Comparison of Early Experience With Intraoperative Wavefront Aberrometry IOL Power Calculations in Laser-Assisted Versus Conventional Cataract Surgery

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Background

Wavefront abberometry and Femtosecond laser treatment have well established advantages when used alone. But research has not addressed the advantages and disadvantages of using the two technologies in conjunction.

- Advantages of Intraoperative Wavefront abberometry:
  - More accurate IOL power calculations[1]
  - Improved accuracy with Toric Lens placements[2]
- Advantages of Femtosecond Laser treatment in Cataract Surgery:
  - Consistent spherical capsulotomies allowing for precise IOL placement and better postoperative visual outcomes[3]

Identifying the problem

Surgical experience has shown that there is a greater degree of postoperative myopia in laser assisted cataract surgery with intraoperative IOL calculations, than in conventional cataract surgery.

- Potential reason for findings:
  - Femtosecond lasers require a patient interface that places pressure on the cornea.
  - This pressure temporarily deforms the cornea
  - The deformity creates an artificially flatter surface during surgery leading overestimated intraoperative IOL power calculations.

Methods:

Retrospective Surgical Outcome Analysis

- Two study groups:
  - LACS = Femtosecond laser (LenSx or Victus) assisted cataract surgery
  - CCS = Conventional Cataract Surgery
- Inclusion Criteria:
  - No previous refractive surgery (virgin eyes)
  - Postoperative target: Plano
  - IOL model: AKREOS MI60L (Baush & Lomb)
  - Surgeon: R. J. Weinstock, MD (Eye Institute of West Florida)
- Data Collection:
  - Preoperative IOL calculations made by IOL Master (Carl Zeiss; Meditec, Dublin, CA)
  - Intraoperative IOL calculations performed by ORA Intraoperative Wavefront Abberometer (WaveTec Vision Systems, Inc.; Aliso Viejo, CA).
  - Outcomes: postoperative Manifest Refraction (POMR) one to fifteen weeks postoperatively.

Results:
Pre and Intra-Operative comparison

	LACS (N=53)	CCS (N=45)	*Independent Sample t-test*
ORA pwr	19.24 (±3.38)	18.48 (±5.12)	*p = 0.393*
PreOP pwr	19.62(±3.13)	18.58 (±5.19)	*p = 0.241*
Paired sample T-test	***p < 0.001***	*p = 0.323*	—

Statistical difference between ORA and PreOP power calculations was found only for the LACS group. All other differences were statistically insignificant.

Results: Postoperative Outcomes

	LACS (N=53)	CCS (N=45)	*Independent Sample t-test*
PO SE (by POMR)	-0.251 D (±0.395 D)	-0.248 D (±0.409 D)	*p = 0.971*
Predicted PO SE (if ORA IOL power implanted in all cases)	-0.666 D (±0.622)	-0.470 D (± 0.597)	***p = 0.116***
Paired sample T-test	***p < 0.001***	***p < 0.001***	—

- **Actual postoperative visual outcomes were similar.**
- **Had the ORA lens been selected in each surgery:**
  - **Both groups would have a greater degree of postoperative myopia.**
  - **The LACS group would have been more significantly affected.**

Conclusions

- Intraoperative IOL power calculations were less consistent with preoperative calculations in the eyes that underwent LACS than in CCS.
- Had the ORA suggested lens been used in each case, the LACS group would be more myopic post operatively than the CCS group.

Discussion

- To improve accuracy and consistency, algorithms must be revised to account for the corneal deformation induced by Femtosecond laser pretreatment.
- Until algorithms improve, surgeons must rely on experience when deviating from preoperative IOL power calculations based on intraoperative readings.

Work Cited

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