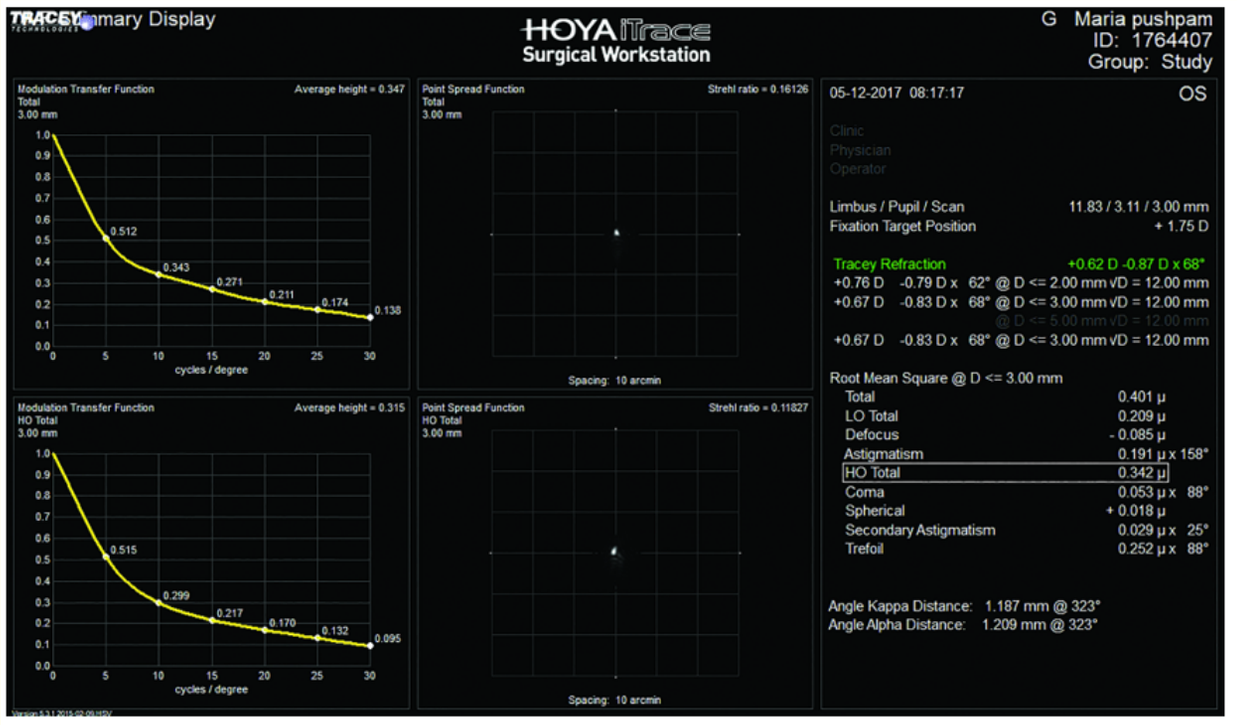

Figure 1: *Example of I TRACE showing PSF and Sterhl ratio in case of FLACS in study group 1.*

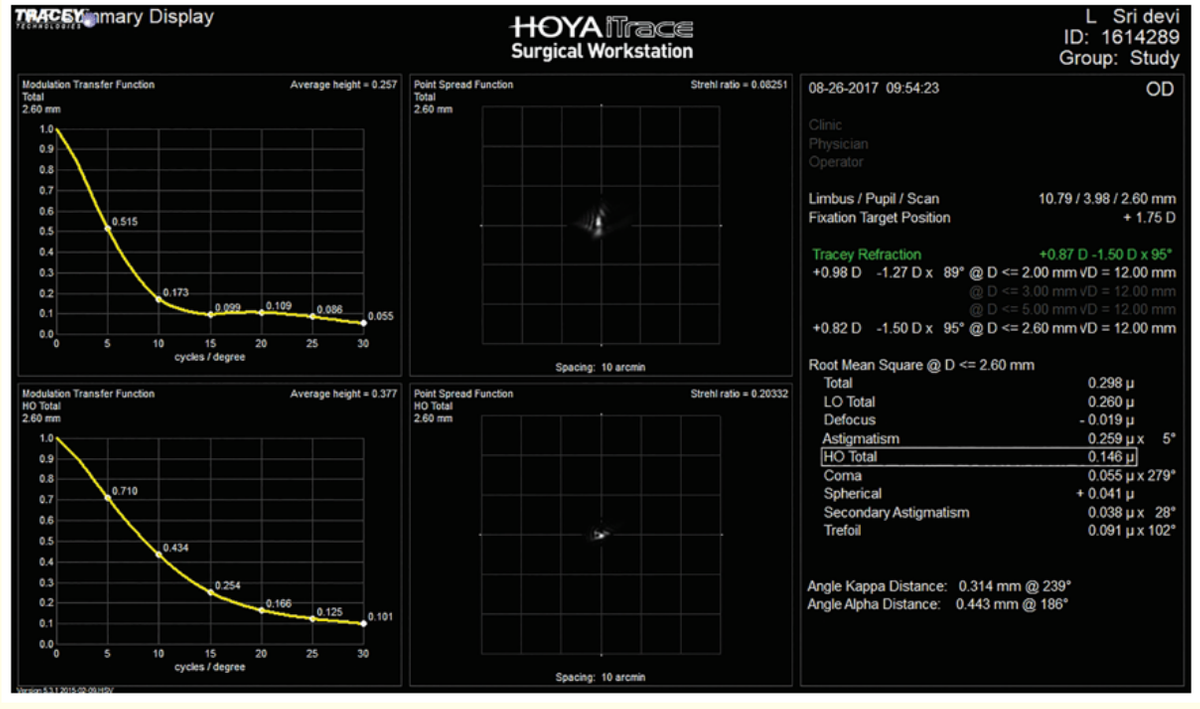

Figure 2: *Example of I TRACE showing PSF (Scattered, coma like degradation) and Sterhl ratio in case of traditional phacoemulsification in group 2.*

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Volume 11 Issue 8 August 2020