# New generation IOL Superformulas for perfecting Cataract surgery outcome: Comparing IOL Power predictions using "IOL-cal.com" with traditional formulas Integrated in Medisight

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## Introduction

Achieving accurate intraocular lens (IOL) power prediction is essential for optimal postoperative vision following cataract surgery. Traditional IOL formulas such as SRK/T, Hoffer Q, and Holladay are generally reliable in eyes with average axial length but often show reduced accuracy in eyes at the extremes of biometric values, such as very short (hyperopic) or long (myopic) eyes.

Emerging "super formulas" available on platforms like IOL-cal.com, which incorporate advanced modelling and artificial intelligenc, offer the potential for more precise refractive predictions across a wide range of axial lengths. IOL-cal.com, developed and maintained by Dr Uday Devgan integrates next generation "superformulas" using AI and modern regression to improve prediction accuracy. Especially valuable for:

- Hyperopic eyes (<22.0 mm)
- High myopic eyes (>26.0 mm)

This study aims to compare the accuracy of IOL-cal.com with traditional formulas across different axial length groups. The goal is to evaluate whether IOL-cal.com offers a significant advantage, particularly in eyes with challenging biometric profiles.

## Methodology

A retrospective analysis was conducted on an initial dataset of 100 eyes from 100 patients who underwent uncomplicated phacoemulsification cataract surgery under 2 surgeons with monofocal IOL implantation working on steep axis.

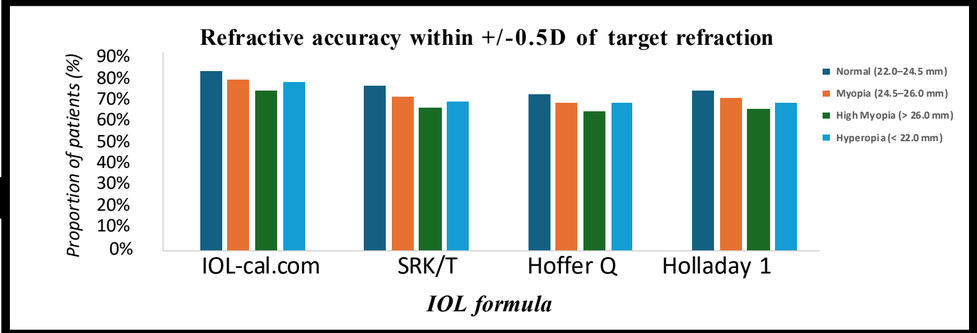
Patient Grouping Based on Axial Length (AL)
Patients were stratified into four biometric subgroups to allow focused comparison. Normal AL 22.0 – 24.5 mm, Myopia > 24.5 – 26.0 mm, High Myopia > 26.0 mm, Hypermetropia (Short AL) < 22.0 mm

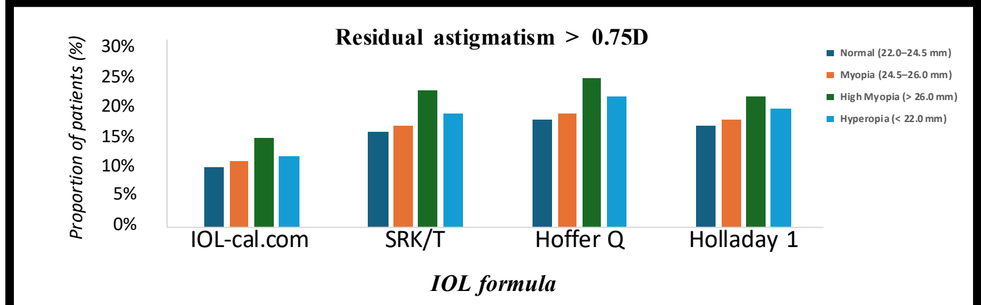
This stratification enables evaluation of IOL power formula performance across a spectrum of ocular anatomy, particularly in eyes with biometric extremes (high myopia and hyperopia), where traditional formulas often underperform.

## Results

**Mean Absolute Prediction Error (MAE)**

| | IOL-cal.com | SRK/T | Hoffer Q | Holladay 1 |
|---|---|---|---|---|
| Normal (22.0–24.5mm) | 0.34 D | 0.39 D | 0.42 D | 0.40 D |
| Myopia (24.5–26.0 mm) | 0.36 D | 0.45 D | 0.49 D | 0.46 D |
| High Myopia (> 26.0 mm) | 0.40 D | 0.49 D | 0.54 D | 0.52 D |
| Hyperopia (< 22.0 mm) | 0.36 D | 0.45 D | 0.50 D | 0.48 D |




## Summary of Findings

IOL-cal.com consistently demonstrated the lowest MAE across all axial length subgroups. The difference was statistically significant ($p < 0.05$), particularly in high myopic and hyperopic eyes.

IOL-cal.com achieved the highest rate of patients within ±0.5 D of target refraction across all groups, most notably outperforming others in the high myopia subgroup.

The lowest rates of residual astigmatism were seen with IOL-cal.com across all biometric categories. The benefit was most pronounced in high myopia, where traditional formulas had significantly higher astigmatism rates.

## Clinical Relevance

- Precision Across All Eyes: Advanced AI-driven formulas (Kane, Barrett, Ladas) improve IOL power accuracy, especially in eyes with atypical biometry.
- Fewer Surprises: Lower prediction errors mean less need for corrective lenses or secondary procedures.
- Faster, Smarter Decisions: Simultaneous multi-formula comparisons streamline workflow and boost confidence.
- Better Outcomes, Happier Patients: Improved predictability supports premium IOL use and enhances patient communication.
- Future-Ready Practice: Aligns with the shift toward refractive outcomes in modern cataract surgery.

The integration of advanced IOL calculation platforms like IOL-cal.com into everyday workflow brings several tangible benefits to day-to-day practice

## Conclusion

IOL-cal.com, utilizing advanced formulas like Kane and Ladas, significantly outperforms traditional methods (SRK/T, Hoffer Q, Holladay 1) across a range of axial lengths—especially in myopic and hyperopic eyes—resulting in improved refractive accuracy, fewer postoperative surprises, and greater patient satisfaction. Its integration into routine cataract surgery enhances precision, efficiency, and alignment with modern refractive goals. However, further studies are needed to validate its performance in post-refractive surgery eyes and with multifocal or premium IOLs, which are less commonly used in NHS settings.

## Reference

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