

# Cataract Surgery

## Chapter 1

### **Intraocular Lenses to Restore and Preserve Vision Following Cataract Surgery**

Robert J. Cionni

1.1	Introduction .....	3
1.2	Why Filter Blue Light? .....	3
1.3	Why is the Consideration of Blue Light Important to Our Cataract and Refractive Lens Exchange Patients? .....	5
1.4	Quality of Vision with Blue-Light Filtering IOLs .....	6
1.5	Clinical Experience .....	8
1.6	Unresolved Issues and Future Considerations .....	9
1.7	Conclusion .....	9
	References .....	9

## Chapter 2

### **Cataract Surgery in Eyes with Loose Zonules**

Ehud I. Assia

2.1	Introduction .....	13
2.2	Surgical Approach .....	14
2.3	Weakened Zonules .....	14
2.4	Zonular Dialysis .....	15
2.5	Capsule Tension Rings .....	15
2.6	Other Types of CTRs .....	18
2.7	Dislocation of Capsular PC-IOL .....	20
	References .....	22

## **Chapter 3**

### **Management of the Small Pupil for Cataract Surgery**

Alan S. Crandall

3.1	Introduction .....	23
3.2	Surgical Management of the Small Pupil .....	23
3.2.1	Two-Instrument Iris Stretch ..	24
3.2.2	Iris Stretch: Beehler Device ..	24
3.2.3	Iris Stretch/Iris Retractors ...	25
3.2.4	Silicone Pupil Expander .....	26
3.2.5	PMMA Pupil Expanders .....	26
3.2.6	Multiple Sphincterotomies ..	26
3.2.7	Special Circumstances: Systemic Alpha 1 Blockers ...	27
	References .....	29

## **Chapter 4**

### **Advanced Intraocular Lens Power Calculations**

John P. Fang, Warren Hill, Li Wang,  
Victor Chang, Douglas D. Koch

4.1	Introduction .....	31
4.2	Axial Length Measurement ..	31
4.2.1	Ultrasound .....	31
4.2.1.1	Applanation Technique .....	32
4.2.1.2	Immersion Technique .....	33
4.2.2	Optical Coherence Biometry	35
4.3	Keratometry .....	36
4.4	Anterior Chamber Depth Measurement .....	37
4.5	IOL Calculation Formulas ....	37
4.5.1	The Second and Third Generation of IOL Formulas ..	38
4.5.2	The Fourth Generation of IOL Formulas .....	38
4.5.3	Capsular Bag to Ciliary Sulcus IOL Power Conversion .....	39
4.6	Determining IOL Power Following Corneal Refractive Surgery .....	39

4.6.1	Methods Requiring Historical Data .....	40
4.6.1.1	Clinical History Method .....	40
4.6.1.2	Feiz-Mannis IOL Power Adjustment Method .....	40
4.6.1.3	Masket IOL Power Adjustment Method .....	40
4.6.1.4	Topographic Corneal Power Adjustment Method .....	40
4.6.2	Methods Requiring No Historical Data .....	41
4.6.2.1	Hard Contact Lens Method ..	41
4.6.2.2	Modified Maloney Method ..	41
4.6.3	Hyperopic Corneal Refractive Surgery .....	41
4.6.4	Radial Keratotomy .....	42
4.6.5	Accuracy and Patient Expectations .....	42
4.7	Corneal Transplantation .....	44
4.8	Silicone Oil .....	44
4.9	Conclusion .....	45
	References .....	45

## **Refractive Surgery**

### **Chapter 5**

#### **Customized Corneal Treatments for Refractive Errors**

Scott M. MacRae, Manoj V. Subbaram

5.1	Introduction .....	49
5.2	Some Basics of Customized Laser Refractive Surgery .....	49
5.3	Forms of Customization .....	52
5.3.1	Optical Customization .....	52
5.3.2	Anatomical Customization ..	52
5.3.3	Functional Customization ...	53
5.4	Technological Requirements for Customized Refractive Surgery .....	54
5.4.1	Physical Properties of the Laser .....	54
5.4.2	Eye Movement Tracking .....	54
5.4.3	Wavefront Measurement and Wavefront-Laser Interface ..	55
5.5	Biomechanics of Refractive Surgery .....	56

5.5.1	LASIK Flap .....	57
5.6	Clinical Results of Customized Excimer Laser Ablation .....	58
5.7	Summary .....	60
	References .....	61

## **Chapter 6**

### **EpiLASIK**

Chris P. Lohmann,  
Christoph Winkler von Mohrenfels,  
Andrea Huber

6.1	Introduction .....	65
6.2	EpiLASIK Microkeratomes ...	66
6.3	Histology of the EpiLASIK Cut .....	67
6.3.1	Light Microscopy .....	67
6.3.2	Transmission Electron Microscopy .....	67
6.3.3	Scanning Laser Microscopy .	68
6.3.4	Cell Vitality .....	68
6.4	EpiLASIK: the Surgery .....	68
6.4.1	Preoperative Evaluation ....	68
6.4.2	Indication for Refraction ....	69
6.4.3	Inclusion Criteria .....	69
6.4.4	Exclusion Criteria .....	69
6.5	EpiLASIK Technique .....	69
6.5.1	Surgical Technique: Pearls ...	70
6.5.2	EpiLASIK Microkeratome Settings Exemplary for the Gebauer/CooperVision EpiVision .....	70
6.5.3	High Myopia: Mitomycin C ..	70
6.5.4	Bandage Contact Lens .....	70
6.5.5	Postoperative Examinations and Medication .....	71
6.6	Clinical Experiences .....	72
6.6.1	Conventional EpiLASIK .....	72
6.6.2	Refractive Results .....	73
6.6.3	Safety .....	74
6.6.4	Uncorrected Visual Acuity (UCVA Efficacy) .....	75
6.6.5	Postoperative Pain .....	75
6.6.6	Corneal Haze .....	75
6.6.7	Corneal Sensitivity .....	76
6.7	Customized Ablation: Wavefront-Guided or Wavefront-Optimized .....	76
6.7.1	Refractive Results .....	76

6.7.2	Visual Outcome	76
6.7.3	Wavefront Analysis	77
6.7.4	Corneal Haze	77
6.8	EpiLASIK Enhancement	77
6.8.1	Refractive Results (Re-surgery)	78
6.8.2	Visual Outcome	78
6.8.3	Corneal Haze	78
6.9	Complications	79
6.9.1	Possible Intra- and Postoperative Complications	79
6.9.1.1	Inability to Get Suction Even When Unit Shows Vacuum Attained	79
6.9.1.2	"Incomplete Flap"	79
6.9.1.3	Conjunctiva "Too Allergic" (Chemosis)	79
6.9.1.4	"Can't Fit the Vacuum Ring"	79
6.10	Pros of EpiLASIK	79
6.11	Cons of EpiLASIK	80
6.12	Important References	80

## Chapter 7

### **The Femtosecond Laser: a New Tool for Refractive and Corneal Surgery**

Mitchell P. Weikert, Anne Bottros

7.1	Introduction	83
7.2	Mechanism of Action	83
7.3	Clinical Applications of the FS laser	84
7.3.1	LASIK Using the Femtosecond Laser	84
7.3.1.1	Laser Settings	85
7.3.1.2	Surgical Technique	86
7.3.1.3	Clinical Results	88
7.3.1.4	Flap Dimensions	88
7.3.1.5	Visual and Refractive Outcomes	90
7.3.1.6	Aberrations	90
7.3.1.7	Complications	92
7.3.2	Intracorneal Ring Segment Implantation	96
7.3.3	Penetrating and Lamellar Keratoplasty	97
7.4	Conclusions	99
	References	99

## Chapter 8

### Complications of Excimer Laser Surgery

Hiroko Bissen-Miyajima

8.1	Introduction .....	101
8.2	Preoperative Evaluation ....	101
8.3	Intraoperative Complications .....	101
8.3.1	Decentered Ablations .....	103
8.3.2	Irregular Astigmatism .....	103
8.3.3	Central Islands .....	103
8.3.4	Undercorrection .....	106
8.3.5	Overcorrection .....	107
8.4	Postoperative Complications .....	107
8.4.1	Regression .....	108
8.4.2	Corneal Haze .....	108
8.4.3	Delayed Epithelialization ...	109
8.4.4	Infections .....	109
8.4.5	Adverse Effects on the Corneal Endothelium .....	109
8.4.6	Corneal Ectasia .....	109
	References .....	110

## Chapter 9

### Refractive Lens Exchange: Risk Management

Emanuel Rosen

9.1	Introduction .....	113
9.2	RLE: Need to Know .....	113
9.3	Cystoid Macular Edema ....	114
9.4	Risk Management and Rhegmatogenous Retinal Detachment .....	114
9.5	Complicated Lens Surgery .	116
9.6	Age and Pseudophakia in Myopic Eyes .....	117
9.7	Odds of RRD Occurrence ...	117
9.8	Why Should Myopic Eyes Be Vulnerable to RRD? .....	118
9.9	Prophylaxis .....	119
9.10	Nd:YAG Laser Posterior Capsulotomy and Retinal Detachment .....	120
9.11	Relationship of RRD Occurrence to Surgical Complications of Lens Extraction .....	120

9.12	Risk of RRD After RLE in Hyperopic Eyes .....	120
9.13	Prognosis of RRD Following RLE: Outcome of Pseudophakic Retinal Detachment .....	121
9.14	Ethical and Medico-Legal Considerations .....	122
9.15	Conclusion .....	123
	References .....	124

## Chapter 10

### **Pseudoaccommodative and Accommodative IOLs**

Mark Packer, I. Howard Fine,  
Richard S. Hoffman, H. Burkhard Dick

10.1	Introduction .....	127
10.2	Clinical Efficacy and Safety .	129
10.3	Photoc Phenomena .....	129
10.4	Refractive Lens Exchange ..	131
10.5	Complication Management	131
10.6	Functional Vision and Multifocal IOL Technology ..	131
10.7	Accommodative Intraocular Lenses .....	133
10.8	Accommodative IOLs in Clinical Practice .....	135
10.9	Dual Optic Accommodative IOL Technology .....	137
10.10	Conclusions .....	139
	References .....	140

## Chapter 11

### **Selecting Phakic Intraocular Lenses for the Correction of Refractive Errors**

Thomas Kohnen, Thomas Kasper

11.1	Introduction .....	143
11.2	From Past to Present: Evolution of Phakic IOLs ...	144
11.2.1	History of Anterior Chamber Phakic IOLs .....	144
11.2.2	Current Models of Anterior Chamber pIOLs .....	144
11.2.2.1	Rigid pIOLs with fixation in the anterior chamber angle	144
11.2.2.2	Foldable pIOLs with fixation in the anterior chamber angle .....	145

11.2.2.3	Rigid Iris-Fixated pIOLs	146
11.2.2.4	Foldable Iris-Fixated pIOL	147
11.2.3	History of Posterior Chamber Phakic IOLs	147
11.2.4	Current Models of Posterior Chamber pIOLs	147
11.2.4.1	Implantable Contact Lens (ICL, Staar)	147
11.2.4.2	Phakic Refractive Lens (PRL, IOL Tech)	147
11.3	General Factors for the Selection of a pIOL	148
11.3.1	Preoperative Refraction	148
11.3.2	Preexisting Astigmatism	149
11.3.3	Anatomical Requirements	150
11.3.3.1	Endothelial Cell Density	150
11.3.3.2	Anterior Chamber Depth	150
11.3.3.3	Anterior Chamber Angle	150
11.3.3.4	Anterior and Posterior Chamber Biometry	151
11.3.3.5	Pupil Diameter	152
11.3.3.6	Opacification and "Crystalline Lens Rise"	153
11.3.3.7	Status of the Retina	153
11.4	Excluding Pathologies	153
11.5	Conclusion	154
	References	154

## Chapter 12

### Intracorneal Implants

Jorge L. Alió y Sanz, Mohamed H. Shabayek

12.1	Introduction	159
12.2	Intracorneal Hydrogel Lenses	159
12.2.1	Introduction	159
12.2.2	Indications	160
12.2.3	Characteristics	160
12.2.4	Surgical Technique	160
12.2.5	Postoperative Treatment	160
12.2.6	Outcome	160
12.2.7	Complications	161
12.3	Intracorneal Ring Segments	161
12.3.1	Introduction	161
12.3.2	Mode of Action	162
12.3.3	Types	162
12.3.4	Surgery Plan	164
12.3.4.1	INTACS	164
12.3.4.2	KERARING	164



12.3.5	Implantation Technique . . . .	165
12.3.5.1	Surgically . . . . .	165
12.3.5.2	Intracorneal Ring Segments with the Femtosecond Laser (IntraLase) . . . . .	166
12.3.5.3	Postoperative Treatment ..	167

12.3.6	Outcomes of Intracorneal Ring Segments .....	167
12.3.7	Complications .....	168
	References .....	168
	<b>Subject Index</b> .....	<b>171</b>