

Mastering Endothelial Keratoplasty

Soosan Jacob
Editor

Mastering Endothelial Keratoplasty

DSAEK, DMEK, E-DMEK, PDEK,
Air pump-assisted PDEK and others

Volume I

 Springer

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ISBN 978-81-322-2816-5 ISBN 978-81-322-2818-9 (eBook)
DOI 10.1007/978-81-322-2818-9

Library of Congress Control Number: 2016945973

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Printed on acid-free paper

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For Abe – you are the reason I am!

**For Ashwin and Riya – you are the reason
for me!**

*“The strongest and sweetest songs yet
remain to be sung.”*

-Walt Whitman

Foreword

We are now witnessing the natural progression of the management of corneal endothelial disease from full thickness penetrating keratoplasty to endothelial transplantation. With any new disruptive surgical technique there are pioneers who provide the leadership and direction to take an innovative idea and create the transformation that will change the future of our specialty. Dr. Soosan Jacob is one of these individuals. She is an undisputed innovator, educator and international leader in anterior segment surgery who constantly looks at surgical dilemmas and discovers solutions to the most difficult problems facing anterior segment surgeons today. Her surgical techniques have changed the face of ophthalmology and have been adapted worldwide to the betterment of our patients. Her videos, often in collaboration with her mentor Dr. Amar Agarwal, are masterpieces of innovation that have helped educate an entire generation of ophthalmologists and have won numerous international awards. In addition she is a prolific writer editing 15 textbooks, writing 200 book chapters and authoring 80 peer-reviewed publications. She is a superb surgeon with many innovative instrumentations and surgical techniques to her credit, but most remarkably she possesses the rarest of all personal attributes, she is an original thinker. Dr. Jacob is creative, analytical, pioneering, and her advances are built on the foundation that no matter what we do, our patients come first and we should do everything to maximize their visual outcome. No case is too complex for Dr. Jacob. In addition, Dr. Jacob, despite all of her accomplishments, is humble and self-effacing, always giving credit to anyone who has in anyway been associated with her success. There is a small group of surgeons around the world that I call on for advice in managing my most demanding surgical cases and Dr. Jacob is at the pinnacle of this elite group.

Over little more than a decade there has been a revolution in advancing our management of corneal endothelial disease. Just a few short years ago penetrating keratoplasty was the routine management of bullous keratopathy, pseudophakic bullous keratopathy and Fuchs' dystrophy. The visual rehabilitation was painfully slow with high postoperative astigmatism, surgically induced glaucoma and a lifetime risk of even mild ocular trauma resulting in a vision threatening wound dehiscence. Endothelial keratoplasty has changed the course of the most common causes of

corneal transplantation. Beginning with DSAEK and advancing to DMEK and now PDEK, visual rehabilitation for endothelial disease has now become safer with more rapid visual rehabilitation and incredible improvement in quality of vision and quality of life over full thickness penetrating keratoplasty. Dr. Soosan Jacob has been at the forefront of these advances with multiple innovations to her credit including the endo-illuminator assisted Descemet's membrane endothelial keratoplasty devised to enhance visualization and three-dimensional depth perception during DMEK and air-pump assisted pre-Descemet's endothelial keratoplasty (PDEK) that makes PDEK surgery easier and more adoptable by surgeons.

Dr. Jacob's new book, *Mastering Endothelial Keratoplasty*, is a comprehensive tour de force of the surgical management of endothelial disease beginning with the history and anatomy, advancing through corneal transplantation, Descemet's stripping automated endothelial keratoplasty (DSAEK), ultrathin DSAEK, Descemet's membrane endothelial keratoplasty (DMEK) and finally pre-Descemet's endothelial keratoplasty (PDEK). The book is a comprehensive analysis of the management of endothelial disease and summarizes all of the best and most useful and practical pearls that she and her authors have developed. Dr. Jacob has brought together an extraordinary internationally recognized group of authors who have changed the face of endothelial management. This book will be widely read by anterior segment surgeons who wish to add to their surgical skill and will be an important contribution to ophthalmology.

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Preface

The landscape of cornea as a sub-speciality has changed significantly from the past. Technology has improved by leaps and bounds and new techniques are constantly evolving. Interlinking of technology, newer surgical techniques, and basic research has brought about rapid shifts in our approach to corneal surgery, especially keratoplasty. Lamellar keratoplasty, both anterior and posterior, have shown such improved results that they have become the standard of care. The last two decades have seen the introduction of posterior lamellar keratoplasty as well as many changes in the way it has been performed. Endothelial keratoplasty has today become the most popular of choices for endothelial dysfunction requiring surgery. In 2011, about half the corneal transplants performed in the USA were Descemet stripping automated endothelial keratoplasty (DSAEK), and in 2012 it overtook penetrating keratoplasty in terms of the number of corneas being used. The acceptance is similar in many other parts of the world. The reason DSAEK is finding favor with both surgeons and patients is because of the improved recovery times and visual outcomes as well as the numerous intra-operative advantages. However, despite the even greater perceived advantages of the two more recent forms of endothelial keratoplasty – Descemet membrane endothelial keratoplasty (DMEK) and Pre-Descemet endothelial keratoplasty (PDEK) – there is still hesitancy on the part of many corneal surgeons to the inclusion of these into their surgical armamentarium. This is because these are perceived as more challenging techniques with a greater learning curve.

This two-volume book on endothelial keratoplasty (EK) serves to fill up a vacuum in this space as there is at present no book that covers all kinds of EK including DSAEK, ultra-thin DSAEK (UT-DSAEK), DMEK, and PDEK. It has been aimed to serve as an excellent guide for DSAEK to both the beginning surgeon as well as those who need a refresher to sharpen their skills further. It also at the same time serves as a stepping stone for successfully, and with minimal heartburn, mastering the more challenging newer endothelial keratoplasties, viz., DMEK and PDEK. The various minute steps that are essential for these as well as for newer ancillary techniques which help make surgery easy such as endoilluminator assisted DMEK (E-DMEK) and the air-pump assisted PDEK have been described in detail. The

original pioneers for the various techniques as well as eminent specialists in this area have contributed their knowledge as well as given their tips and tricks for increasing surgical success. The two volumes have been designed to comprehensively cover the pre-, intra-, and post-operative period. The presence of numerous high-quality photographs, illustrations, and linked videos help make understanding easier and make this two volume book a must-have for all corneal surgeons. Despite the amount of educational material in it, the size and format has been kept to allow easy reading. The electronic format of the book helps carry it around for easy and quick reference at any place or time.

I would like to thank many people for making this labor of love possible. My co-authors who have contributed so much of their valuable time and effort to writing excellent chapters and have become dear friends; my friends and colleagues for their constant support in innumerable ways, and Saijmol AI for helping me with everyday work that otherwise would have overwhelmed me. I would also like to thank Naren Aggarwal and Teena Bedi from Springer for encouraging me to take on this task, for being immensely helpful at every step and for keeping this book to such high standards. I would like to thank all my patients from whom I have learnt so much and all the teachers in my life who have taught me so much. I would like to especially thank my two mentors, Drs. Amar and Athiya Agarwal who have pushed me ever forwards and always encouraged me to keep raising the bar further and further, always more than I would think possible for myself. I would also like to thank my parents – Mary Jacob and Lt. Col Jacob Mathai – for guiding me and molding me into what I am and my brother Alex Jacob and my sister Asha Jacob for always being there for me. Finally, I would like to thank Dr. Abraham Oomman, my husband, my best friend, my confidante, and my sounding board for his unflinching support and constant love, for making me keep at it and complete it, and lastly my children, Ashwin and Riya, who tolerated me throughout and kept me smiling through all the long hours spent.

Finally, as Oliver Wendell Holmes said, “Great things in this world depends not so much on where we stand but which direction we are moving.” This book is an attempt to throw a light to illuminate the path and make it easier to travel. I hope you the reader will enjoy this book and glean from it pearls that you will be able to incorporate into your practice.

Chennai, India

Soosan Jacob

About the Editor

Dr. Soosan Jacob, MS, FRCS, DNB, MNAMS is Director & Chief; Dr. Agarwal's Refractive and Cornea Foundation (DARCF) and Senior Consultant, Cataract and Glaucoma Services, Dr. Agarwal's Group of Eye Hospitals, Chennai, India. She is a noted speaker widely respected for her innovative techniques and management of complex surgical scenarios. She conducts courses and delivers lectures in numerous national and international conferences; has been the recipient of IIRSI Special Gold medal, Innovator's award (Connecticut Society of Eye Physicians), ESCRS John Henahan award for Young Ophthalmologist, AAO Achievement award and two time recipient of ASCRS Golden Apple award. She has special interest in cutting-edge cataract, cornea, glaucoma, and refractive surgery and has won more than 40 international awards for videos on her surgeries, innovations and challenging cases at prestigious international conferences in United States and Europe. Her innovations, many of which have won international awards, include anterior segment transplantation, where cornea, sclera, artificial iris, pupil and IOL are transplanted en bloc for anterior staphyloma; suprabrow single stab incision ptosis surgery to enhance postoperative cosmesis; turnaround techniques for false channel dissection during Intacs implantation; Glued Endo-Capsular Ring and Glued Capsular Hook for subluxated cataracts; Stab Incision Glaucoma Surgery (SIGS) as a guarded filtration surgery technique; Contact lens assisted crosslinking (CACXL) for safely crosslinking thin keratoconic corneas; Endo-illuminator assisted DMEK (E-DMEK) and Air Pump Assisted PDEK for easier and better surgical results; and the PrEsbyopic Allogenic Refractive Lenticule (PEARL) Inlay for treating presbyopia. She has proposed a new classification of Descemet's membrane detachments into rhegmatogenous, tractional, bullous and complex detachments with a suitable treatment algorithm and a new technique of relaxing descemetotomy for tractional Descemet's detachment. Her surgeries and surgical techniques have often been Editor's Choice in prestigious International Ophthalmic websites (AAO/ ONE network, ISRS, Eyetube etc). Her video blog "Journey into the Eye - A surgeon's Video blog" in the prestigious Ocular Surgery News, USA features her surgical videos. She also has her own surgical educational YouTube channel: Dr. Soosan Jacob with more than 2500 subscribers. Dr. Jacob is senior faculty for training postgraduate, fellowship

and overseas doctors. She has authored more than 80 peer reviewed articles, numerous chapters in more than 30 textbooks by international publishers, is editor for 15 textbooks in ophthalmology and reviewer for many prestigious journals. She has two popular columns, “Eye on Technology” and “Everything you want to know about” in the prestigious EuroTimes magazine published by ESCRS. She is a committee member of ISRS/AAO Multimedia Library and is on the editorial board of the Ocular Surgery News–Asia Pacific Edition, Cataract and Refractive Surgery Today- Europe, Glaucoma Today and the EuroTimes Magazines. Her life and work have been featured on the Ocular Surgery News cover page, “5Q” interview (prestigious Cataract and Refractive Surgery Today), “Sound off” column (CRST) and is the first researcher internationally to be interviewed in the prestigious CRST “Researcher’s Column.” She can be contacted at dr_soosanjan@hotmail.com

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