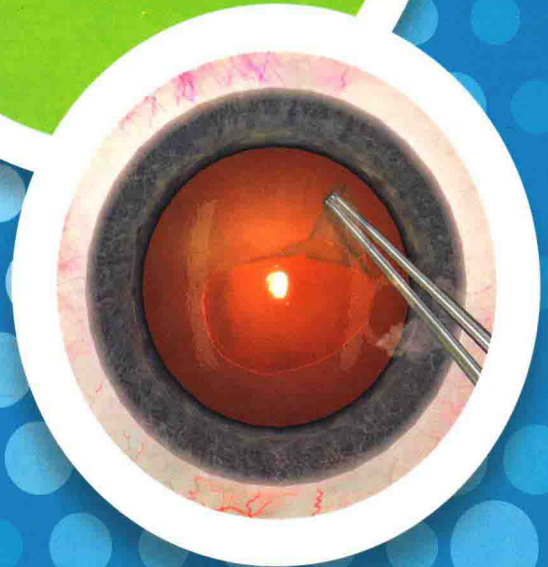


# Basic Principles of Ophthalmic Surgery

**Third Edition**

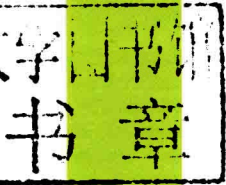
Ayman Naseri, MD  
Executive Editor



# Basic Principles of Ophthalmic Surgery

Third Edition

Ayman Naseri, MD  
Executive Editor



 **AMERICAN ACADEMY<sup>®</sup>  
OF OPHTHALMOLOGY**  
*The Eye M.D. Association*



Published after collaborative  
review with the European Board  
of Ophthalmology subcommittee

### Clinical Education Secretaries

Louis B. Cantor, MD, *Senior Secretary  
for Clinical Education*  
Christopher J. Rapuano, MD, *Secretary  
for Ophthalmic Knowledge*


### Committee for Resident Education

Jean R. Hausheer, MD, *Chair*  
Christopher B. Chambers, MD  
Laura K. Green, MD  
Lois M. McNally, MD  
Jeff Pettey, MD  
Jean E. Ramsey, MD, MPH  
Shilpa G. Reddy, MD  
R. Michael Siatkowski, MD  
Laura L. Wayman, MD  
Jennifer S. Weizer, MD

### Academy Staff

Dale E. Fajardo, EdD, *Vice President,  
Education*  
Beth Wilson, *Director, CME & Programs*  
Kimberly Torgerson, *Publications Editor*  
D. Jean Ray, *Production Manager*  
Denise Evenson, *Design*  
Daniel Mummert, *Director, Online  
Education and the ONE Network*  
Jasmine Chen, *Manager, E-Learning*  
Eric Gerdes, *Interactive Designer*  
Laura Ryan, *E-Editor*  
Donna Scism, *E-Editor/Proofreader*  
Debra Marchi, CCOA, *Administrative  
Assistant*

Cover image courtesy of VRMagic.

American Academy of Ophthalmology,  
Basic and Clinical Science Course,  
Ophthalmic Technology Assessments,  
*Ophthalmology*, Preferred Practice  
Pattern, ProVision, SmartSight, The  
Ophthalmic News & Education  
Network,  and The Eye M.D.  
Association are, among other marks,  
the registered trademarks and  
trademarks of the American Academy  
of Ophthalmology.



The Academy provides this material for educational purposes only. It is not intended to represent the only or best method or procedure in every case, nor to replace a physician's own judgment or give specific advice for case management. Including all indications, contraindications, side effects, and alternative agents for each drug or treatment is beyond the scope of this material. All information and recommendations should be verified, prior to use, with current information included in the manufacturers' package inserts or other independent sources, and considered in light of the patient's condition and history. Reference to certain drugs, instruments, and other products in this publication is made for illustrative purposes only and is not intended to constitute an endorsement of such. Some materials may include information on applications that are not considered community standard, that reflect indications not included in approved FDA labeling, or that are approved for use only in restricted research settings. **The FDA has stated that it is the responsibility of the physician to determine the FDA status of each drug or device he or she wishes to use, and to use them with appropriate patient consent in compliance with applicable law.** The Academy specifically disclaims any and all liability for injury or other damages of any kind, from negligence or otherwise, for any and all claims that may arise from the use of any recommendations or other information contained herein.

### Financial Disclosures

Academy staff members who contributed to the development of this product state that within the past 12 months, they have had no financial interest in or other relationship with any entity discussed in this book that produces, markets, resells, or distributes ophthalmic health care goods or services consumed by or used in patients, or with any competing commercial product or service.

The authors and reviewers state that within the past 12 months, they have had the following financial relationships:\*

Dr Bandello: Alcon Laboratories (C), Alimera Sciences (C), Allergan (C), Bausch & Lomb (C), Bayer Schering Pharma (C), Farmila-Thea Farmaceutici S.p.A. (C), Genentech (C), F. Hoffmann-La Roche AG (C), Novagali Pharma SA (C), Novartis Pharmaceuticals (C), Pfizer (C), Sanofi S.A. (C), ThromboGenics (C)

Dr Creuzot-Garcher: Alcon Laboratories (C, S), Allergan (C, L, S), Bausch & Lomb (C), Bayer, Novartis Pharmaceuticals (C, L, S), Laboratoires Théa (C)

Dr Gedde: Alcon Laboratories (C), Allergan (C)

Dr Grupcheva: Johnson & Johnson (L), Théa (L)

Dr Andrew G. Lee: Credential Protection (O)

Dr Lustbader: LCA Vision (E), Novartis Pharmaceuticals (O)

Dr Winn: US Patent application: P5224US00 (P)

Dr Wladis: Lions Eye Foundation (S)

The other authors and reviewers state that within the past 12 months, they have had no financial interest in or other relationship with any entity discussed in this book that produces, markets, resells, or distributes ophthalmic health care goods or services consumed by or used in patients, or with any competing commercial product or service.

\*C = consultant fees, paid advisory boards, or fees for attending a meeting; L = lecture fees (honoraria), travel fees, or reimbursements when speaking at the invitation of a commercial sponsor; O = equity ownership/stock options of publicly or privately traded firms (excluding mutual funds) with manufacturers of commercial ophthalmic products or commercial ophthalmic services; P = patents and/or royalties that might be viewed as creating a potential conflict of interest; S = grant support for the past year (all sources) and all sources used for a specific talk or manuscript with no time limitation

Copyright © 2006, 2011, 2015 American Academy of Ophthalmology<sup>®</sup>. All rights reserved.

Printed in the United States of America.

19 18 17 16 15      1 2 3 4

# Contributors

**Maria M. Aaron, MD**

Professor of Ophthalmology  
Director, Section of Comprehensive Ophthalmology  
Emory University  
Atlanta, Georgia

**Daniel I. Bettis, MD**

Glaucoma Fellow  
John A. Moran Eye Center  
University of Utah  
Salt Lake City, Utah

**Keith D. Carter, MD**

Lillian C. O'Brien and Dr C. S. O'Brien Chair in  
Ophthalmology  
Chair and Head, Department of Ophthalmology  
University of Iowa Carver College of Medicine  
Iowa City, Iowa

**Jack A. Cohen, MD**

Associate Professor of Ophthalmology  
Associate Chair for Education  
Resident Program Director  
Rush University Medical Center  
Chicago, Illinois

**Sarah W. DeParis, MD**

Resident Physician  
Department of Ophthalmology  
University of California, San Francisco  
San Francisco, California

**J. Paul Dieckert, MD, MBA**

Medical Director for Member Education  
Director, Division of Vitreoretinal Disease and Surgery  
Baylor Scott & White Healthcare  
Temple, Texas

**Robert B. Dinn, MD**

Eye Physicians, Inc.  
Kokomo, Indiana

**James P. Dunn, MD**

Professor of Ophthalmology  
Director, Uveitis Unit  
Wills Eye Hospital Retina Service  
Philadelphia, Pennsylvania

**Kian Eftekhari, MD**

Salt Lake Regional Medical Center  
Salt Lake City, Utah

**Steven J. Gedde, MD**

John G. Clarkson Chair in Ophthalmology  
Vice Chair of Education  
Professor of Ophthalmology  
Bascom Palmer Eye Institute  
Miami, Florida

**William G. Gensheimer, MD**

Instructor/Fellow  
Department of Ophthalmology  
University of Colorado School of Medicine  
Aurora, Colorado

**Eric R. Holz, MD**

Clinical Associate Professor of Ophthalmology  
Baylor College of Medicine  
Houston, Texas  
Retina and Vitreous Associates of Texas  
Houston, Texas

**Yousuf M. Khalifa, MD**

Chief of Service  
Department of Ophthalmology  
Grady Memorial Hospital  
Associate Professor of Ophthalmology  
Cornea and External Diseases  
Emory Eye Center  
Atlanta, Georgia

**Anna S. Kitzmann, MD**

Department of Ophthalmology  
Mayo Clinic Health System  
Fairmont, Minnesota

**Alla Kukuyev, MD**

Robert Cizik Eye Clinic  
Clinical Assistant Professor  
Department of Ophthalmology & Visual Science  
The University of Texas  
Houston, Texas

**Paul D. Langer, MD**

Associate Professor of Ophthalmology  
Director, Division of Ophthalmic Plastic,  
Reconstructive, and Orbital Surgery  
Department of Ophthalmology, New Jersey Medical  
School  
Newark, New Jersey

**Andrew G. Lee, MD**

Professor of Ophthalmology, Neurology, and  
Neurological Surgery, Weill Cornell Medical  
College  
Chair, Department of Ophthalmology, Houston  
Methodist Hospital  
Clinical Professor of Ophthalmology, UTMB Galveston  
Clinical Professor of Head and Neck Surgery, UT MD  
Anderson Cancer Center  
Adjunct Professor of Ophthalmology, The University of  
Iowa and Baylor College of Medicine



**Jennifer Lee, MD**

Washington Pacific Eye Associates  
Kirkland, Washington  
Clinical Assistant Professor of Ophthalmology  
University of Washington  
Seattle, Washington

**Yunhee Lee, MD, MPH**

Assistant Professor of Clinical Ophthalmology  
Bascom Palmer Eye Institute  
Miami, Florida

**Jay M. Lustbader, MD**

Chair, Departments of Ophthalmology, MedStar  
Georgetown University Hospital and MedStar  
Washington Hospital Center  
Professor of Ophthalmology, Georgetown University  
School of Medicine  
President, Washington National Eye Center

**Casey Mickler, MD**

Storm Eye Institute  
Medical University of South Carolina  
Charleston, South Carolina

**Frank Moya, MD**

Assistant Professor of Ophthalmology, Glaucoma  
Section  
Duke Eye Center  
Winston-Salem, North Carolina

**Hreem Patel, MD**

Rush University Medical Center  
Chicago, Illinois

**Ensa K. Pillow, MD**

Attending Physician, Ophthalmology  
Oklahoma City Veterans Affairs Medical Center  
Oklahoma City, Oklahoma  
Clinical Assistant Professor, Department of  
Ophthalmology  
University of Oklahoma

**Dmitry Pyatetsky, MD**

Assistant Professor  
Ophthalmology Residency Program Director  
Northwestern University Feinberg School of Medicine  
Chief, Ophthalmology, Jesse Brown VA Medical Center  
Chicago, Illinois

**Peter A. Quiros, MD**

Assistant Professor, Department of Ophthalmology  
University of Southern California  
Doheny Eye Institute  
Los Angeles, California

**Anvesh C. Reddy, MD**

Department of Ophthalmology  
University of Missouri–Kansas City School of Medicine  
Kansas City, Missouri

**Mahendra K. Rupani, MD**

Assistant Professor, Ophthalmology  
University of Missouri–Kansas City School of Medicine  
Kansas City, Missouri

**Paul J. Tapino, MD**

Associate Professor of Clinical Ophthalmology  
Director, Ophthalmology Residency Program  
The Scheie Eye Institute  
Philadelphia, Pennsylvania

**M. Reza Vagefi, MD**

Associate Clinical Professor of Ophthalmology  
Associate Residency Program Director  
University of California, San Francisco  
San Francisco, California

**Nicholas J. Volpe, MD**

Chair, Department of Ophthalmology  
George and Edwina Tarry Professor of Ophthalmology  
Northwestern University Feinberg School of Medicine  
Chicago, Illinois

**Jonathan D. Walker, MD**

Assistant Clinical Professor  
Indiana University School of Medicine  
Fort Wayne, Indiana  
Allen County Retinal Surgeons  
Fort Wayne, Indiana

**David K. Wallace, MD, MPH**

Professor of Ophthalmology & Pediatrics  
Director of Clinical Research  
Duke Eye Center  
Durham, North Carolina

**Andrew A. Wilson, MD**

Dean McGee Eye Institute  
Oklahoma City, Oklahoma

**Bryan J. Winn, MD**

Assistant Professor of Ophthalmology at  
Columbia University Medical Center  
Residency Program Director  
Columbia University  
New York, New York

**Edward J. Wladis, MD**

Associate Professor, Ophthalmic Plastic Surgery  
Department of Ophthalmology  
Lions Eye Institute  
Albany Medical College  
Albany, New York

**Sandra M. Woolley, PhD, CPE**

Ergonomist, Occupational Safety  
Mayo Clinic  
Rochester, Minnesota

**Norman A. Zabriskie, MD**

Vice-Chair Clinical, Medical Director  
Department of Ophthalmology/Visual Sciences  
John A. Moran Eye Center  
University of Utah  
Salt Lake City, Utah

# Foreword

How do you teach surgery? How do you learn surgery? We surgeons have vivid memories of events in our surgical learning path—the first time we scrubbed in as medical students, the first time we sutured a laceration, or the first time we touched a beating heart—and many, many more.

As ophthalmologists, we remember the first successful cataract surgery and the patient's vision the next day—and we remember our first serious intraoperative complication and the steps we took to manage it. We likely all shared a similar surgical learning process in residency training as we built on our general medical and surgical experience, sequentially adding knowledge, specific manual maneuvers, and procedural components through a combination of didactics, surgical “wet laboratories,” observation, and supervised patient experience. Then, under supervision, we assembled it all into the complete package as primary surgeon.

Is that the best way to learn surgery? Ultimately, no. In an ideal system, ophthalmic surgical simulation technology will soon allow us to gain not only technical proficiency but also experience in intraoperative decision-making and complication management. When surgeons in training then perform their “first case” as a primary surgeon, they will do so having had important near-real-life experience. The process will benefit surgeons in training and patients alike.

But surgery is much, much more than the technical performance of a set of skill components. A well-constructed set of surgical learning objectives must involve many subjects, including the biomechanics of wound construction and healing, instrument design, surgical materials (such as sutures and irrigation fluids), and sterility and infection control. It should include patient selection, the informed consent processes, medical ethics, postoperative management, and complication avoidance and management, among other topics.

For ophthalmology, surgery is a core and a complex competency, and education in this complex subject remains a process equally daunting for teacher and student alike. Anything that can facilitate the process benefits future patients. *Basic Principles of Ophthalmic Surgery*, together with the Academy's companion volume, *Basic Techniques of Ophthalmic Surgery*, packages many of the key elements of the surgical process and environment into an invaluable adjunct to the learning program for residents.

Simulators, texts, and videos are only imperfect tools in this educational process. But they can better prepare us to meet the challenges. There is one other critical component to surgical education—the experienced operative teacher and mentor who sits (or stands) at our side and guides us through the exciting, exacting, and at times stressful process of altering living human tissue. This volume, both text and video, reflects the commitment and talents of some of those incredible ophthalmic educators who have shepherded the earlier editions.

As surgeons we have a profound obligation to our patients. They honor us by trusting to us their sight and sometimes their lives. This text acknowledges the scope and complexity of that obligation.

David W. Parke II, MD  
*Chief Executive Officer*  
*American Academy of Ophthalmology*

# Preface

Many years ago when the American Academy of Ophthalmology began development of *Basic Principles of Ophthalmic Surgery*, respected educators immediately recognized the need for a comprehensive resource to aid in navigating the surgical learning curve experienced by all ophthalmology residents. Led by Dr Anthony Arnold in its inaugural edition and by Dr Thomas Oetting in the second edition, this book shares the collective knowledge and experience of passionate surgical educators accumulated over thousands of hours of professional dedication. The hope is that residents and educators from around the corner and around the world can benefit from this text in traversing among the most challenging aspects of residency training: the interface between the patient and the novice surgeon.

This edition is divided into 4 major sections: Evaluation and Preparation, Surgical Logistics, Intraoperative Considerations, and Postoperative Considerations. All of the previous chapters has been updated where appropriate, and several new chapters have been added to further expand on specific topics in greater depth. New chapters include “Informed Consent” (by Kian Eftekhari, MD, and Paul J. Tapino, MD), “Simulation in Surgical Training” (by William G. Gensheimer, MD, and Yousuf M. Khalifa, MD), “ACGME Requirements for Surgical Training” (by Bryan J. Winn, MD), and “Complications and Their Consequences” (by Sarah DeParis, MD, and M. Reza Vagefi, MD).

For all of the authors in this book, we are grateful for their generous contributions of time, effort, and expertise, offered on behalf of many future generations of ophthalmologists. I am also personally grateful for the support of Kim Torgerson and for her patience and guidance in creating this edition.

Ayman Naseri, MD  
*Ophthalmology Residency Program Director, University of California  
Chief of Ophthalmology at the San Francisco Veterans Affairs Medical Center  
San Francisco, California*

## Acknowledgments

---

The Academy wishes to acknowledge the following people who reviewed the second edition and suggested changes for the third edition. For the Committee on Resident Education: Christopher B. Chambers, MD; Laura K. Green, MD; Jean R. Hausheer, MD; Andrew G. Lee, MD; Alison R. Loh, MD; Laura L. Wayman, MD; Jennifer S. Weizer, MD; and Evan L. Waxman, MD, PhD. For the European Board of Ophthalmology: Wagih Aclimandos, London, UK; Christina Grupcheva, MD, Varna, Bulgaria; Catherine Creuzot-Garcher, MD, PhD, Dijon, France; Hanne Olsen Julian, Copenhagen, Denmark; Francesco Bاندello, MD, FEBO, Milan, Italy. For peer review of new chapters: Michele M. Bloomer, MD;



Laura K. Green, MD; Jean R. Hausheer, MD; Andrew G. Lee, MD; Nick Mamelis, MD; Anne Menke (OMIC); Todd J. Mondzelewski, MD; Jennifer S. Weizer, MD; and Evan L. Waxman, MD.

A special thanks to Richard Caesar, MBBS, FRCOphth, and Bryn M. Burkholder, MD, for providing videos.

The Academy thanks the following for supplying photographs for the instruments chapter, including Anthony Kroboth, Ambler Surgical; Anne Bohsack, FCI Ophthalmics; Gordon Dahl, Katena Products; Larry Laks, MicroSurgical Technology; Scott Heck, Wilson Ophthalmic; and Amy Wang, ASICO, LLC. Photo credits: figures for this chapter are courtesy of Ambler Surgical unless otherwise noted. Figures 8-18, 8-39, and 8-46 are courtesy of FCI Ophthalmics; Figures 8-37, 8-38, 8-53, 8-66, 8-67, 8-75, 8-76, and 8-86 are courtesy of Katena Products; Figures 8-40, 8-41, 8-45, and 8-71 are courtesy of MicroSurgical Technology; Figure 8-72, part 2, is courtesy of ASICO, LLC; and Figures 8-74 and 8-91 are courtesy of Wilson Ophthalmic.

# Contents

Foreword ix  
Preface xi

## Part I

### Evaluation and Preparation 1

#### Chapter 1

##### Patient Selection 3

Maria M. Aaron, MD

Criteria for Surgical Intervention 3  
Factors Affecting Surgical Risk 4  
Ethical Considerations 7  
Implications of the Surgeon's  
Experience 8

#### Chapter 2

##### Preparation of the Patient 11

Hreem Patel, MD  
Jack A. Cohen, MD

Preparations in the Office 11  
Process in the Operating Room 13

#### Chapter 3

##### Preparation of the Surgeon 17

Eric R. Holz, MD  
Alla Kukuyev, MD

Familiarization 17  
Understanding the Planned  
Procedure 18  
Knowing the Tools 18  
Physical Factors Affecting the  
Surgeon 18  
Hand Preparation 20  
Operating Room Environment 20

#### Chapter 4

##### Informed Consent 25

Kian Eftekhari, MD  
Paul J. Tapino, MD

Importance of Informed Consent 25  
Elements of Informed Consent 26

Challenges for Residents Obtaining  
Informed Consent 28  
Summary 31

#### Chapter 5

##### Simulation in Surgical Training 35

William G. Gensheimer, MD  
Yousuf M. Khalifa, MD

Wet Laboratory 35  
Intraocular Simulation 36  
Virtual Reality 39

## Part II

### Surgical Logistics 43

#### Chapter 6

##### The Importance of Ergonomics for Ophthalmologists 45

Sandra M. Woolley, PhD, CPE  
Anna S. Kitzmann, MD

Ergonomics and Ergonomic Risk  
Factors 45  
Adopting Ergonomically Friendly  
Practices 46  
Reducing the Risk of Developing  
Musculoskeletal Disorders 58

#### Chapter 7

##### The Operating Microscope and Surgical Loupes 63

Norman A. Zabriskie, MD  
Daniel I. Bettis, MD

Advantages and Disadvantages of  
Magnification 63  
Patient Positioning 64  
Surgeon Positioning 68  
Positioning the Bed 70  
Stabilizing the Hands 72  
Microscope Function 76  
Surgical Loupes 81

## **Chapter 8**

### **Surgical Instruments and Blades 85**

Jay M. Lustbader, MD  
Robert B. Dinn, MD

Surgical Instruments 85  
Other Specialized Surgical  
Instruments 105  
Surgical Blades 107

## **Chapter 9**

### **Suture Materials and Needles 111**

Jennifer Lee, MD  
Keith D. Carter, MD

Characteristics of Sutures 111  
Classification of Sutures 111  
Needles 115

## **Chapter 10**

### **Lasers 119**

Jonathan D. Walker, MD

Laser Physics 119  
Laser/Tissue Interactions 120  
Wavelength 123  
Controlling the Energy 124  
Putting the Variables Together 125  
Laser Safety 127  
Patient Issues 127  
New Directions 129

## **Chapter 11**

### **ACGME Requirements for Surgical Training 133**

Bryan J. Winn, MD

ACGME Case Logs 133  
Common Pitfalls 135  
Tips on Maintaining an Accurate Surgical  
Log 136  
Beyond Residency and the ACGME 137  
Milestones 137

## **Part III**

### **Intraoperative Considerations 141**

## **Chapter 12**

### **Aseptic Technique and the Sterile Field in the Operating Room 143**

Ensa K. Pillow, MD  
Andrew A. Wilson, MD

Skin Preparation 143  
Application of Antiseptic Agents 144  
Hand Scrubbing 144  
Gowning and Gloving 146  
Draping 147  
Sterile Field 150

## **Chapter 13**

### **Ophthalmic Anesthesia 153**

Steven J. Gedde, MD  
Yunhee Lee, MD, MPH

Sedation 153  
Local Anesthetic Agents 154  
Regional Anesthetic Agents 155  
Local Anesthesia 157  
Regional Anesthesia 158  
General Anesthesia 163  
Facial Nerve Blocks 164  
Complications of Ophthalmic  
Anesthesia 165

## **Chapter 14**

### **Hemostasis 171**

J. Paul Dieckert, MD, MBA

Prevention 171  
Heating 171  
Vasoconstriction 173  
Biochemical Enhancement of  
Hemostasis 173  
Mechanical Tamponade 174  
Embolization 174

## **Chapter 15**

### **Suturing and Knot Tying 177**

Edward J. Wladis, MD  
Paul D. Langer, MD

Simple Square Knot (Instrument  
Tie) 177  
Basic Suturing Principles 179  
Common Suturing Techniques 180

## **Chapter 16**

### **Intraocular Fluids 187**

James P. Dunn, MD

Ophthalmic Viscosurgical Devices 187  
Irrigating Fluids 191  
Mydriatics and Miotics 192  
Anesthetics 193  
Corticosteroids, Antibiotics, and  
Antifungals 194

- Capsular Staining Agents 194
- Vascular Endothelial Growth Factor Antagonists 195
- Compounding Intraocular Drugs 195

## Chapter 17

### Patient Safety Issues 199

- Andrew G. Lee, MD
- Infection Prophylaxis 199
- Surgery on the Incorrect Eye 199
- Incorrect Intraocular Lens Placement 201
- Minimizing Medication Errors:
  - Communication about Drug Orders 202
- Preventing Surgeon-Related Fire in the Operating Room 204

## Part IV

### Postoperative Considerations 211

## Chapter 18

### Postoperative Management 213

- Nicholas J. Volpe, MD
- Dmitry Pyatetsky, MD
- Postoperative Instructions 213
- Timing of Postoperative Care 215
- Focus of the Examination 217
- Pain Management 219
- Management of Complications 219

## Chapter 19

### The Healing Process 225

- Frank Moya, MD
- Peter A. Quiros, MD
- Casey Mickler, MD
- Healing by Intention 225
- The Process of Healing 226
- Wound Healing in Dermal/Conjunctival Tissue 229
- Corneal Wound Healing 233
- Scleral Wound Healing 235
- Uveal Wound Healing 236
- Modifying Wound Healing 237
- Wound Healing Enhancers 238
- The Ultimate Goal 240

## Chapter 20

### Dressings 243

- David K. Wallace, MD, MPH
- Advantages and Disadvantages of Postoperative Dressings 243
- Indications 244
- Supplies 244
- Technique for Dressing Placement 246
- Postoperative Instructions 248
- Dressing Removal 248

## Chapter 21

### Handling of Ocular Tissues for Pathology 251

- Mahendra K. Rupani, MD
- Anvesh C. Reddy, MD
- Preoperative Planning, Frozen and Routine Specimens 251
- Supplies and Equipment, Requisitions 252
- Labeling of Specimen Containers 254
- Specimen Requisitions 254
- Transportation 256
- Frozen Sections 256
- Pearls for Handling of Routine Specimens 256
- Special Procedures 260
- Gross Specimens Only 260

## Chapter 22

### Complications and Their Consequences 263

- Sarah W. DeParis, MD
- M. Reza Vagefi, MD
- Care of the Patient 263
- Medicolegal Implications of an Error 265
- Care of the Surgeon in the Event of an Error 267

## Appendix A

### Preferred Responses, Chapter Self-Assessment Tests 271

- Index 273





PART I

# Evaluation and Preparation







# Patient Selection

*Maria M. Aaron, MD*

The performance of surgery involves much more than the procedure itself. The beginning surgeon often focuses on the successful completion of the technical procedure—merely getting from point A to point B—without complications. Successful surgery, however, also requires careful patient selection, preoperative evaluation, and postoperative care. This chapter focuses on issues of patient selection, including criteria for surgical intervention, factors affecting surgical risk, ethical considerations including informed consent and advertising, and the implications of the surgeon's experience.

## Criteria for Surgical Intervention

---

The surgeon must carefully assess the patient's complaints and expectations for surgery. Upon reviewing the clinical pathology, he or she must determine if the surgical procedure will accomplish the desired outcome. For example, the patient with mild to moderate macular degeneration undergoing cataract extraction might be expecting a 20/20 result similar to that of others who have had the procedure; consequently, the surgeon must communicate a reasonable expectation of more limited visual acuity in this situation. Moreover, a patient with severe macular degeneration and a dense posterior capsular opacity may not benefit at all from a YAG capsulotomy, and therefore the laser procedure is not justified.

In addition to understanding the patient's expectations, the surgeon must carefully review the clinical findings in order to accurately assess risk, evaluate whether surgery is justified, and communicate the risk-benefit ratio clearly to the patient. Careful clinical evaluation may reveal coexisting disease that might increase the potential risks of surgery. For example, a patient who has a moderate degree of corneal endothelial guttata who is undergoing phacoemulsification for a dense brunescient lens has the added risk of corneal decompensation. Table 1-1 lists common coexisting findings to consider when evaluating patients for cataract surgery, which is the type of surgery in which the beginning surgeon is most likely to be involved. While the implications of such abnormalities may vary depending upon the clinical situation and the experience of the surgeon, preoperative examination should include their consideration in every case. Many first-year residents may be involved in eyelid and laser procedures.

**Table 1-1 Common Concerns to Consider Before Cataract Surgery**

Condition	Risk
<b>History</b>	
Previous trauma	Zonular or capsular weakness
<b>General physical condition</b>	
Dementia	Altered response to anesthesia, movement during procedure
Severe spine/neck disease	Inability to lie supine
Congestive heart failure	Inability to lie supine
Prior use of an alpha blocker	Intraoperative floppy iris syndrome
<b>Anterior segment</b>	
Abnormally shallow anterior chamber	Reduction of working space
Abnormally deep anterior chamber	Difficulty with maneuvers
Exposure keratopathy	Corneal decompensation
Endothelial guttata	Corneal decompensation
History of iritis or inflammatory condition	Severe postoperative inflammation
Poor pupillary dilation	Challenging nuclear removal, iris prolapse
Pseudoexfoliation	Poor dilation and zonular weakness
Advanced glaucoma	Spike in intraocular pressure
Prior trabeculectomy	Failure of shunt
Corneal scars	Poor visualization
Phacodonesis	Zonular weakness
Mature cataract or poor red reflex	Poor visualization of capsulorrhexis
<b>Posterior segment</b>	
Previous pars plana vitrectomy	Loss of vitreous support
High myopia	Retinal detachment
Diabetic retinopathy	Progression of disease
Macular degeneration	Possible progression of disease
Other macular pathology	Limited visual outcome

## Factors Affecting Surgical Risk

Ophthalmic surgical procedures are often performed on elderly patients who require careful medical evaluation to avoid surgical or systemic complications. While a patient's age does not necessarily correlate with his or her physical and mental status, older patients often have concomitant medical conditions requiring multiple medications. Proper pre-operative medical assessment allows for selection of proper surgical candidates and helps ensure a smooth operative procedure and course in those who proceed to surgery.

Preoperative medical evaluation, either a brief survey by the surgeon or a detailed assessment by a medical specialist, depending on the clinical situation, allows for selection of those patients who can safely undergo surgery and identification of those who either require medical care before surgery or cannot safely proceed. The examiner should take a thorough history—including questions about medications, allergies, bleeding disorders and prior surgical procedures—during the preoperative assessment. The surgeon should



detect the past use of alpha-blocking agents such as tamsulosin, as a history of these agents increases the risk of the intraoperative floppy iris syndrome. He or she should also pay careful attention to a patient's use of aspirin-containing products and additional medications that may cause bleeding, including warfarin sodium (Coumadin), heparin, nonsteroidal anti-inflammatory drugs (NSAIDs), and herbal therapies such as Ginkgo biloba, garlic, and ginger. Many patients are unaware that aspirin and NSAIDs may cause bleeding and therefore do not report them unless specifically questioned.

Anticoagulants are of particular concerns when considering eyelid, periorbital, or orbital procedures. In patients requiring oral anticoagulants for prevention of stroke and transient ischemic attack, suspension of these agents carries risks, and alternative anesthesia or consultation with the patient's physician should be considered. Systemic situations that may require special evaluation or therapy before surgery include cardiac disease, hypertension, pulmonary disease, and diabetes. Issues of anesthesia may be a concern with children and people with altered mental status.

### **Cardiac Disease**

Patients with cardiac disease should be evaluated for any recent ischemic events, arrhythmias, or congestive heart failure (CHF). Patients with severe CHF may have difficulty lying supine for the duration of the procedure and may require intensive therapy to optimize cardiac status before surgery. (See Chapter 2 for discussion of positioning the patient.) If the patient is unstable or if the surgeon has any degree of uncertainty about the cardiac stability, the cardiologist or primary care provider should clear the patient before the performance of the ophthalmic procedure.

### **Hypertension**

Arterial blood pressure control is essential in patients undergoing ophthalmic surgery, as uncontrolled pressure increases risk of cardiovascular complications. Patients with a systolic blood pressure over 180 mmHg and a diastolic blood pressure over 100 mmHg should be evaluated and treated before the performance of an elective procedure.

### **Postural Limitations**

Proper positioning of the patient for surgical or laser procedures is essential for uncomplicated, successful surgery. The majority of intraoperative procedures require the patient to be in the supine position; however, patients with severe kyphosis, cerebral palsy, myotonic dystrophy, or obesity may present challenges. These patients may also be difficult to position for office procedures at the slit lamp. Adjusting the operating table and/or chair, rotating the surgical microscope or laser apparatus, altering the surgical/laser approach, and using pillows, sheets, foam, and so on are effective techniques for minimizing discomfort for patients and surgeons.

### **Pulmonary Disease**

The patient with severe chronic obstructive pulmonary disease or asthma will need clearance by his or her pulmonary or primary care physician before elective surgery.