Effective Lens Position & Refractive Outcomes of Complex IOL Fixation Techniques

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INTRODUCTION

Various IOL fixation techniques may be used:

- In the presence of compromised capsular integrity
- When an implanted IOL has been subluxed
- When a patient has been left aphakic

Post-operative refractive results based on pre-operative measurements

- Formulaic calculations estimate for non-complicated "in-the-bag" IOL placement
- Assumed effective lens position (ELP)
  - Distance from the anterior corneal vertex to the anterior surface of the IOL
- Limited post-operative refractive data exists for complex IOL fixation techniques

Purpose

- To describe effective lens position and post-operative refractive outcomes for:
  - in-the-bag, iris-fixated anterior chamber IOLs (ACIOL), sulcus, optic capture, reverse optic capture, scleral sutured, iris-fixated posterior chamber IOLs (PCIOL), and IOLs with capsule tension ring (CTR) or capsular tension segment (CTS) use

METHODS

Study Design and Population

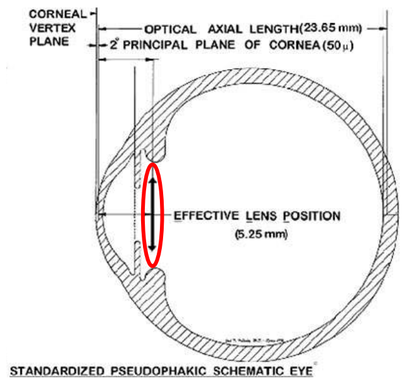
- Retrospective cohort study
- 212 eyes of 192 patients from February 2007 to August 2019 at a single institution
- Preoperative IOL master and postoperative month 1 refraction and anterior segment OCT obtained

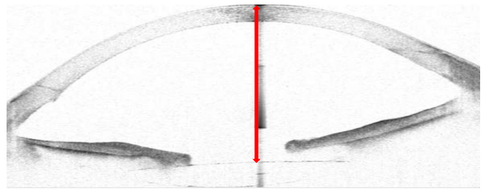
Outcome Measures

- Effective Lens Position (mm ± SD)
- Mean Arithmetic Error (MArE; D ± SD)
- Groups were analyzed using one-way analysis of variance (ANOVA)

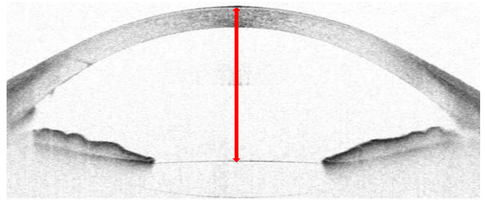
RESULTS

Characteristic	n = 212
Mean Age (y) mean ± SD	65.8 ± 14.1
Male, n (%)	96 (45%)
Right Eye, n (%)	108 (51%)
IOL Fixation Technique	
In-the-bag	41 (19%)
Iris-fixated ACIOL	35 (17%)
Sulcus	39 (18%)
Optic capture	36 (17%)
Reverse optic capture	22 (10%)
Scleral sutured	13 (6%)
CTR/CTS	20 (9%)
Iris-fixated PCIOL	6 (3%)
Keratometry (K1/K2;D)	
In-the-bag	43.90/44.89
Iris-fixated ACIOL	42.80/44.54
Sulcus	43.60/44.26
Optic capture	43.19/44.13
Reverse Optic Capture	43.51/44.39
Scleral Sutured	42.91/44.72
CTR/CTS	41.56/43.11
Iris-fixated PCIOL	42.78/43.39
Anterior Chamber Depth (mm)	
In-the-bag	3.09 ± 0.74
Iris-fixated ACIOL	4.20 ± 0.82
Sulcus	4.20 ± 0.97
Optic capture	3.82 ± 0.78
Reverse Optic Capture	3.47 ± 0.64
Scleral Sutured	3.62 ± 0.75
CTR/CTS	3.15 ± 0.51
Iris-fixated PCIOL	4.27 ± 0.82

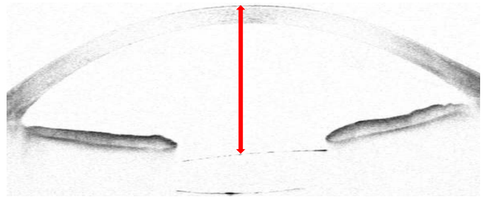




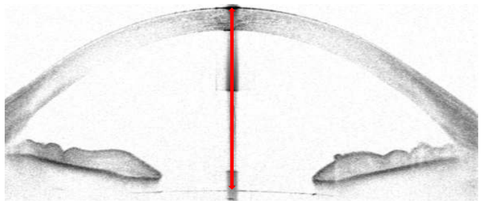
In-the-bag



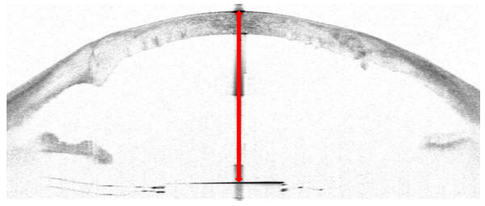
Sulcus



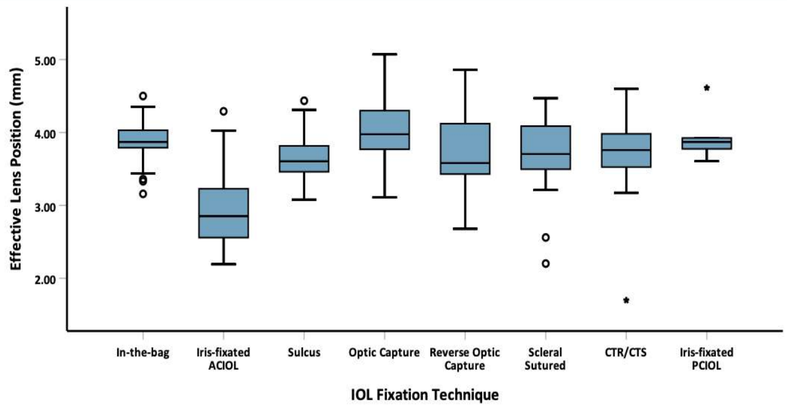
Optic Capture



Reverse Optic Capture



Scleral Sutured



IOL Fixation Technique	ELP (mm ± SD)	MArE (D ± SD)
In-the-bag	3.88 ± 0.29	-0.39 ± 0.83
Iris-fixated ACIOL	2.96 ± 0.53	-0.51 ± 0.85
Sulcus	3.66 ± 0.34	-0.92 ± 1.10
Optic capture	4.02 ± 0.42	-0.24 ± 1.08
Reverse optic capture	3.66 ± 0.51	-0.43 ± 0.84
Scleral sutured	3.59 ± 0.63	-0.97 ± 1.39
CTR/CTS	3.71 ± 0.61	-0.03 ± 0.99
Iris-fixated PCIOL	3.94 ± 0.35	-1.24 ± 1.08

- Iris-fixated ACIOLs have the lowest ELP (p<0.001)
- Optic capture has higher ELP relative to sulcus placement (p=0.02)
- Sulcus & CTR/CTS had the greatest difference in refractive outcome (p=0.03)
- Optic capture & in-the-bag closest in both ELP & refractive outcome

CONCLUSIONS

- IOL fixation techniques have an effect on ELP and ultimate refractive outcome, which should be taken into consideration when planning complex IOL fixation to optimize visual outcome

REFERENCES

1. Holladay JT. Refractive power calculations for intraocular lenses in the phakic eye. 1993 Jul 15;116(1):63–6.
2. Osher RH. Adjusting intraocular lens power for sulcus fixation. Journal of Cataract & Refractive Surgery. 2004 Oct;30(10):2031–1.
3. Gimbel HV, DeBroff BM. Intraocular lens optic capture. Journal of Cataract & Refractive Surgery. 2004 Jan;30(1):200–6.