
SMALL INCISION CATARACT SURGERY (Manual Phaco)

SMALL INCISION CATARACT SURGERY (Manual Phaco)

SECOND EDITION

Editor

Kamaljeet Singh MS

Professor

Department of Ophthalmology

MLN Medical College

and

Consultant Ophthalmologist

State Institute of Ophthalmology

Allahabad, Uttar Pradesh, India

Foreword

Hector Bryson Chawla

 **JAYPEE - HIGHLIGHTS**
MEDICAL PUBLISHERS, INC.

Published by

Jitendar P Vij

Jaypee Brothers Medical Publishers (P) Ltd

Corporate Office

4838/24 Ansari Road, Daryaganj, **New Delhi** - 110002, India, Phone: +91-11-43574357, Fax: +91-11-43574314

Registered Office

B-3 EMCA House, 23/23B Ansari Road, Daryaganj, **New Delhi** - 110 002, India

Phones: +91-11-23272143, +91-11-23272703, +91-11-23282021

+91-11-23245672, Rel: +91-11-32558559, Fax: +91-11-23276490, +91-11-23245683

e-mail: jaypee@jaypeebrothers.com, Website: www.jaypeebrothers.com

Offices in India

- **Ahmedabad**, Phone: Rel: +91-79-32988717, e-mail: ahmedabad@jaypeebrothers.com
- **Bengaluru**, Phone: Rel: +91-80-32714073, e-mail: bangalore@jaypeebrothers.com
- **Chennai**, Phone: Rel: +91-44-32972089, e-mail: chennai@jaypeebrothers.com
- **Hyderabad**, Phone: Rel:+91-40-32940929, e-mail: hyderabad@jaypeebrothers.com
- **Kochi**, Phone: +91-484-2395740, e-mail: kochi@jaypeebrothers.com
- **Kolkata**, Phone: +91-33-22276415, e-mail: kolkata@jaypeebrothers.com
- **Lucknow**, Phone: +91-522-3040554, e-mail: lucknow@jaypeebrothers.com
- **Mumbai**, Phone: Rel: +91-22-32926896, e-mail: mumbai@jaypeebrothers.com
- **Nagpur**, Phone: Rel: +91-712-3245220, e-mail: nagpur@jaypeebrothers.com

Overseas Offices

- **North America Office, USA**, Ph: 001-636-6279734, e-mail: jaypee@jaypeebrothers.com, anjulav@jaypeebrothers.com
- **Central America Office, Panama City, Panama**, Ph: 001-507-317-0160, e-mail: cservice@jphmedical.com
Website: www.jphmedical.com
- **Europe Office, UK**, Ph: +44 (0) 2031708910, e-mail: info@jpmedpub.com

Small Incision Cataract Surgery (Manual Phaco)

© 2010, Jaypee Brothers Medical Publishers (P) Ltd.

All rights reserved. No part of this publication should be reproduced, stored in a retrieval system, or transmitted in any form or by any means: electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of the editor and the publisher.

This book has been published in good faith that the material provided by contributors is original. Every effort is made to ensure accuracy of material, but the publisher, printer and editor will not be held responsible for any inadvertent error (s). In case of any dispute, all legal matters are to be settled under Delhi jurisdiction only.

First Edition: 2002

Second Edition: 2010

ISBN 978-81-8448-980-4

Typeset at JPBMP typesetting unit

Printed at Ajanta Offset

To
My respected parents
Pitaji, Late S Amar Singh Saluja
and
Mataji, Smt Ram Rakhi Saluja

Contributors

AK Grover MD

Senior Consultant
Ganga Ram Hospital, New Delhi, India

Amar Agarwal MS FRCS FRCOphth (Lon)

Medical Director
Agarwal's Eye Hospital
13 Cathedral Road, Chennai, India

Amporn Jongsareejit MD

Mettapracharak (Raikhing) Hospital
Sampran Nakornpathom, Thailand

Arvind Singh MS

Lecturer
Regional Institute of Ophthalmology
MLN Medical College, Allahabad, India

BK Singh MS

Eye Surgeon
State Institute of Ophthalmology
Allahabad, India

BN Chaudhary MBBS

Senior Divl Medical Officer (NE Rly)
Junior Resident
Department of Ophthalmology
MLN Medical College
State Institute of Ophthalmology
Allahabad, India

D Swarup MS

Medical Superintendent
State Institute of Ophthalmology
Allahabad, India

Daljit Singh MS

Consultant Ophthalmologist
Amritsar, India

Debasish Bhattacharya MS

Consultant Ophthalmologist
DISHA Eye Hospital, Kolkata, India

Dinesh Talwar MD

Consultant Ophthalmologist
Centre for Sight
Ex-Addl Professor
Dr RP Centre for Ophthalmic Sciences
All India Institute of Medical Sciences
New Delhi, India

Francisco J Gutiérrez-Carmona

MD PhD
Department of Ophthalmology
Hospital General de Segovia
Segovia, Spain

Gagandeep Singh Brar MD

Assistant Professor
Department of Ophthalmology
Postgraduate Institute of Medical
Education and Research
Chandigarh, India

Garima Rai MSH

Senior Resident
BR Sahai Hospital, Jaipur, India

Gopal S Pillai

Ex-Senior Resident
Dr RP Centre for Ophthalmic Sciences
All India Institute of Medical Sciences
New Delhi, India

HC Chandola MD

Professor
Department of Anaesthesiology
MLN Medical College, Allahabad, India

HK Tiwari MD

Consultant Ophthalmologist
Centre for Sight
Ex-Professor and Chief
Dr RP Centre for Ophthalmic Sciences
All India Institute of Medical Sciences
New Delhi, India

Harinder Sethi MD

Dr RP Centre for Ophthalmic Sciences
All India Institute of Medical Sciences
New Delhi, India

Harpreet Singh

Registrar
Ganga Ram Hospital, New Delhi, India

Hector Bryson Chawla FRCS

Consultant Ophthalmic Surgeon
Royal Infirmary, Edinburgh, UK

Jagat Ram MD

Professor
Department of Ophthalmology

Postgraduate Institute of Medical
Education and Research
Chandigarh, India

KS Kathait MS

Eye Surgeon, Kashipur, India

KPS Malik MD

Head, Department of Ophthalmology
Safdarjung Hospital, New Delhi, India

Kamaljeet Singh MS

Professor
Department of Ophthalmology
MLN Medical College and
Consultant Ophthalmologist
State Institute of Ophthalmology
Allahabad, India

Kshama Dwivedi MS

Senior Resident
Regional Institute of Ophthalmology
MLN Medical College, Allahabad, India

Kuldeep Kr Srivastava MS

Consultant
Indira Gandhi Hospital, Lucknow
Ex-Consultant
Arvind Eye Hospital and
Postgraduate Institute of Ophthalmology
1, Anna Nagar, Madurai, India

Lalit Verma MD

Consultant Ophthalmologist
Centre for Sight
Additional Professor
Dr RP Centre for Ophthalmic Sciences
All India Institute of Medical Sciences
New Delhi, India

MK Rathore MS

Head and Professor of Ophthalmology
Rewa Medical College, Rewa, India

MP Tandon MS

Professor
Department of Ophthalmology
MLN Medical College
State Institute of Ophthalmology
Allahabad, India

Mahipal S Sachdev MD

Medical Director
Centre for Sight, New Delhi, India

Manjul Pant MS

Consultant, Tata Memorial Hospital
Jamshedpur, India

Mayel P Lepcha MBBS

Junior Resident
Regional Institute of Ophthalmology
MLN Medical College, Allahabad, India

Monika Joshi MS

Senior Resident
Department of Ophthalmology
Lady Harding Medical College
New Delhi, India

Mool Chand

Senior Resident
Dr RP Centre for Ophthalmic Sciences
All India Institute of Medical Sciences
New Delhi, India

Nikhilesh Trivedi MS

Ophthalmic Surgeon, Balaghat, India

P Mishra MS

Professor and Head
RMMCH, Annamalai University
Annamalainagar, Tamil Nadu, India

P Vijayalakshmi MS DO

Arvind Eye Hospital and
Postgraduate Institute of Ophthalmology
1, Anna Nagar, Madurai, India

PC Saxena MD DM (Card)

Head and Professor
Department of Cardiology
MLN Medical College, Allahabad, India

Pankaj Puri MD

Senior Registrar
Ganga Ram Hospital, New Delhi, India

Parul Mehrotra MS

Senior Resident
GTB Hospital, New Delhi, India

Pooja Lal MS

Resident
Regional Institute of Ophthalmology
MLN Medical College, Allahabad, India

Pradeep Venkatesh MD

Consultant
Dr RP Centre for Ophthalmic Sciences
All India Institute of Medical Sciences
New Delhi, India

Prashant Bhattiya MD

Senior Registrar
Dr RP Centre for Ophthalmic Sciences
All India Institute of Medical Sciences
New Delhi, India

RN Misra MS

Ex-Director, Professor
Department of Ophthalmology
MLN Medical College
State Institute of Ophthalmology
Allahabad, India

RP Singh MS

Ex-Senior Eye Surgeon
State Institute of Ophthalmology
Allahabad, India

Rajesh Sinha MD DNB

Senior Registrar
Dr RP Centre for Ophthalmic Sciences
All India Institute of Medical Sciences
New Delhi, India

Rajiv Vaish MS

Consultant Ophthalmologist
Allahabad, India

Rasik B Vajpayee MS

Professor of Ophthalmology
Dr RP Centre for Ophthalmic Sciences
All India Institute of Medical Sciences
New Delhi, India

Ruchi Goel MD

Associate Professor
Department of Ophthalmology
Maulana Azad Medical College
New Delhi, India

S Thanikachalam MD

Lecturer in Ophthalmology
RMMCH, Annamalai University
Annamalainagar, Tamil Nadu, India

SP Singh MS

Director
Regional Institute of Ophthalmology
MLN Medical College, Allahabad, India

Sanjeev Thapar MS

Resident
Regional Institute of Ophthalmology
MLN Medical College, Allahabad, India

Santosh Suman MS

Resident
Regional Institute of Ophthalmology
MLN Medical College, Allahabad, India

Sarita Bajaj MD DM (Endo, AIIMS)

Professor of Medicine
MLN Medical College, Allahabad, India

Shweta Pandey MS

Ex-Resident
State Institute of Ophthalmology
Allahabad, India

Subodh K Agarwal MS

Consultant Ophthalmologist
Lucknow, India

Sujata Lakhtakia MD

Head and Professor of Ophthalmology
Rewa Medical College, Rewa, India

Sumeet Jain MBBS

Junior Resident
Department of Ophthalmology
MLN Medical College
State Institute of Ophthalmology
Allahabad, India

Sunita Agarwal MS

Consultant Ophthalmology
Agarwal's Eye Hospital, Bengaluru, India

TN Vyas MS

Ex-Senior Resident
Department of Ophthalmology
MLN Medical College
State Institute of Ophthalmology
Allahabad, India

Tanuj Dada MD

Lecturer
Dr RP Centre for Ophthalmic Sciences
All India Institute of Medical Sciences
New Delhi, India

Tariq Akhtar MBBS

Resident
Regional Institute of Ophthalmology
MLN Medical College, Allahabad, India

VK Srivastava MS

Senior Eye Surgeon
State Institute of Ophthalmology
Allahabad, India

VP Gupta MS

Professor of Ophthalmology
GTB Hospital, New Delhi, India

Varun Kharbanda MBBS

Resident
Regional Institute of Ophthalmology
MLN Medical College, Allahabad, India

Vipin Bihari MS

Ex-Director, Professor
Department of Ophthalmology
MLN Medical College and
State Institute of Ophthalmology
Allahabad, India

Foreword

The aim of quality modern cataract surgery is to achieve an optimal visual result by the removal of a reduced nucleus through a small incision without inflicting irreparable damage on the corneal endothelium.

Contrary to fashionable belief, expensive equipment is no obligatory, indeed, particularly if not well maintained, it can be a positive hindrance. It certainly raises the cost at the outset and can often increase the possibility of things going wrong at anytime later.

Manual phaco is relevant to both the developing and the developed world and Dr Kamaljeet Singh and his coauthors have succeeded admirably in their attempt to cover the subject in all its aspects. Each chapter gives step by step instruction that will delight the converted and tempts those not yet persuaded of its importance.

From the start of my career I have tried not to be dependent on complicated equipment except where necessity commands and not only is manual phacosection my chosen approach to the cataract of others, it would also be my own, if surgery ever be necessary.

Hector Bryson Chawla FRCS (Ed.)
Consultant Ophthalmic Surgeon
Royal Infirmary, Edinburgh
Scotland

Preface to the Second Edition

Since the first edition of this book, which was welcomed by all the eye surgeons, who could not afford to buy a phacoemulsification machine, SICS has come of age. It has now been accepted as the surgery of choice in hard cataracts by every cataract surgeon, whether expert of phacoemulsification or not. Today, in majority of the hospitals, where hundreds of cataract surgeries are performed everyday, SICS is the preferred procedure. Gradually, surgeons have accumulated experience and several advances in the technique of SICS have taken place during the recent past. This has helped immensely in improving the quality of procedure of SICS.

We are grateful to all the authors, who have shared their vast experience, and revised the chapters despite their busy schedules. We are extremely thankful to all the dedicated teachers, excellent surgeons and academicians, who have been kind enough to contribute new chapters for the book.

This edition has been revised and elaborated with more text and color photographs. We hope this new addition will be useful to the readers.

Our especial thanks to Shri Jitendar P Vij (Chairman and Managing Director) and all staff of M/s Jaypee Brothers Medical Publishers (P) Ltd who have been extremely cooperative in the preparation of this mammoth task.

The goal of this second edition is to present a book complete in every aspect of Small Incision Cataract Surgery both for practicing surgeons and academicians. We wish this book will be handy in improving the skills of surgeons at large.

Kamaljeet Singh

Preface to the First Edition

The sense of sight, according to Sydney Smith, is indeed the highest bodily privilege, the purest physical pleasure, which man has derived from his Creator. The onus of maintaining this wonderful gift throughout life rests on the skills of an ophthalmic surgeon. Through the period of time these surgical skills have undergone many innovations and advances. The journey of cataract surgery has evolved from the eighteenth century Jacques Daviel's extracapsular surgery to the present-day extracapsular surgery of phacoemulsification with foldable lenses. Modern day phacoemulsification with foldable intraocular lenses is being practiced in almost ninety percent of the patients in the developed countries of the world. The surgery has improved to a level where surgeons are implanting intraocular lenses through less than 1 mm incision, giving patients almost instant vision. Today Indian surgeons are marching shoulder-to-shoulder with their Western counterparts in the progress made in the world of ophthalmology. Many surgeons in India have proved beyond doubt that they are highly skilled and given the opportunity they can perform equally well if not better than the more fortunate Western ophthalmologists.

Unfortunately, the benefits of improved technology and technique in phacoemulsification are being availed by a fortunate, comparatively wealthy few in the developing world. Majority of the masses has to go through the ordeal of intracapsular surgery with its attendant hazards of aphakic spectacles. In recent times at least ECCE IOL has been made available to the teeming millions of the developing world, thanks to the untiring efforts of the WHO. But sutures, astigmatism and complications like posterior capsular opacification and decentration accompany this surgery.

Therefore, on one end of the spectrum we have phaco surgery with foldable lenses practiced by the resourceful surgeons and availed by the wealthy few. While on the other, patients coming from the lower strata of society have to bear with aphakic spectacles. In fact, in a developing country like India, our primary goal should be to strive hard to provide all the benefits to the common man at minimum possible costs. In achieving this goal, manual phaco or the non-phaco small incision cataract surgery (SICS) can be extremely helpful. It has almost all the advantages of phacoemulsification, namely, less astigmatism, early mobility, less decentration and at the same time, is as inexpensive as ECCE IOL. This book has been written precisely with the above-mentioned goal in mind. The main purpose of this book is to explain the various surgical maneuvers with diagrams, photographs and a detailed text. Simple steps, explained in easy language, are the hallmark of this book. It is hoped that this may stimulate the reader towards this surgery, which may prove to be significant for easy transition. An attempt has been made to acquaint the reader with almost all the subjects of IOL surgery by this technique so that he does not feel the need to turn to any other book.

The book begins with the history of cataract surgery, which is so important to understand as the technique has evolved tremendously in a very short span of time. Preoperative evaluation and various anesthetic techniques are very significant in giving good surgical results. Subjects like diabetes and hypertension management have been specially included in the book as they have become so widespread that their effective management must be clear to all the surgeons. An effort has been made to describe all the techniques of nucleus delivery to achieve the same objective, that is, a sutureless anastigmatic result. Readers are requested to go through each chapter with care and form their own impression of the benefits and risks involved in each technique. It is advisable to follow the systemic approach of one step and one technique at a time. Postoperative complications and their management pertaining to this particular surgery have also been dealt with exhaustively. Management of endophthalmitis, posterior dislocation of lens and posterior capsular opacification form separate chapters in this book due to their significance in obtaining good surgical outcome. Pediatric cataract surgery through tunnel—a complicated subject has also been extensively covered.

Eminent surgeons, of national and international repute, who have a vast experience and knowledge in this particular field of surgery, have contributed in this book. They are confident of this surgery, have provided excellent results and through their concisely written chapters, with photographs and diagrams, have provided substance to this book. I am extremely grateful to them for giving their best in the shortest possible time. Finally, this book would be considered successful only if the reader could deliver the objective of providing good vision at economical cost to maximum number of patients.

Kamaljeet Singh

Acknowledgments

In presenting this work, I have been supported by several friends, teachers, colleagues and family members. I am deeply indebted to my friends Dr Mahipal S Sachdev and Dr Amar Agarwal who mainly motivated me to write this book. I am immensely thankful to Prof RN Misra who encouraged me to initiate this work and has been a constant source of inspiration for me. I am also grateful to Prof Vipin Bihari for permitting me to use the existing facilities in the department.

I am indebted to many colleagues and residents in the department who have not only drawn the diagrams but also painstakingly read the proofs for which I especially acknowledge Dr Sanjay Sharma, Dr Sumeet Jain, Dr Pawan Kumar and Dr Riyaz Khan. I also thank Dr JD Jain and Dr AK Chadha for their valuable suggestions.

I extend my gratitude to my two special residents—Dr BN Choudhary and Dr KS Kathait, who have worked with me for over three years and have suggested several improvements in the technique of manual small incision cataract surgery.

My thanks are also extended to Alcon Labs (India) for providing beautiful illustrations as well as to the Journal Survey of Ophthalmology (Elsevier) and The Highlights of Ophthalmology for their copyright permission.

I also wish to express my gratitude to Shri Jitendar P Vij (Chairman and Managing Director) and staff of Jaypee Brothers who never got ruffled by my regular urgent calls for preparation of this manuscript. Mr Vinod and Mr Vivek Naithani of Allahabad, the father and son team, did the typing work with meticulous accuracy, to them I am highly obliged.

I will fail in my duty if I do not thank my wife Dr Anuja for her help and timely suggestions, as also for calming me in my moments of anxiety while I was preparing this book.

My special appreciation to my daughter Manika and son Pranav, for patiently bearing the loss of special moments in the preparation of this mammoth task.

I am extremely grateful to Dr Hector Bryson Chawla, who despite his busy schedule, always gave me a helping hand and never disappointed for any demand. I am also thankful to Dr Jongsareejit for his timely response.

Contents

1. Anatomy of the Lens	1
<i>BN Chaudhary, Kamaljeet Singh</i>	
2. History of Cataract Surgery	4
<i>Kamaljeet Singh, KS Kathait</i>	
3. Sterilization	9
<i>Sunita Agarwal, Amar Agarwal</i>	
4. Viscoelastics	35
<i>VP Gupta</i>	
5. Comparison of Various ECCE Techniques	43
<i>Kamaljeet Singh, Vipin Bihari</i>	
6. Diabetes in Cataract Surgery	47
<i>Sarita Bajaj</i>	
7. Management of Hypertension in Cataract Surgery	52
<i>PC Saxena</i>	
8. Preoperative Evaluation for SICS	54
<i>Kamaljeet Singh, Sumeet Jain</i>	
9. Biometry	56
<i>D Swarup, Santosh Suman</i>	
10. Ocular Anesthesia	63
<i>Kamaljeet Singh, VK Srivastava</i>	
11. Anesthesiologist's Role in Ocular Surgery	67
<i>HC Chandola</i>	
12. Postoperative Infections: Prevention and Management	70
<i>Jagat Ram, Gagandeep Singh Brar</i>	
13. The Manual Small Incision: Surgical Aspects—I	77
<i>Mahipal S Sachdev, P Mishra, S Thanikachalam</i>	
14. The Manual Small Incision: Astigmatic Considerations—II	85
<i>Mahipal S Sachdev, Pradeep Venkatesh</i>	
15. Practical Aspects for Astigmatism Management in SICS	87
<i>Kamaljeet Singh, Garima Rai</i>	
16. Capsulotomy for Small Incision Cataract Surgery	91
<i>AK Grover, Pankaj Puri, Harpreet Singh</i>	
17. Hydroprocedures	99
<i>Subodh K Agarwal</i>	

18. Nucleus Prolapse from Capsular Bag	103
<i>RP Singh, BK Singh, BN Chaudhary</i>	
19. ACM Fluidics During Blumenthal's Technique	106
<i>Arvind Singh, Mayel P Lepcha</i>	
20. The Phaco-sandwich Technique	109
<i>Kamaljeet Singh, Varun Kharbanda</i>	
21. Modified Fishhook Technique	115
<i>Rajiv Vaish</i>	
22. Manual Phacofracture	118
<i>Rajesh Sinha, Prashant Bhartiya, Rasik B Vajpayee</i>	
23. Phacofracture by a Wire Loop	122
<i>Debasish Bhattacharya</i>	
24. Microvectis Technique	125
<i>P Mishra, S Thanikachalam</i>	
25. Modified Blumenthal's Technique	129
<i>KPS Malik, Ruchi Goel</i>	
26. Small Incision Manual Phacosection Using the Anterior Chamber Maintainer	135
<i>Hector Bryson Chawla</i>	
27. Manual Multiphacofragmentation: A New Technique for Cataract Surgery	139
<i>Francisco J Gutiérrez-Carmona</i>	
28. The New Method of Manual Phacofragmentation (Phacodrainage)	143
<i>Amporn Jongsareejit</i>	
29. Temporal Tunnel Incision in SICS	147
<i>MK Rathore, Sujata Lakhtakia</i>	
30. SICS in Small Pupil	150
<i>SP Singh, Parul Mehrotra</i>	
31. Cortical Clean-up	161
<i>RN Misra, TN Vyas</i>	
32. Intraocular Lenses	165
<i>Tanuj Dada, Harinder Sethi</i>	
33. The Technique of Intraocular Lens (IOL) Implantation in SICS	175
<i>Nikhilesh Trivedi</i>	
34. Wound Closure	178
<i>MP Tandon, TN Vyas</i>	
35. When and How to Convert?	183
<i>Kamaljeet Singh</i>	
36. Current Status of Medications in Cataract Surgery	185
<i>Kamaljeet Singh, Shweta Pandey, Monika Joshi, Kshama Dwivedi</i>	

37. Complications of Manual Phaco	190
<i>Kamaljeet Singh, Manjul Pant</i>	
38. Management of Posteriorly Dislocated Lenses	195
<i>Lalit Verma, P Venkatesh, HK Tiwari</i>	
39. Postsurgical Endophthalmitis	201
<i>Lalit Verma, Pradeep Venkatesh, HK Tiwari</i>	
40. Toxic Anterior Segment Syndrome (TASS): Diagnosis and Management	217
<i>Kamaljeet Singh, Sanjeev Thapar, Pooja Lal, Tariq Akhtar</i>	
41. Posterior Segment Disorders and SICS	226
<i>Dinesh Talwar, Mool Chand, Gopal S Pillai</i>	
42. Glaucoma and Manual Small Incision Cataract Surgery (MSICS)	236
<i>P Mishra, S Thanikachalam</i>	
43. Pediatric Cataract: My Experiences	242
<i>Daljit Singh</i>	
44. SICS in Pediatric Cataracts	247
<i>Kuldeep Kr Srivastava, P Vijayalakshmi</i>	
45. SICS in Refractive Lens Exchange	252
<i>Kamaljeet Singh, Santosh Suman</i>	
46. Posterior Capsule Opacification	255
<i>Jagat Ram, Gagandeep Singh Brar</i>	
47. SICS: Surgery of Choice for High Volume Surgeons	262
<i>Kamaljeet Singh</i>	
 <i>Index</i>	 <i>265</i>