Post-LASIK Multifocal Intraocular Lens Implantation after Pars Plana Vitrectomy

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Financial Disclosure

- The author certifies that I have no commercial associations that may pose a conflict of interests in connection with this presentation.

Purpose

- To evaluate the accuracy of intraocular lens power calculation in cases of post-LASIK multifocal intraocular lens(IOL) implantation after pars plana vitrectomy(PPV).

Methods

- We reviewed two eyes of two patients implanted with AcrySof® ReSTOR® D1 who had previous LASIK surgery.
- One patient (Case 1) was conducted phacovitrectomy for cataract and epiretinal membrane.
- The other patient (Case 2) were conducted phaco surgery after PPV for rhegmatogenous retinal detachment.
- The clinical outcomes were evaluated 1 and 2 months postoperatively and consisted of distant, intermediate, and near visual acuity regarding to the accuracy of IOL power calculation.

Case 1

Name:
ID:
Date of Birth: 07/02/1952
Exam Date: 12/26/2012
Eye Surgeon: **savit eye hospital**

Formula: Haigis-L (myopic)
Target Ref.: plano
n: 1.3375

ZEISS

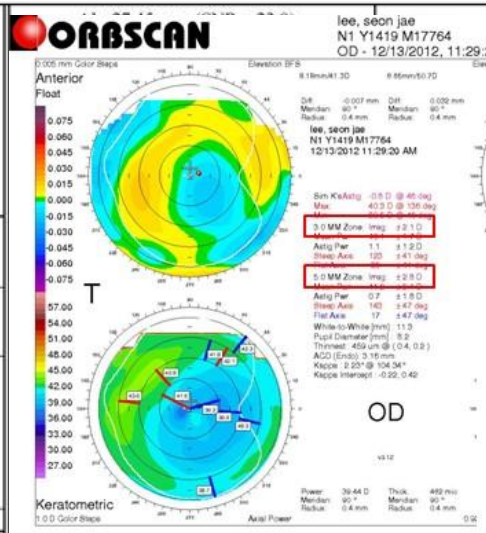
The readings should be checked for plausibility, as there might be pathological changes.
Valid for myopic LASIK/LASEK/PRK only! Do not use after RK or hyperopic treatments!

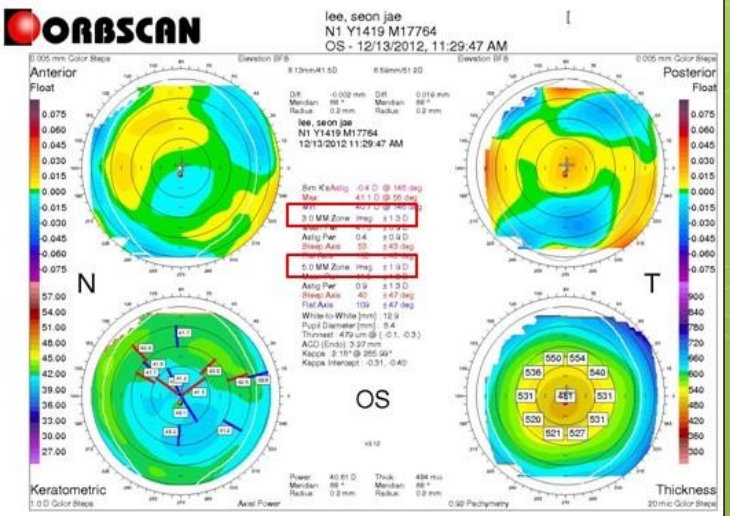
OD
right

AL: 27.27 mm (SNR = 128.0)
K1: 38.22 D / 8.83 mm @ 38°
K2: 38.93 D / 8.67 mm @ 128°
R / SE: 8.75 mm / 38.58 dpt
Cyl.: -0.71 D @ 38°
opt. ACD: 3.77 mm

Eye Status: phakic

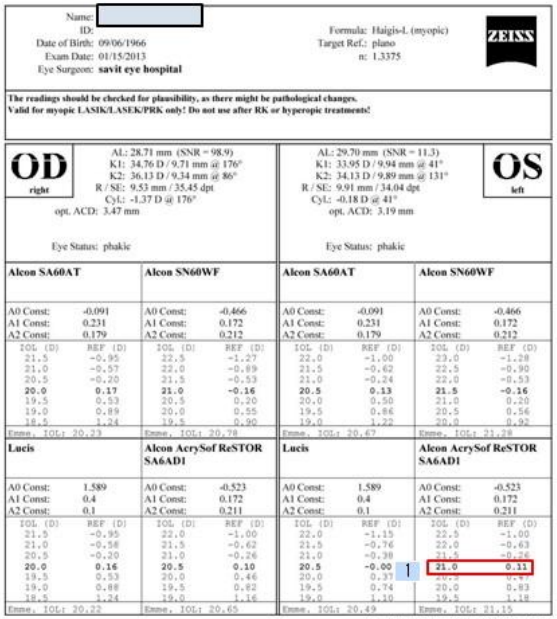
Alcon SA60AT		**Alcon SN60WF**	
A0 Const:	-0.091	A0 Const:	-0.466
A1 Const:	0.231	A1 Const:	0.172
A2 Const:	0.179	A2 Const:	0.212
IOL (D)	REF (D)	IOL (D)	REF (D)
20.0	-1.23	20.5	-1.24
19.5	-0.86	20.0	-0.88
19.0	-0.49	19.5	-0.52
18.5	**-0.13**	**19.0**	**-0.17**
18.0	0.22	18.5	0.18
17.5	0.57	18.0	0.53
17.0	0.92	17.5	0.87
Emme. IOL: 18.31		Emme. IOL: 18.76	
Lucis		**Alcon AcrySof ReSTOR SA6AD1**	
A0 Const:	1.589	A0 Const:	-0.523
A1 Const:	0.4	A1 Const:	0.172
A2 Const:	0.1	A2 Const:	0.211
IOL (D)	REF (D)	IOL (D)	REF (D)
20.0	-1.04	20.0	-0.98
19.5	-0.68	19.5	-0.62
19.0	-0.32	19.0	-0.26
18.5	**0.04**	**18.5**	**0.09**
18.0	0.39	18.0	0.44
17.5	0.73	17.5	0.79
17.0	1.07	17.0	1.13
Emme. IOL: 18.55		Emme. IOL: 18.63	





Postop refraction: Plano
UCVA (BCVA): 0.7 (0.7)

Case 2



Name:
ID:
Date of Birth: 09/06/1966
Exam Date: 01/15/2013
Eye Surgeon: **savit eye hospital**

Formula: Haigis-L (myopic)
Target Ref.: plano
n: 1.3375

ZEISS

The readings should be checked for plausibility, as there might be pathological changes.
Valid for myopic LASIK/LASEK/PRK only! Do not use after RK or hyperopic treatments!

OD right

AL: 28.71 mm (SNR = 98.9)
K1: 34.76 D / 9.71 mm @ 176°
K2: 36.13 D / 9.34 mm @ 86°
R / SE: 9.53 mm / 35.45 dpt
Cyl: -1.37 D @ 176°
opt. ACD: 3.47 mm
Eye Status: phakic

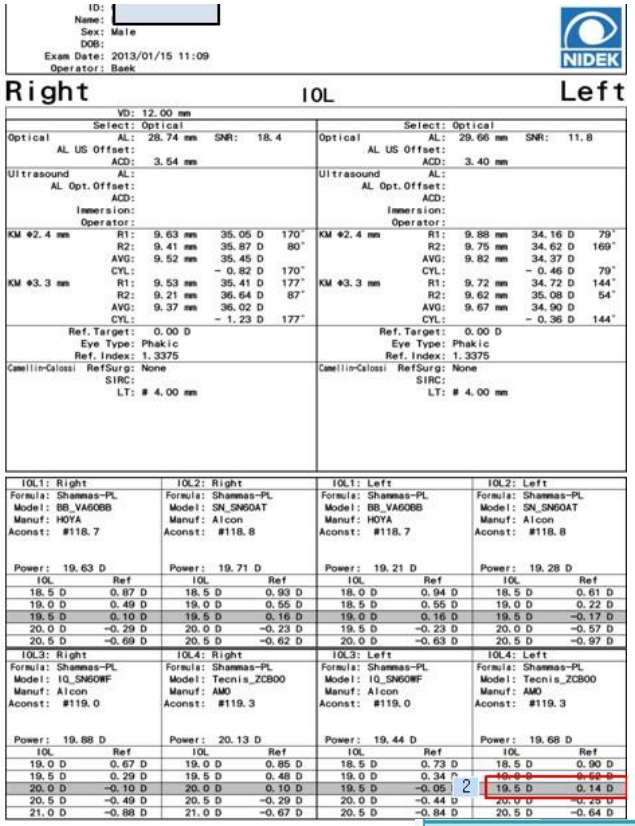
OS left

AL: 29.70 mm (SNR = 11.3)
K1: 33.95 D / 9.94 mm @ 41°
K2: 34.13 D / 9.89 mm @ 131°
R / SE: 9.91 mm / 34.04 dpt
Cyl: -0.18 D @ 41°
opt. ACD: 3.19 mm
Eye Status: phakic

Alcon SA60AT		**Alcon SN60WF**		**Alcon SA60AT**		**Alcon SN60WF**	
A0 Const:	-0.091	A0 Const:	-0.466	A0 Const:	-0.091	A0 Const:	-0.466
A1 Const:	0.231	A1 Const:	0.172	A1 Const:	0.231	A1 Const:	0.172
A2 Const:	0.179	A2 Const:	0.212	A2 Const:	0.179	A2 Const:	0.212
IOL (D)	REF (D)	IOL (D)	REF (D)	IOL (D)	REF (D)	IOL (D)	REF (D)
21.5	-0.95	22.5	-1.27	22.0	-1.00	23.0	-1.28
21.0	-0.57	22.0	-0.89	21.5	-0.62	22.5	-0.90
20.5	-0.20	21.5	-0.53	21.0	-0.24	22.0	-0.53
20.0	**0.17**	**21.0**	**-0.16**	**20.5**	**0.13**	**21.5**	**-0.16**
19.5	0.53	20.5	0.20	20.0	0.50	21.0	0.20
19.0	0.89	20.0	0.55	19.5	0.86	20.5	0.56
18.5	1.24	19.5	0.90	19.0	1.22	20.0	0.92
Emme, IOL: 20.23		Emme, IOL: 20.78		Emme, IOL: 20.67		Emme, IOL: 21.28	
Lucis		**Alcon AcrySof ReSTOR SA6AD1**		**Lucis**		**Alcon AcrySof ReSTOR SA6AD1**	
A0 Const:	1.589	A0 Const:	-0.523	A0 Const:	1.589	A0 Const:	-0.523
A1 Const:	0.4	A1 Const:	0.172	A1 Const:	0.4	A1 Const:	0.172
A2 Const:	0.1	A2 Const:	0.211	A2 Const:	0.1	A2 Const:	0.211
IOL (D)	REF (D)	IOL (D)	REF (D)	IOL (D)	REF (D)	IOL (D)	REF (D)
21.5	-0.95	22.0	-1.00	22.0	-1.15	22.5	-1.00
21.0	-0.58	21.5	-0.62	21.5	-0.76	22.0	-0.63
20.5	-0.20	21.0	-0.26	21.0	-0.38	21.5	-0.24
20.0	**0.16**	**20.5**	**0.10**	**20.5**	**-0.00**	**21.0**	**0.11**
19.5	0.53	20.0	0.46	20.0	0.37	20.5	0.47
19.0	0.88	19.5	0.82	19.5	0.74	20.0	0.83
18.5	1.24	19.0	1.16	19.0	1.10	19.5	1.18
Emme, IOL: 20.22		Emme, IOL: 20.65		Emme, IOL: 20.49		Emme, IOL: 21.15	

(* = Changed manually, ! = Borderline Value)

Carl Zeiss IOLMaster® Advanced Technology V. 5.4



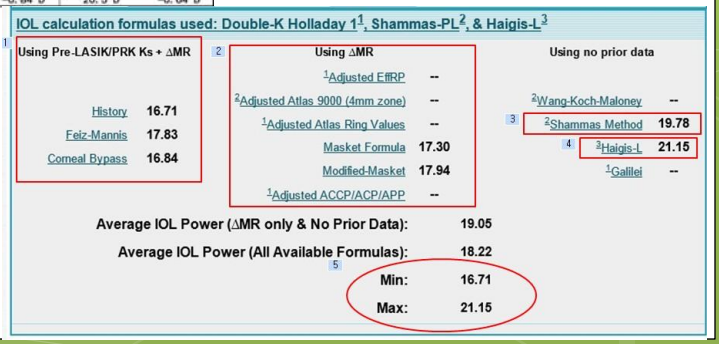
ID:
Name:
Sex: Male
DOB:
Exam Date: 2013/01/15 11:09
Operator: Baek

NIDEK

Right **IOL** **Left**

	Right			Left		
VD: 12.00 mm						
Select: Optical				Select: Optical		
Optical	AL: 28.74 mm	SNR: 18.4		Optical	AL: 29.66 mm	SNR: 11.8
AL US Offset:				AL US Offset:		
ACD:	3.54 mm			ACD:	3.40 mm	
Ultrasound	AL:			Ultrasound	AL:	
AL Opt.Offset:				AL Opt.Offset:		
ACD:				ACD:		
Immersion:				Immersion:		
Operator:				Operator:		
KM Φ2.4 mm	R1: 9.63 mm	35.05 D	170°	KM Φ2.4 mm	R1: 9.88 mm	34.16 D 79°
	R2: 9.41 mm	35.87 D	80°		R2: 9.75 mm	34.62 D 169°
	AVG: 9.52 mm	35.45 D			AVG: 9.82 mm	34.37 D
	CYL:	- 0.82 D	170°		CYL:	- 0.46 D 79°
KM Φ3.3 mm	R1: 9.53 mm	35.41 D	177°	KM Φ3.3 mm	R1: 9.72 mm	34.72 D 144°
	R2: 9.21 mm	36.64 D	87°		R2: 9.62 mm	35.08 D 54°
	AVG: 9.37 mm	36.02 D			AVG: 9.67 mm	34.90 D
	CYL:	- 1.23 D	177°		CYL:	- 0.36 D 144°
Ref.Target:	0.00 D			Ref.Target:	0.00 D	
Eye Type:	Phakic			Eye Type:	Phakic	
Ref.Index:	1.3375			Ref.Index:	1.3375	
Camellin-Calossi	RefSurg: None			Camellin-Calossi	RefSurg: None	
	SIRC:				SIRC:	
	LT: # 4.00 mm				LT: # 4.00 mm	

IOL1: Right		IOL2: Right		IOL1: Left		IOL2: Left	
Formula: Shammas-PL		Formula: Shammas-PL		Formula: Shammas-PL		Formula: Shammas-PL	
Model: BB_VA60BB		Model: SN_SN60AT		Model: BB_VA60BB		Model: SN_SN60AT	
Manuf: HOYA		Manuf: Alcon		Manuf: HOYA		Manuf: Alcon	
Aconst: #118.7		Aconst: #118.8		Aconst: #118.7		Aconst: #118.8	
Power: 19.63 D		Power: 19.71 D		Power: 19.21 D		Power: 19.28 D	
IOL	Ref	IOL	Ref	IOL	Ref	IOL	Ref
18.5 D	0.87 D	18.5 D	0.93 D	18.0 D	0.94 D	18.5 D	0.61 D
19.0 D	0.49 D	19.0 D	0.55 D	18.5 D	0.55 D	19.0 D	0.22 D
19.5 D	0.10 D	19.5 D	0.16 D	19.0 D	0.16 D	19.5 D	-0.17 D
20.0 D	-0.29 D	20.0 D	-0.23 D	19.5 D	-0.23 D	20.0 D	-0.57 D
20.5 D	-0.69 D	20.5 D	-0.62 D	20.0 D	-0.63 D	20.5 D	-0.97 D
IOL3: Right		IOL4: Right		IOL3: Left		IOL4: Left	
Formula: Shammas-PL		Formula: Shammas-PL		Formula: Shammas-PL		Formula: Shammas-PL	
Model: IQ_SN60WF		Model: Tecnis_ZCB00		Model: IQ_SN60WF		Model: Tecnis_ZCB00	
Manuf: Alcon		Manuf: AMO		Manuf: Alcon		Manuf: AMO	
Aconst: #119.0		Aconst: #119.3		Aconst: #119.0		Aconst: #119.3	
Power: 19.88 D		Power: 20.13 D		Power: 19.44 D		Power: 19.68 D	
IOL	Ref	IOL	Ref	IOL	Ref	IOL	Ref
19.0 D	0.67 D	19.0 D	0.85 D	18.5 D	0.73 D	18.5 D	0.90 D
19.5 D	0.29 D	19.5 D	0.48 D	19.0 D	0.34 D	19.0 D	0.52 D
20.0 D	-0.10 D	20.0 D	0.10 D	19.5 D	-0.05 D	19.5 D	0.14 D
20.5 D	-0.49 D	20.5 D	-0.29 D	20.0 D	-0.44 D	20.0 D	-0.25 D
21.0 D	-0.88 D	21.0 D	-0.67 D	20.5 D	-0.84 D	20.5 D	-0.64 D



IOL calculation formulas used: Double-K Holladay 1[1], Shammas-PL[2], & Haigis-L[3]

Using Pre-LASIK/PRK Ks + ΔMR		Using ΔMR		Using no prior data	
History	16.71	[1]Adjusted EffRP	--	[2]Wang-Koch-Maloney	--
Feiz-Mannis	17.83	[2]Adjusted Atlas 9000 (4mm zone)	--	[2]Shammas Method	19.78
Corneal Bypass	16.84	[1]Adjusted Atlas Ring Values	--	[3]Haigis-L	21.15
		Masket Formula	17.30	[1]Galilei	--
		Modified-Masket	17.94		
		[1]Adjusted ACCP/ACP/APP	--		

Average IOL Power (ΔMR only & No Prior Data): 19.05

Average IOL Power (All Available Formulas): 18.22

Min: 16.71

Max: 21.15

Postop refraction: - 1.50 D
UCVA (BCVA): 0.2 (1.0)

Results

- One patient (Case 1) had LASIK surgery and excimer laser enhancement in one eye previously.
  - Postoperative refraction value of one patient was plano, but uncorrected and corrected vision was 0.6.
  - Preoperative topography showed irregular astigmatism in the center of cornea.
- Postoperative refraction value of the other patient (Case 2) was -1.50 diopter(D) at 1 month.
  - Shammas-PL and Haigis-L formula were considered preoperatively and Shammas-PL formula was more accurate than Haigis-L formula.

Discussions

Evaluation of axial length measurement of the eye using partial coherence interferometry & ultrasound

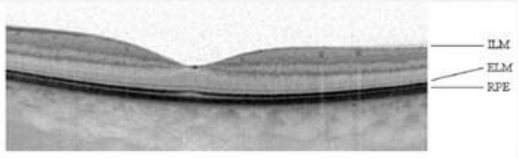
Refractive changes after vitrectomy & phacovitrectomy for macular hole & epiretinal membrane

Myopic shift after vitrectomy & phacovitrectomy

Table 1. Summary of the procedure (ie, sequence of surgery) and use of intraocular gas tamponade in studies of the refractive error after vitrectomy and phacovitrectomy.

Author*	Procedure	Number of Eyes	Major Pathologies	AL	RE (D)
Falkner-Radler[7]	Phacovitrectomy	21	ERM	Optical	−0.52
Manvikar[8]	Phacovitrectomy	20	ERM	Optical	−0.10
Schweitzer[9]	Phacovitrectomy	26	ERM, DR	Optical	+0.16
Senn[10]	Phacovitrectomy	26	DR, ERM, uveitis	Unknown	−0.18
Suzuki[11]	Phacovitrectomy	206	DR, MH, RD	Unknown	−0.05
Kovacs[12]	Phacovitrectomy	12	ERM, DR	US	−0.79
Jeoung[13]	Phacovitrectomy	154	DR, MH, ERM	US	−0.06
Manvikar[8]	Phacovitrectomy + gas	39	RD, ERM, DR	Optical	+0.03
Schweitzer[9]	Phacovitrectomy + gas	28	MH	Optical	−0.30
Falkner-Radler[7]	Phacovitrectomy + gas	19	MH	Optical	−0.20
Hwang[14]	Phacovitrectomy + gas	40	MH	US	−0.61
Shioya[15]	Phacovitrectomy + gas	36	MH	US	−0.55
Patel[16]	Phacovitrectomy + gas	40	MH	US	−0.39
Sun[17]	Phacovitrectomy + gas for some patients	23	ERM, MH	US	−0.46
Manvikar[8]	Cat in previous vit	42	MH	Optical	−0.10
Senn[10]	Cat in previous vit	26	DR, ERM, uveitis	Unknown	−0.01
Hamoudi[18]	Cat in previous vit	28	ERM	Optical	−0.26
Campo[19]	Vit in previous cat	81	RD	Unknown	−0.15
Kumagai[20]	Vit in previous cat	67	ERM, MH	Unknown	−0.30
Byrne[21]	Vit in previous cat	29	RD, ERM, MH	Unknown	−0.45
Byrne[21]	Vit + gas in previous cat	34	RD, ERM, MH	Unknown	−0.61

AL = axial length; Cat = cataract surgery; DR = diabetic retinopathy; ERM = epiretinal membrane; MH = macular hole; RD = rhegmatogenous retinal detachment; RE = refractive error; US = ultrasound; Vit = vitrectomy
*First author



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Conclusions

- We experienced unusual cases of multifocal IOL implantation after vitrectomy and LASIK.
- The IOL power calculation may be inaccurate after vitrectomy.
- Also, preoperative topographic finding is important after LASIK surgery.

Thank you!

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