



Optical quality comparison between 2 collagen copolymer posterior chamber phakic intraocular lens designs. *Domínguez-Vicent A. et al. J Cataract Refract Surg 2015; 41:1268–1278.*

PURPOSE: The purpose of this study was to compare the in-vitro optical quality between the Visian Implantable Collamer Lenses (ICL) V4c and V5 for several powers and apertures.

Sample Description

- Two lenses of V4c model and two lenses of V5 model were measured for different powers (-3.00, -6.00, -9.50 and -10.50 D).
- The V5 is the latest release of the ICL. This lens has an optic diameter up to 6.10 mm depending on the power of the intraocular lens (IOL), and it is larger than the previous V4c model (see Table 1).

| ICL model | ICL power (D) | | | |
|-----------|---------------|-------|-------|--------|
| | -3.00 | -6.00 | -9.50 | -10.50 |
| V4c | 5.77 | 5.77 | 5.51 | 5.25 |
| V5 | 6.10 | 6.10 | 6.05 | 5.75 |

Table 1. Optical diameter (mm) as a function of the lens power and ICL model.

Methods

- The optical quality of each lens was measured in-vitro with the NIMO TR1504 (Lambda-X, Belgium) for a centered position, and the aperture used in each measurement varied with the design (V4c or V5) and the nominal power of the ICL (see Table 2).
- The description of the lens optical quality for each optical power and aperture was performed objectively in terms of the root mean square (RMS) of higher order aberrations and Strehl ratio, which were analyzed with statistical methods. Furthermore, the point spread function and image simulations were computed for -3.00 and -10.50 D to display the impact of the optical quality on an image.

What were the results?

- Both designs had negative spherical aberration, which increased with the optical power, and negligible amounts of other higher-order aberrations.
- No statistical significant differences were obtained in any RMS and Strehl ratio between the V4c and V5 for the same power and aperture.
- Minimal differences were seen in the point-spread functions and simulated images between both designs within the same aperture.

| Optical apertures | ICL power (D) | | | |
|-------------------|---------------|-----------|-----------|-----------|
| | -3.00 | -6.00 | -9.50 | -10.50 |
| 3.00 mm | V4c V5 | V4c V5 | V4c V5 | V4c V5 |
| 4.50 mm | V4c V5 | V4c V5 | V4c V5 | V4c V5 |
| 5.50 mm | V4c V5 | V4c V5 | V4c V5 | V5 |
| 6.00 mm | V5 | V5 | V5 | - |

Table 2. ICL models measured depending on power and optical aperture.

Author's conclusions

- The V4c and V5 showed good and comparable optical quality in that they should not affect the visual performance after their implantation.
- The new V5 model, which has a larger optic diameter than the V4c model, can benefit patients with larger pupils under dim light conditions.
- The current study assessed the optical quality of ICL phakic IOLs without including ocular wavefront aberrations. It should be taken into account that the patient's wavefront aberrations will affect the optical quality of the phakic IOL.



STAAR's take-home messages

- ◊ This is the first study that reports the optical quality of the V5 model.
- ◊ The potential for unwanted images and photic phenomena depend on the relative diameter of the pupil and the diameter of the IOL^{1,2}.
- ◊ The new ICL V5 is expected to reduce the incidence of night disturbances in those patients with large pupils under dim condition.

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References

1. Burk PO. Investigation of unwanted images caused by intraocular lenses. J Cataract Refract Surg. 1988; 14:334-338.
2. Aslam TM and Dhillon B. Principles of Pseudophakic Photic Phenomena. Ophthalmologica 2004; 218:4–13.