Comparison of Optical Quality of A Piggyback Multifocal IOL with that of A Primary Multifocal IOL

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Cataract surgery has slowly but surely evolved into a refractive procedure. There is more demand than ever for spectacle independence and rightly so. Along with accurate prediction of post operative refraction, assessing optical quality has gained popularity with advancements in technology. Advancements in IOLs have offered the patient multifocality; and piggyback IOLs have extended the advantages to an even larger set of patients. These IOLs can not only salvage outcomes with refractive surprises, but can also offer multifocality in a hitherto monofocal patient. Another advantage of piggyback IOLs is that the procedure is reversible and relatively easy to perform. However, advantages of these lenses are of value only if the optical quality of this system is as good as or better than that obtained by implanting a multifocal IOL in the bag.

The purpose of this case report was to retrospectively compare the visual outcomes of a IOL complex [monofocal IOL (Acrysof IQ) and a piggyback multifocal intraocular lens (Sulcoflex, Rayner)] in one eye with an apodized diffractive multifocal IOL (Acrysof ReSTOR, SN6AD1 with a near add of +3D) in the capsular bag in the other eye of the same patient.

Case Report

A 68 year old man who had undergone an uneventful cataract surgery in his right eye elsewhere with a monofocal IOL (Acrosof IQ), presented to us with a refractive surprise of -0.75 DS/-1.00 DC X 135° with a UCDVA of logMAR of 0.78 and BCDVA of logMAR 0. The left eye had a multifocal IOL with UCDVA of logMAR 0 and UCNVA of N6. As he was keen on complete spectacle independence, he subsequently underwent piggyback implantation of a Sulcoflex multifocal in the right eye (-2D, 3.5D near add). He had an UCDVA of logMAR 0 and UCNVA of N6, 1 month postoperatively.

HOA were measured using the OPD-SCAN III (Nidek) and the iTrace (Tracey Technologies, Corp) ray-tracing aberrometer. The HOA in the eye with the piggyback IOL (OD) were compared with the eye in which the primary multifocal IOL was implanted (OS). Visual quality was assessed using Optical Quality Analysis System, OQAS™ (Optical Quality Analysis System). This paper was judged the BEST PAPER of CATARACT-II Session.
System, Visiometrics S.L, Tarrasa). OQAS uses the double step technique to provide parameters to quantitatively assess the optical quality of an eye with intraocular lenses. The OSI or optical scatter index is an index of the degree of dispersion which occurs in an optical system when there is an opacity being traversed by light. It is estimated that OSI values below 1.2 correspond to eyes that produce less scattering.\(^2\) The MTF of an optical system is a function which allows for the assessment of the degree of detail the system is able to distinguish.\(^3\)

**RESULTS**

On the OPD-SCAN III higher order aberrations were worse in the eye with the piggyback IOL compared to the multifocal IOL (0.396 vs. 0.165). On the iTrace, the eye with the piggy back multifocal IOL showed higher internal as well as total aberrations as compared to the eye with the multifocal IOL. The total internal aberrations after correcting for defocus for a 2.8mm scan had an HO total of 0.215µ, spherical aberration of 0.108 with a coma of 0.155µ. In comparison the left eye had an HO total of 0.035µ, spherical aberration of -0.004 and coma of 0.024µ. The OSI on OQAS was 2.3 in the eye with the piggyback IOL while it was 0.8 in the eye with the primary multifocal IOL indicating that the primary multifocal IOL scored better on visual metrics.

**DISCUSSION**

Explanting a hydrophobic “in the bag” IOL is fraught with complications especially when the surgery has been done years earlier. There is the danger of complete luxation of the IOL with the bag, corneal endothelial damage and astigmatism induced by the larger wound required amongst others. In these cases, piggyback IOLs may be a welcome option for many.

In our study we found that the piggyback multifocal IOL scored lower on visual metrics as compared to the primary multifocal IOL. Although the patient was happy with his new found spectacle independence, he maintained that the quality of vision was better in the eye with the primary multifocal IOL. Yet, he did not face any gross difficulty in his daily activities. He was satisfied with the outcome as the refractive error for distance had been corrected and his near vision and reading ability was significantly better than reading monocularly with the ReSTOR.

The worse optical performance in the eye with the piggyback IOL may be due to the potential for increased surface reflections caused by 4 surfaces of the two IOLs in comparison to 2 surfaces of the primary multifocal IOL.\(^4\) However, recently a study published by Schrecker J et. al. found no disadvantages in reflection behavior and image quality caused by splitting the total refractive power into a system of 2 IOLs with 4 optical interfaces.\(^5\)
Conclusion
Though both the monofocal-piggyback multifocal IOL complex and the primary multifocal IOL give predictable visual outcomes, the primary multifocal IOL seems to fare better on optical quality assessment. However, piggyback IOLs may still be an exciting option for patients seeking spectacle independence after having undergone monofocal IOL implantation in the past. A detailed pre-operative counseling is of utmost importance in handling patient expectation and satisfaction. Limitation of the study of course is that it is only a single case report. Data from a larger case series may help shed more light on comparison between the two in the future.

REFERENCES