
EDITORIAL

Quality of Vision after Cataract Surgery: A Never-ending Challenge for Ophthalmologist

The journey of restoring vision through cataract surgery is a testament to the marvels of medical innovation. From the pioneering technique of phacoemulsification to the refinement of IOLs and personalized treatment plans, each advancement has contributed to transforming cataract surgery into a life-changing procedure. As technology continues to evolve, the prospect of even more precise, minimally invasive, and customizable approaches to restoring vision holds the promise of brighter futures for individuals suffering from cataracts, reaffirming the power of medical progress to illuminate lives.

Harold Ridley's invention of the intraocular lens in 1949 laid the foundation for a new era in cataract surgery. [1] The introduction of IOLs allowed for the restoration of clear vision after cataract removal, significantly improving patients' quality of life. His work opened the door to further innovations in IOL technology, such as foldable materials, advanced designs, and multifocal capabilities, which have revolutionized the field of ophthalmology.

For centuries, cataract surgery involved manually removing the clouded lens through a large incision. This method often necessitated long recovery periods and was associated with a range of complications. Phacoemulsification, introduced in the 1967 by Charles Kelman, [2] marked a paradigm shift in cataract surgery, significantly reduced surgical trauma, accelerated recovery times, and decreased the risk of complications compared to traditional extracapsular cataract extraction.

Those two ground-breaking discoveries have paved the way for ophthalmologists to significantly enhance the effectiveness of cataract surgery, but even though we can achieve surgical outcomes of 6/6 with the Snellen Chart, it doesn't necessarily mean we provide the best quality of vision for our patients. Cataract surgery then evolved into cataract refractive surgery, where further developments include innovations in preoperative and intraoperative diagnostics, femtosecond laser-assisted cataract surgery (FLACS), and a new generation of intraocular lenses (IOLs).

The development of diagnostic tools for cataracts has greatly aided the accuracy of intraocular lens (IOL) power calculations, including the presence of the latest formula from the Barrett Universal II, which is considered more accurate than other formulas in eyes with an axial length greater than 22 mm [3]. With the rapid advancement of technology in diagnostics, we now have a multitude of parameters that we use to take into consideration when selecting the most suitable type of IOL for each individual. We have come to understand that in order to provide better quality of vision after cataract surgery, we must consider factors such as tear films, corneal asphericity, angle kappa, posterior corneal astigmatism, mesopic and photopic pupil diameter, and other aspects that influence the occurrence of higher order aberrations, which can impact the quality of vision.

Currently, the IOL that we most commonly use is IOL with negative asphericity, aiming to compensate for the positive corneal asphericity, which in elderly Indonesians is 0.29 ± 0.13 micron. [4]. However, the decision to choose a negative asphericity IOL is not that

straightforward, as even a slight IOL decentration or tilt can lead to a decrease in quality of vision worse than that of an IOL with neutral asphericity. If a patient desires clear vision for distance, intermediate, and reading, the option that can be offered is a multifocal IOL and we need to consider the value of Angle Kappa. Angle kappa is difficult to measure and the functional equivalent is the Chang-Waring chord (CWC), also known as chord mu. It is a two-dimensional vector measured across the corneal surface from the center of the pupil to the coaxially sighted, subject-fixated corneal light reflex. [5]. There is no definite cut-off value of chord mu above which a diffractive multifocal IOL should not be used. Theoretical optical bench studies and in vivo testing indicate that if chord mu is greater than 0.5 mm, patients with a diffractive lens are more likely to experience noticeable visual phenomena.

The tear film is also one of the factors that plays an important role for quality of vision in post-cataract surgery. A recent study by Hutauruk et al indicates that if the non-invasive keratographic tear film break-up time (NIKBUT) value is below 9.93 seconds, patients will begin to experience visual disturbances according to the Quality of Vision questionnaire. [4].

There are numerous IOL technology available at present. Monofocal, monofocal toric, extended depth of focus (EDOF), multifocal, trifocal, and accommodating are some of the classifications used to describe optical technologies of IOL designs. Choosing the right type of IOL for each unique individual has become challenging due to the presence of various diagnostic parameters obtained from pre-operative examinations. In the future, it is hoped that artificial intelligence and big data can assist us in selecting the most suitable type of IOL based on examination results and the individual specific conditions of each individual's eyes.

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