

Mastering the Techniques of **IOL Power Calculations**



Mastering the Techniques of **IOL Power Calculations**

2nd Edition

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My wife Katharina and my son Michael.

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Foreword to the Second Edition

In my opinion, the most important subject in the field of cataract surgery is the calculation of the appropriate lens implant (IOL) power. The very first complication of lens implantation was an IOL power prediction error of 16 D by Sir Harold Ridley when he implanted his first IOL in 1949. The mistake was repeated in 1950 when he implanted his second lens. He then turned his attention to fixing the problem which allowed lens implantation to proceed. Through the 50s, 60s and early 70s, it became the standard to use an 18.5 D prepupillary IOL for all eyes and the patient would wind up with the same refractive error they had all their life, regardless of how bad it was. Some had devised crude charts allowing a surgeon to vary that power based on the patient's previous refraction in hopes of getting closer to emmetropia. However, European pioneer surgeons, such as Cornelius Binkhorst and Jan Worst of the Netherlands, were measuring the axial length of the eye using a crude A-scan ultrasound and calculating the target IOL power using a Gaussian optics formula such as that devised by von der Hiedje or Colenbrander.



I introduced immersion ultrasound IOL power calculation in the America in 1974 using the original Hoffer formula and stimulated Sonometrics, Inc (Boston) to manufacture the first specific A-scan for IOL power (the DBR-100) in 1975. Over the years, improvements in ultrasound instrumentation and development of more accurate formulas (Haigis, Hoffer Q, Holladay and SRK/T) have made lens power calculation very accurate when there is attention to detail. The introduction of the IOLMaster by Zeiss in 1999 revolutionized this process by making axial length measurement much easier, repeatable and more accurate with only 10-15% of eyes still needing an ultrasound measurement.

In the past, patients quietly accepted needing an eyeglass prescription after cataract surgery. That is no longer true. Patient expectations today are that their postoperative refractive error will be what they expect it to be and at no time is this more important than when performing a clear lens extraction to correct ametropia or implanting a phakic IOL. It behoves every surgeon implanting IOLs to become an expert in this subject and this textbook will help in that regard. Obtaining the exact IOL power desired is the biggest practice builder there is. Making patients happy, however, is the most gratifying compensation and what this is all about.

I congratulate Dr Garg for assembling such a large group of contributors so as to enable the reader to learn a lot about this important topic, be they novice or expert. I may not completely agree with every statement in this textbook but difference in experience and opinion is what helps move science forward.

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Foreword to the First Edition

In 1999, I visited India for the first time, to meet my now good friend Dr. Amar Agarwal in Chennai. The knowledge and skill I met imbued me with a deep respect for my Indian colleagues, I therefore felt honoured to be asked to write the Foreword to this book.

A good textbook should bear the characteristics of an enthusiastic teacher, taking students by the hand and leading them through the tasks to be mastered, leaving them wiser for the experience. The authors of this book have fully understood this process by which we learn.


As early as 1870, Placido studied the corneal surface with his Disc. In 1880 Javal in France was already aware of the importance of photographically recording the images to be studied. In 1896, Professor Allvar Gullstrand (1868 – 1930) developed the first photokeratoscope, giving us quantitative data on the form of the cornea. This allowed him to calculate the corneal meridian profiles, which are surprisingly similar to those derived from modern Corneal Topography Analyses. Gullstrand improved the ophthalmoscope, and invented the slit-lamp. He and Helmholtz were the first to describe schematic eye models to approximate the optical properties of a normal eye.

As a member of the Swedish Ophthalmological Community for almost 30 years, the work of Professor Gullstrand, who won the Nobel Prize in Physiology or Medicine in 1911, lies close to my heart. Indeed his work in many ways has helped to provide the background to the knowledge presented in this book.

I started my Residency in Ophthalmology 1976, and implanted my first IOL in 1983. Biometry and IOL calculations were relatively crude at that time, and postoperative anisometropia was not uncommon, something that we have been able to correct in many cases after introduction of the Excimer laser. In the Spring of 1993, I performed my first PRK. At that time the cornea was viewed as an essentially two-dimensional piece of plastic. There were many satisfied patients but also a number of dissatisfied. **This textbook by Internationally Eminent Dr. Ashok Garg and co-authors** will explain just why a more complex evaluation of the eye is needed, and will describe the state of the art in the technology we use to ensure the best possible results today.



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Preface to the Second Edition

The First Edition of IOL Power Calculation book released only three years ago is completely sold out much before our expectations with worldwide appreciations and acclamations. We are certainly encouraged by this tremendous response and our publisher has asked us for revised (second) edition.

IOL power calculation is a complex and important subject. A number of new formulas have come up for cataract and refractive surgeons which deliver good outcomes and provide another avenue to validate our IOL selections.

The Second edition contains 56 chapters covering all aspects of IOL power calculation from basic to advanced IOL power calculations in various clinical and difficult conditions of the eye by International Masters of this field. Precision in IOL power calculations shall lead to accurate vision in cataract and refractive patients with less complications.

Our sincere gratitudes are due to publisher specially Sh. Jitendar P Vij (CEO), Mr. Tarun Duneja (General Manager, Publishing) and all staff members of M/s Jaypee Brothers Medical Publishers (P) Ltd. for their dedicated efforts and preparation of second edition in a very short time.

We are confident that the second edition covering all clinical conditions and newer formulas shall serve as ready reference to ophthalmologists worldwide in their clinical practice for precise IOL power calculations.

Editors



Preface to the First Edition

Intraocular lens power calculation is an important clinical parameter. An accurate and precise biometry is one of the key factors in obtaining a good refractive outcome after cataract surgery. A small preoperative ocular biometry error leads to significant postoperative refractive error posing problems both for patient and surgeon. Inaccurate axial length measurements and inappropriate use of Intraocular lens power formulae generally lead to this problem.

Standard keratometry and computed corneal topography are commonly used parameters. Estimation of central anterior chamber depth is vital in new theoretical formulae for IOL power calculation. New technologies have been introduced in this field specially customised IOL power formulae, measurement of axial length (IOL master), customised axial length approach, computerized rotary 3D scanning system, etc. These techniques certainly help the ophthalmologists for proper preoperative assessment to obtain predicted postoperative refractive outcomes.

Improved measurement technologies and refinements in IOL power formulae reduce postoperative refractive errors in long and short eyes as well as normal axial length eyes.

This International book of IOL power calculations covers all aspects of calculations from normal cornea to after refractive surgery, in Phaco/Microphaco, on irregular corneal surface, in phakic IOLs, in corneal scarring and astigmatism and in pediatric cataract surgery. A number of leading International ophthalmologists who are masters in this field have contributed their experiences in form of chapters for the benefit of ophthalmologists. Our special thanks to the publisher M/s Jaypee Brothers Medical Publishers (P) Ltd. specially Mr. Jitendar P Vij (CEO), Mr. Tarun Duneja (General Manger, Publishing) and all staff members who extended full cooperation and published this International book in a very short time.

We are hopeful that this book shall meet the expectation of ophthalmologists in providing complete information in relation to IOL power calculations in their day-to-day clinical practice.

Editors



Section 1: Preliminary Considerations and Various IOL Power Calculation Formulas and Basics

1. Schematic Eye	3
<i>Athiya Agarwal, Amar Agarwal, Ashok Garg (India)</i>	
2. A-scan Biometry	5
<i>Sunita Agarwal, Amar Agarwal, Ashok Garg (India)</i>	
3. Corneal Topography	10
<i>Athiya Agarwal, Sunita Agarwal, Amar Agarwal, Nilesh Kanjani (India)</i>	
4. Optical Corneal Tomography	21
<i>Sandra Franco, Jose B Almeida (Portugal), Manuel Parafita (Spain)</i>	
5. Optical Biometry with IOL Master (Partial Coherence Interferometry)	24
<i>Ashok Garg (India)</i>	
6. Anterior Chamber Depth in IOL Power Estimation	26
<i>Aravind R Reddy (UK)</i>	
7. How to Calculate the Constant A	28
<i>Sonja Hairer, Tom Conze, Jerome Bovet (Switzerland)</i>	
8. Axial Length Dependence of IOL Constants	31
<i>Wolfgang Haigis (Germany)</i>	
9. IOL Calculations: When, How and Which?	36
<i>Kumar J Doctor, Nita Shanbhag, Sumita Karandikar, Pooja Deshmukkh (India)</i>	
10. How to Measure a Correct Central Keratometric Reading for IOL Power Calculation after LASIK Surgery?	46
<i>Lung-Kun Yeh, I-Jong Wang (Taiwan)</i>	
11. An Update on IOL Power Calculation Formulas	51
<i>JT Lin (Taiwan), Ashok Garg (India)</i>	
12. The New IOL Formulas based on Gaussian Optics	62
<i>JT Lin (Taiwan)</i>	
13. Classical vs Modern Formulas for Estimated Lens Position (ELP)	70
<i>JT Lin (Taiwan)</i>	
14. IOL Power Calculations	75
<i>Kenneth J Hoffer (Santa Monica, CA, USA)</i>	

15. The Theoretical Summary of IOL Formulas	92
<i>JT Lin (Taiwan)</i>	
16. Error Analysis of IOL Power Calculations	101
<i>JT Lin (Taiwan)</i>	
17. The Basics of Accommodating IOLs	106
<i>JT Lin (Taiwan)</i>	
18. IOL Calculation in Long and Short Eyes	114
<i>Wolfgang Haigis (Germany)</i>	
19. Customization of IOL Formulas	121
<i>B Vineeth Kumar (UK)</i>	

Section 2: IOL Power Calculations in Cataract Surgery

20. Intraocular Lens Power Selection for Children	127
<i>Rupal H Trivedi (USA), M Edward Wilson Jr (USA)</i>	
21. Age Dependent IOL Power Calculations for Pediatric Patients	136
<i>JT Lin (Taiwan)</i>	
22. History & Method of Intraocular Lens Power Calculation for Cataract Extraction Surgery after Corneal Refractive Surgery	142
<i>Alberto Artola Roig, Jorge L Alio Y Sanz (Spain)</i>	
23. Intraocular Lens Power Calculations in Phaco and Microphaco	146
<i>Ashok Garg (India), Arif Adenwala (UAE)</i>	
24. Intraocular Lens Power Calculations for High Myopia	153
<i>Renyuan Chu, Jinhui Dai (China)</i>	
25. Accuracy of Intraocular Lens Power Calculation in Bimanual Microphacoemulsification	159
<i>Gian Maria Cavallini, Luca Campi, Giovanni Neri (Italy)</i>	
26. Clinical Outcomes of Cataract Surgery after Previous Refractive Surgery	164
<i>Frank J Goes (Belgium)</i>	

Section 3: IOL Power Calculations in Refractive Surgery (Corneal and Lenticular Refractive Surgery)

27. IOL Power Calculations: A Topographic Method	175
<i>Frederic Hehn (France)</i>	
28. IOL Power Calculation in Post-hyperopic PresbyLASIK Cataract: Preliminary Results	180
<i>Roberto Pinelli (Italy)</i>	
29. Comparison of Methods for IOL Power Calculation after Incisional and Photoablative Refractive Surgery	184
<i>Antonio Calossi, Massimo Camellin (Italy)</i>	
30. IOL Power Calculations after Corneal Refractive Surgery	205
<i>Srinivas K Rao (India), Arthur Cheng, Dennis SC Lam (China)</i>	

31. The Latkany Regression Formula for Intraocular Lens Calculations after Myopic Refractive Surgery	213
<i>Evelyn Icasiano, Robert Latkany (USA)</i>	
32. The Latkany Regression Formula for Intraocular Lens Calculations after Hyperopic Refractive Surgery	218
<i>Evelyn Icasiano, Robert Latkany (USA)</i>	
33. Which IOL Formula to Use after Refractive Surgery	221
<i>Sonja Hairer, Tom Conze, Jerome Bovet (Switzerland)</i>	
34. Intraocular Lens Power Calculation after Advanced Surface Ablations (ASA)	225
<i>Tsiklis NS, Kymionis GD, Portaliou DM, Pallikaris IG (Greece)</i>	
35. The Mathematics of LASIK	231
<i>JT Lin (Taiwan)</i>	
36. Preoperative Evaluation of the Anterior Chamber for Phakic IOLs with the AC OCT	238
<i>Georges Baikoff (France)</i>	
37. Biometry for Refractive Lens Surgery	244
<i>Mark Packer, I Howard Fine, Richard S Hoffman (USA)</i>	
38. IOL Power Calculations in Phakic IOLs	252
<i>Dimitrii Dementiev, Kukrenkov Vetchiaslav (Italy)</i>	
38. Raytracing Analysis of Accommodating IOL	254
<i>Yoshiaki Nawa (Japan)</i>	
40. Analysis of Dual-optics Accommodating IOLs	259
<i>JT Lin (Taiwan)</i>	
41. Aspherical IOL Analysis	265
<i>JT Lin (Taiwan)</i>	

Section 4: Miscellaneous (Recent Advances and IOL Power Calculations in Difficult Situations)

42. Determining Corneal Power for Intraocular Lens Calculations in Patients with Corneal Scarring and Irregular Astigmatism	277
<i>Mujtaba A Qazi, Irwin Y Cua, Jay S Pepose (USA)</i>	
43. IOL Calculation in Hyperopes	281
<i>Wolfgang Haigis (Germany), Frank J Goes (Belgium)</i>	
44. Consistent IOL Calculation in Normal and Odd Eyes with the Raytracing Program OKULIX	285
<i>Paul Rolf Preussner (Germany)</i>	
45. A-scan in Difficult Situations	292
<i>Anand A Shroff (India)</i>	
46. Management of Refractive Surprises after Cataract Surgery	305
<i>Armando Capote, Eneida de la C Perez, Marcelino Rio (Cuba)</i>	
47. Intraocular Lens Power Calculation in the High Myopic Eye	314
<i>Fengju Zhang, Yan Wang (China)</i>	
48. Calculation of Intraocular Lens Power in Cataract with Silicone Oil Eyes	318
<i>Fengju Zhang, Yan Wang (China)</i>	

49. Intraoperative IOL Power Calculation	320
<i>Arturo Pérez-Arteaga (Mexico)</i>	
50. ZEMAX Raytracing Method for Accommodative IOL	327
<i>JT Lin (Taiwan), Minshan Jiang (China)</i>	
51. Problems of IOL Power Calculation in Pediatric Cataract Surgery	331
<i>Marek E Prost (Poland)</i>	
52. Intraocular Lens Calculation after Prior Refractive Surgery	337
<i>Kenneth J Hoffer (Santa Monica, CA, USA)</i>	
53. Cataract Surgery: Calculating the IOL Power in Case of Anisometropia	345
<i>Laure Gobin, Jos J Rozema, Marie-José Tassignon (Belgium)</i>	
54. Review of IOL Power Calculation: A Theoretical Analysis of Proposed Formulas	356
<i>Laure Gobin, Jos J Rozema, Marie Jose Tassignon (Belgium)</i>	
55. IOL Power Calculation for Cornea Triple and Penetrating Keratoplasty with IOL Exchange	368
<i>Ashok Sharma (India)</i>	
56. IOL Power Calculations in Eyes with Irregular Corneas	371
<i>Barun K Nayak, Sunil Moreker (India)</i>	
<i>Index</i>	<i>375</i>