

NOMOGRAMS TO PREDICT LENS VAULT



Efforts to avoid ICL exchange and explantation continue.

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PREDICTION OF IMPLANTABLE COLLAMER LENS VAULT BASED ON PREOPERATIVE BIOMETRIC FACTORS AND LENS PARAMETERS

Di Y, Li Y, Luo Y¹

Industry support: None

ABSTRACT SUMMARY

A retrospective study of 300 patients (300 eyes) who underwent implantation of a Visian ICL V4c (STAAR Surgical) analyzed a range of anterior segment parameters to correlate them with postoperative vault size. The goal was to establish and validate a predictive formula.

Patients were randomly and evenly divided into two groups: one for formula development and one for formula validation. Using the IOLMaster 700 (Carl Zeiss Meditec), investigators meticulously measured axial length, central corneal thickness, white-to-white distance, and lens thickness. Using anterior segment OCT, they measured anterior chamber depth (ACD), anterior chamber width, crystalline lens rise, angle-to-angle (ATA) distance, pupillary distance, angle open distance at 500 μm and 700 μm , trabecular iris space area at 500 μm and 700 μm , anterior chamber angle, and 1-week postoperative vault in the horizontal position.

All measured parameters except crystalline lens rise positively correlated with the 1-week postoperative vault. ACD was the most influential factor, followed by ICL size and ATA distance. The derived formula for predicting vault size 1 week after lens implantation was as follows: vault (mm)

$= -1.279 + 0.291 \times \text{ACD (mm)} + 0.210 \times \text{ICL V4 size (mm)} - 0.144 \times \text{ATA distance (mm)}$; $P < .001$). This formula demonstrated good agreement with actual postoperative measurements, indicating its potential utility in clinical practice to improve vault prediction.

DISCUSSION

The well-designed and well-executed study by Di et al¹ exemplifies the ongoing quest to predict the ICL vault more accurately, particularly in nonaverage eyes where standard calculations may not suffice. This need arises from a common clinical challenge: Despite meticulous preoperative measurements, postoperative complications due to inappropriate vault size can occur, necessitating an ICL exchange, rotation, or explantation.

A plethora of studies, including this one by Di et al,¹ have proposed that various anterior segment parameters are critical to predict postoperative vault accurately. Each study has

advocated for its methodology based on outcomes within specific patient cohorts. Together, they contribute to a growing but inconclusive body of literature for surgeons. For instance, the current study's¹ emphasis on ACD, ICL size, and ATA distance as primary predictors of vault size offers a refined approach to vault prediction. The diverse findings across studies, however, highlight variabilities in anatomic considerations and surgical outcomes, which are further complicated by the characteristics of the specific population evaluated, such as the predominantly Chinese cohort in this study.¹

This diversity raises concerns about the generalizability of findings across different racial and ethnic groups, given the known variability in ocular biometrics among populations. It suggests a pressing need for a universal, adaptable formula that can accommodate variations across individuals. The confusion stemming from the literature about which

STUDY IN BRIEF

- A retrospective study analyzed a large sample of Chinese patients who underwent implantation of an ICL V4c (STAAR Surgical). The research aimed to establish and validate a formula to predict the postoperative ICL vault at 1 week by examining the correlation between preoperative anterior segment parameters and the actual vault achieved.

WHY IT MATTERS

Inappropriate vault is the most common reason for ICL exchange or explantation, especially in nonaverage eyes where the standard manufacturer's calculator may fall short. This study provides surgeons with a predictive formula to refine the prediction of postoperative ICL vault.

parameters are the most critical for vault prediction necessitates a consensus

or a meta-analytical approach that synthesizes findings from various studies

to recommend a comprehensive, universally applicable predictive model.

COMPARATIVE EVALUATION OF MULTIPLE NOMOGRAMS FOR PREDICTING POSTOPERATIVE VAULT AFTER IMPLANTABLE COLLAMER LENS SURGERY

Moshirfar M, Han KD, Jaafar MA, et al²
Industry support: None

ABSTRACT SUMMARY

A retrospective study analyzed 209 eyes that underwent the implantation of an ICL (Visian V4, EVO V4c, or EVO+ V5, all from STAAR Surgical) between 2018 and 2023. The investigators focused on the prediction accuracy of various nomograms for postoperative vault. Preoperative measurements included axial length, aqueous depth, white-to-white distance, ACD, sulcus-to-sulcus (STS) distance, ATA distance, scleral spur-to-scleral spur distance, lens thickness, central corneal thickness, STS lens rise, ciliary body inner diameter, and scotopic pupillary distance.

Significant variations in the mean absolute error were found among the nomograms. The Kim, Rocamora, Russo, and Reinstein formulas performed best for predicting postoperative vaults close to actual measurements. The Russo nomogram most frequently predicted a vault within 50 μm , followed by the Reinstein within 100 μm and the Rocamora within 150 μm . Univariate linear regression analysis showed that the mean vault was positively correlated with axial length, ACD, aqueous depth, anterior chamber angle, and pupillary distance and negatively correlated with sphere, STS lens rise, ciliary body inner diameter, and lens thickness. ACD emerged as the most significant predictor in multivariate regression analysis, highlighting the parameter's importance in ICL sizing.

DISCUSSION

This study complements that by

Di et al¹ by directly addressing the challenge of navigating the plethora of ICL sizing nomograms available. Moshirfar et al² sought to discern which nomogram provided the most accurate and practical approach for predicting postoperative vault. The comparison of nearly all available ICL sizing nomograms offers a valuable guide for clinicians and highlights the superiority of certain nomograms such as the Kim, Rocamora, Russo, and Reinstein over others. This comparison is crucial because it not only seeks to identify the most accurate nomograms but also considers the practicality of their use in clinical settings.

The variety of nomograms available, and the different parameters they prioritize, reflects the complexity of accurately predicting postoperative vault and the potential difficulty in applying these models universally. Some nomograms require measurements that may not be readily available in all practice settings owing to a lack of specific equipment, which is another obstacle for surgeons aiming to use these tools effectively.

Together, the studies by Di et al¹ and Moshirfar et al² highlight a significant issue in ICL implantation: the

need for a universally applicable, easy-to-use predictive model that can accommodate the variability in ocular anatomy across different patient populations. ■

1. Di Y, Li Y, Luo Y. Prediction of implantable collamer lens vault based on preoperative biometric factors and lens parameters. *J Refract Surg.* 2023;39(5):332-339.
2. Moshirfar M, Han KD, Jaafar MA, et al. Comparative evaluation of multiple nomograms for predicting postoperative vault after implantable collamer lens surgery. *J Cataract Refract Surg.* 2024;50(1):64-71.

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STUDY IN BRIEF

- ▶ A retrospective analysis evaluated the accuracy of nine to 12 different sizing nomograms for the Visian V4, EVO V4c, and EVO+ V5 ICLs (all from STAAR Surgical). The goal was to identify the most reliable formulas for vault predictability and which preoperative measurements are most predictive of vault size.

WHY IT MATTERS

Vault issues are the main cause of postoperative complications after ICL implantation. Comparing different ICL sizing nomograms helps to identify the most effective formulas for predicting postoperative vault and the key anterior segment parameters essential for accurately predicting ICL size.