
Refractive Surgery Atlas

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Editors

Refractive Surgery Atlas

Surgical techniques and complications

 Springer

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ISBN 978-3-031-60660-1 ISBN 978-3-031-60661-8 (eBook)
<https://doi.org/10.1007/978-3-031-60661-8>

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To all my fellows who constantly inspire me through their boundless curiosity and thirst for knowledge.

—**Samir A. Melki**

To my teachers at Boston Vision. To my parents Ahmad and Sahar, whose love and guidance have shaped me into the person I am today. To my beloved wife Lulwa, whose unwavering support and encouragement have fueled my passion for writing. And to my precious daughter Yasma, who is the inspiration behind every word written in this book.

—**Wassef Chanbour**

To my wife Allison who helped put me through medical school, raise our children, and is the keystone to our family.

—**Jason Brenner**

Foreword

With gratitude and great admiration, I am honored to introduce the outstanding work of the *Refractive Surgery Atlas: Surgical Techniques and Complications* by Samir Melki, MD, PhD, Wassef Chanbour, MD, and Jason Brenner, MD. This comprehensive book is a testament to the remarkable progress achieved in refractive surgery, providing a guide to surgical techniques while addressing the complexities and challenges of managing potential complications.

Refractive surgery has undergone tremendous advancements, revolutionizing how we correct vision and liberating countless individuals from dependence on corrective lenses. The advent of laser vision correction has been remarkable, driven by the relentless pursuit of safety and efficiency. Moreover, refractive surgery is on the path to being considered a specialty of medicine with ophthalmology as a prerequisite, as defined by the World College of Refractive Surgery and Visual Sciences (www.wcrsvs.org).

Within these pages, esteemed experts in the field have meticulously documented and curated an extensive collection of surgical techniques, ensuring readers acquire the knowledge and skills required to navigate the intricate world of refractive surgery. This atlas is a comprehensive guide for experienced surgeons and aspiring ophthalmologists and provides valuable insights for researchers and scholars interested in this rapidly evolving field. One of the distinguishing features of this atlas is its unwavering focus on the understanding of complications. While refractive surgery offers immense benefits, it is not without risks. Recognizing this, the authors have dedicated significant attention to preventing and managing potential complications arising during or after surgical interventions. By shedding light on the nuances of difficulties, they empower practitioners to approach these challenges confidently, ensuring the highest level of patient care and safety.

I sincerely appreciate the authors and contributors who have dedicated their time, knowledge, and passion to creating this remarkable atlas. Their unwavering commitment to advancing the field of refractive surgery is evident in every chapter, making this volume an indispensable resource that will undoubtedly shape the future of ophthalmic surgery.

I am honored to contribute to this work by describing a case of iatrogenic ectasia after SMILE. This was the first (and still the only) case of ectasia that I generated after laser vision correction. Paradoxically, I dedicate my research to preventing such complex and unfortunate complications. Nevertheless, the lessons learned using the “black-box thinking” mindset have been fundamentally relevant for my evolution as a refractive surgeon-scientist. I recommend this work and invite you to the learning journey through the *Refractive Surgery Atlas: Surgical Techniques and Complications*. May this atlas inspire and empower you to provide the best possible care for your patients.

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Renato Ambrósio Jr

Preface

The *Refractive Surgery Atlas* starts with an introduction that provides an overview of the most commonly used refractive surgical techniques. The subsequent chapters delve into the intraoperative and postoperative complications that can arise from LASIK and PRK surgeries, combining detailed descriptions of potential complications with strategies for preventing and treating them.

In addition to LASIK and PRK, *Refractive Surgery Atlas* also covers other types of refractive surgeries, such as phakic intraocular lenses, SMILE, and incisional surgeries. Each surgery is discussed in detail, with explanations on their indications and their potential risks and benefits.

One of the unique features of this book is the case-based approach used to present normal and abnormal changes encountered during and following refractive surgeries.

Overall, *Refractive Surgery Atlas* is an essential resource for anyone interested in refractive surgery. Whether you're a surgeon, an optometrist, a medical student, or a resident, this book provides comprehensive information that will help you identify potential complications and make the right decisions to manage them.

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Boston, MA, USA
Minneapolis, MN, USA

Samir A. Melki
Jason Brenner
Wassef Chanbour

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Jason Brenner, MD started his education at Lafayette College where he obtained a Bachelor of Science in biology with a minor in medical ethics. After his undergrad, he attended medical school at George Washington University School of Medicine in Washington, D.C. He then completed his residency training at Temple University Hospital in Philadelphia, where he was also chief resident.

He is a board-certified ophthalmologist, specializing in cornea, refractive, and anterior segment surgery. He did his fellowship under the supervision of Dr. Melki, at the Boston Eye Group and is currently one of the primary refractive surgeons at Boston Vision. He is also an associate staff at Beth Israel Deaconess Medical Center in Boston. As a cornea specialist, his primary interests are LASIK, Visian ICL surgery, femtosecond-assisted cataract surgery, sutured intraocular lenses, anterior segment reconstruction, and corneal transplants.

Wassef Chanbour, MD is an assistant professor at the University of Minnesota. After obtaining the medical degree from the Lebanese University in Beirut, he completed the ophthalmology residency at the Beirut Eye and ENT Specialist Hospital. He is specialized in cornea and refractive surgery, and his fellowship training was at Beth Israel Deaconess Medical Center and Boston Vision, under the guidance of Dr. Samir Melki. His practice includes all patients with different medical and surgical corneal and anterior segment diseases. He treats adults and children with the latest surgical techniques including endothelial keratoplasties in addition to the latest refractive procedures including LASIK, ICL, and femtosecond-assisted cataract surgery.

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Abbreviations

AC	Anterior chamber
AI	Artificial intelligence
AK	Arcuate keratotomy
ART-max	Ambrósio relational thickness-maximum
ASN	Acute stromal necrosis
AS-OCT	Anterior segment optical computed tomography
BCL	Bandage contact lens
BCVA	Best corrected visual acuity
BL	Bowman's layer
CAIRS	Corneal allogenic intrastromal ring segments
CBI	Corneal Biomechanical Index
CCT	Central corneal thickness
CXL	Collagen cross-linking
DALK	Deep anterior lamellar keratectomy
DLK	Diffuse lamellar keratitis
EBMD	Epithelial basement membrane dystrophy
Epi-ON CXL	Epithelium-ON collagen cross-linking
FS-ICRS	Femtosecond-assisted intracorneal ring segment implantation
ICL	Implantable collamer lens
ICRS	Intrastromal corneal ring segments
IOL	Intraocular lens
LALEX	Laser-assisted lenticular extraction with a small incision
LASIK	Laser-assisted in situ keratomileusis
LRI	Limbal relaxing incisions
LVC	Laser vision correction
OBL	Opaque bubble layer
OCT	Optical coherence tomography
OZ	Optical zone
PK	Penetrating keratoplasty
PRFI	Pentacam random forest index
PRK	Photorefractive keratectomy
PTA	Percent of tissue altered
PTK	Phototherapeutic keratectomy
RK	Refractive keratectomy
RSB	Residual stromal bed
SMILE	Small incision lenticule extraction
TBI	Tomography and biomechanical index
UCVA	Uncorrected visual acuity
VGB	Vertical gas breakthrough

Acknowledgements

We wish to thank the contributing authors of this book, whose hard work has resulted in a more up-to-date text. We are deeply grateful to the doctors who generously shared their expertise and clinical cases, making this book a rich resource for medical professionals and students alike. Your contribution to this book, through your photographs and compelling clinical cases, is invaluable and will undoubtedly make a difference in the lives of many patients. Thank you for being a vital part of this project.

This book was not funded by any external sources.