

Contents

SECTION 1: Introduction

1. Corneal Optics and Geometry	3
The Optical System of the Human Eye	3
Corneal Geometry	5
2. Measuring Corneal Geometry	8
Curvature-based Devices (Topographers)	8
Elevation-based Tomographers	10
OCT-based Tomographers	11
Topography versus Tomography	11
Systems Available in the Market	13
3. Screening Guidelines	14
The Four-Composite Map	14
General Settings	14
Main Color Bar Settings	16
Maps Overlay	17
Specific Settings for Holladay Report	20
Image Quality Control	20

SECTION 2: Tomographic Maps and Profiles

4. Overview	29
Corneal Parameters	29
5. Corneal Power Maps	32
Factors Affecting Corneal Power Measurement	32
Maps Measuring Corneal Power	32
Patterns of Corneal Curvature	37
Clinical Differences between the Sagittal and Tangential Curvature Maps	42
6. Elevation Maps	45
Principle of the Elevation Maps	45
The Reference Surface	45
Patterns of Elevation Maps	49
7. Belin/Ambrósio Enhanced Ectasia	54
The Belin/Ambrósio Ectasia Display	54
Pachymetric Data	55
Numeric Values	60
Clinical Applications of Belin/Ambrósio Enhanced Ectasia	60

8. Corneal Thickness Maps and Profiles	64
Corneal Thickness Map (Pachymetry Map) 64	
Corneal Thickness Spatial Profile and Percentage Thickness Increase 66	
Pachymetric Progression Index 67	
The Relative Pachymetry 70	

9. Geometric Tomography and Corneal Topometry	75
Corneal Toricity 75	
Corneal Asphericity 75	
Corneal Asymmetry 76	

SECTION 3: Understanding Corneal Refraction

10. Astigmatism	83
Definitions and Classifications of Astigmatism 83	
Types of Astigmatism 83	
Etiology of Irregular Astigmatism 86	
Evaluation of Irregular Astigmatism 90	

11. Objective Corneal Dioptric Power	95
Calculating Objective Corneal Dioptric Power 95	
Clinical Examples 96	

12. Astigmatic Disparity	99
Etiology 99	
Types of Astigmatic Disparity 100	
Management of Astigmatic Disparity 100	

SECTION 4: Wavefront Science

13. Basics of Wavefront Analysis and Measurements	105
Principles of Wavefront and Wavefront Analysis 105	
Classification of Aberrations 105	
Measurement of Aberrations 105	
Analytic Systems 108	
Changes of Aberrations with Age 109	
Clinical Application of Wavefront Technology 109	

14. Zernike Analysis	111
Understanding Zernike Polynomials 112	
Correlation between Zernike Polynomials and Irregular Astigmatism Types 112	
Description of Zernike Polynomials 115	

15. Fourier Analysis.....	123
Fourier Analysis of Corneal Wavefront 124	

16. Corneal Asphericity and Related Functions.....	127
Corneal Shapes related to Asphericity	127
Q-Value and Corneal Asphericity	128
Corneal and Ocular Spherical Aberration	128
Visual Function and Spherical Aberration	132
Depth of Focus	132
Ocular Spherical Aberration and Neural Adaptation	135
The Effect of Corneal Asphericity on Measuring Refraction	137
The Effect of Corneal Asphericity on Vision	139

SECTION 5: The Systematic Interpretation of Corneal Tomography

17. Factors of False Findings	143
Contact Lenses	143
Misalignment	143
Large Angle Kappa or Lambda	146
Tear Film Disturbance	146
Corneal Opacities and Pathologies	148
Previous Corneal Surgeries	148
Inadequate Exposure to the Camera	149
Pregnancy	149
18. Enantiomorphism	152
19. The Practical Subjective Scoring System	157
The Practical Subjective Scoring System (PS3)	157
Application of the PS3 in Laser-based Refractive Surgery	162
Regularity versus Risk Scoring	163
20. The Practical Subjective IOL Selection Algorithm.....	169

SECTION 6: Corneal Tomography in Ectatic Corneal Diseases

21. Tomographic Characteristics of Ectatic Corneal Diseases	173
Tomographic Definition of ECDs	173
22. Grading Systems of Ectatic Corneal Diseases	180
Amsler-Krumeich Classification	180
Alio-Shabayek Modification	180
Modification of Ishii and Associates	180
Belin "ABCD" Grading System	180
23. Progression Criteria	184
Parameters of Progression	184
Observing Progression	187
To Crosslink or not to Crosslink	188
Observation after Corneal Crosslinking	188

24. Entities Misdiagnosed as Ectasia	189
Source	189
Patterns	189

SECTION 7: Miscellaneous

25. The Holladay Report	205
Holladay Report	205
Holladay Detailed EKR Report	207
Clinical Examples	209
26. Corneal Tomography in Cataract Surgery	218
Preoperative Screening Process	218
Preoperative Planning Process	219
Postoperative Planning Process	222
<i>Bibliography</i>	<i>225</i>
<i>Index</i>	<i>235</i>