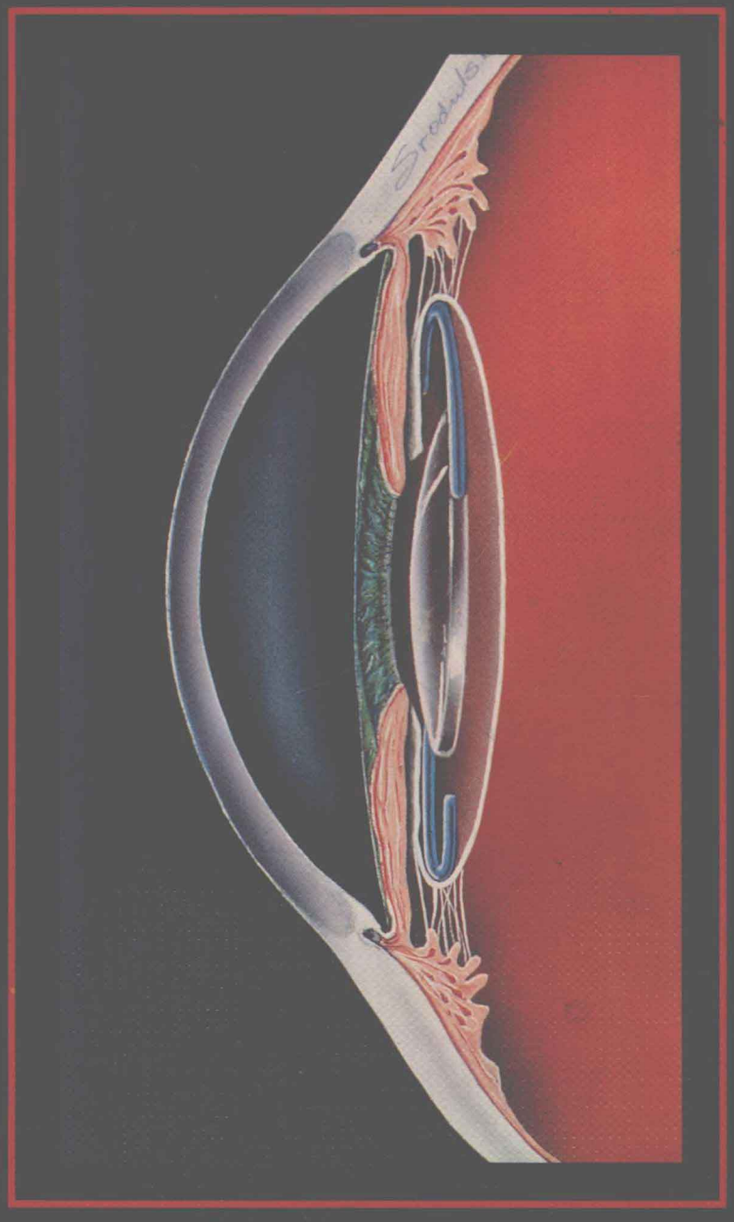
Color Atlas of
LENS IMPLANTATION



Edited by Piers Percival

Color Atlas of
LENS IMPLANTATION

Editor

S.P.B. Percival
MA, MB, B Chir, FRCS, FCOphth, DO
Department of Ophthalmology
Scarborough District Hospital
Yorkshire
United Kingdom


Mosby Year Book

St. Louis Baltimore Boston Chicago London Philadelphia Sydney Toronto

Mosby
Year Book

Dedicated to Publishing Excellence

Mosby–Year Book, Inc.
11830 Westline Drive
St. Louis, MO 63146

Published with rights in the USA, Canada and Puerto Rico by Mosby–Year Book, Inc.
A Year Book Medical Publishers imprint of Mosby–Year Book, Inc.
ISBN 0-8151-6664-8

English edition first published by Wolfe Publishing Ltd,
2–16 Torrington Place, London WC1E 7LT, UK.

Contents

Foreword

As the population of the world grows and social conditions improve, many more people reach advanced age and so may become victims of degenerative disorders, of which senile cataract is probably the most common and certainly the most disabling. Fortunately, its effects are now almost completely remediable.

In the past 40 years it has proved possible, after a cataract extraction, to restore the optical system within the eye by implanting an artificial lens, which in some respects is actually superior to a natural lens because it provides better light transmission and colour vision. We no longer tell the patient that the cataract needs removal, but instead that the eye requires a new lens, which will provide a second 'lease' of almost natural sight.

Half-a-century ago cataract surgery was a difficult and hazardous procedure requiring a high degree of skill and, for the patient, two weeks in hospital lying perfectly still. Now, with improved anesthesia, pharmaceutical control of inflammation and infection and a new generation of surgical instruments with, not least, efficient operating microscopes, excellent results have been brought within the reach of every well-equipped ophthalmic surgeon. Furthermore, modern cataract surgery now requires only a day in hospital or can sometimes be undertaken as an out-patient procedure.

Now that, it is said, over 10 million lens implants have been inserted, many patients with developing cataract have learned of this revolution in surgery, which now produces such quick and vastly improved results. The almost instant restoration of natural sight has produced it's own problems for it has led to a demand for cataract surgery which, throughout the world, is insatiable.

This book sets out to describe just how far ophthalmic surgery has now progressed in its efforts to restore, safely and consistently, sight of the highest quality to millions throughout the world. It also discusses the complications and problems that pose a challenge, for nothing stands still, especially in ophthalmology. What better teachers can we have than the active surgeons at work each day in many different countries, who are themselves deeply committed to the better relief of the most common and crippling penalty of advancing age?

HAROLD RIDLEY

Preface

In 1972 approximately 1000 lens implantation operations were performed worldwide. By 1982 the annual rate had reached 1,000,000, half of which were in North America. The annual rate is now over three million, and by 1992 should have trebled again, such is the explosion in this fascinating field of medicine. Cataract extraction has always been the most common major surgical operation and, with 30 million sufferers in the Indian sub-continent alone, there is clearly much to be done in the expansion of surgical training. However, lens implantation has brought a need for changes in technique. The patients' expectations and the visual prognosis can now be so much better when advanced methods are used that everywhere on Earth should be expected to benefit from these changes. Eye surgeons the world over are now anxious to appraise their work and learn the techniques that can ensure safety for their patients, whether by using the more traditional methods or the new intercapsular methods, whereby virtually all the surgery is carried out inside the membrane that encapsulates the cataract, so affording greater protection to the delicate tissues inside the eye and greater stability for the lens implanted. Perfection may be heightened by the new method of circular capsulorhexis.

The purpose of this book is to explain in pictorial form the options now available, the reasoning behind change and the management of problems and complications. Simple maneuvers are preferred to the complicated, thereby encouraging the trainee and facilitating an easy transition for those experienced surgeons now changing from the intracapsular to intercapsular approach or phacoemulsification.

It is a book for experts wishing to enhance their skills with the very latest information, for example in histopathology, endophacoemulsification, implant design and scleral fixation, as well as a guide for those just beginning in this new and exciting field.

Finally, any success of this Atlas will be due to the dedication of the contributors, leading exponents of lens implantation from all over the world, who, with their associates, secretaries and photographers, have combined to provide a comprehensive account of one of the most fascinating subjects in modern medicine. I most sincerely thank each and every one. For the readers, I can do no better than to wish them a 'lift' towards new horizons in their approach to help those who cannot see.

PIERS PERCIVAL

Acknowledgements

I am very deeply grateful to Mrs. Verne Wright for her immense help in ensuring that communications with the contributors were successfully completed and for retyping many of the manuscripts before presentation to the publishers. I also thank R. Bijster, L.I. Los and A.M. Worst van Dam (Chapter 13), and Emily Hindman (Chapter 36) for their help in preparing manuscripts for individual chapters. Much of the information concerning the blindness problem in Kenya was supplied by Dr Randy Whitfield (Chapter 47), for which I am grateful.

For illustrations I am indebted to numerous colleagues, photographers and artists, who have helped to supply the contributing authors with up-to-date material, and must acknowledge, in particular, Krystina Strodulski of The Center for Intraocular Lens Research, Charleston, South Carolina (Front cover, **36.32**), T. Mole of Southampton Eye Hospital (Chapters 3 and 12), W. Velt for the drawings in Chapter 13, Sue Ford of the Western Ophthalmic Hospital (**16.30, 16.31, 23.21**), Calver Townsend of the Western Ophthalmic Hospital (**16.30, 16.31**), Zvi Friedman of the Goldschleger Eye Institute (Chapter 19), Sandra Brown, RN, and Catherine Barry of The Medical University of South Carolina (Chapter 36), Rayner Intraocular Lenses Ltd (**12.1, 12.3, 17.2, 32.7, 32.8, 32.10**), Allergan Medical Optics (**19.6**), Alcon Ltd. (**19.9, 19.10, 20.1**), Pharmacia Ophthalmics (**21.2**), Iolab Corporation (**21.1, 32.5**), Rodenstock Ltd (**44.2**), Sigmacon Ltd (**44.3**), as well as the authors and publishers of various books and journals in giving ideas or permission for reproduction, including *The American Journal of Ophthalmology* (**10.4, 10.5, 15.1, 41.9, 41.10, 41.19**), *Archives of Ophthalmology* (**15.22**), *Highlights of Ophthalmology* (**44.4**), *Implants in Ophthalmology* (**19.1–19.5, 27.2, 27.4, 46.1–46.8, 46.10, 46.11**) and *Intraocular Lenses; Evolution, Designs, Complications and Pathology* Williams and Wilkins (**25.1, 36.1, 36.3, 36.4, 36.9, 36.11, 36.14, 36.17, 36.28–36.31**), and *Ocular Surgery News* (**27.8, 27.9**).

The line illustrations not listed above were drawn by Joanna Cameron and Gill Ellsbury.

PIERS PERCIVAL

Contributors

Mr Michael Absolon, FRCS, FCOphth,
Southampton Eye Hospital,
Wilton Avenue,
Southampton SO9 4XW,
England

Dr Peter J. Agapitos, MD, FRCS(C),
Assistant Professor of Ophthalmology,
University of Minnesota,
Department of Ophthalmology,
Ramsey Clinic and St Paul-Ramsey Medical Center,
St Paul, Minnesota,
United States of America

Prof. John Alpar, MD,
St Luke Eye Institute,
5311 West 9th Avenue,
Amarillo, Texas,
United States of America

Dr Aziz Y Anis, MD FACS,
The Anis Eye Institute,
1919 South 40th Street, Suite 206,
Lincoln, Nebraska 65806,
United States of America

Prof. David Apple, MD,
Department of Ophthalmology,
Medical University of South Carolina,
171 Ashley Avenue,
Charleston, South Carolina 29425,
United States of America

Mr Eric J. Arnott, FRCS,
11 Milford House,
7 Queen Anne Street,
London W1N 9FD,
England

Prof. Danièle Aron Rosa, MD,
The Rothschild Eye Institute,
25 Rue Manin,
75019 Paris,
France

Prof. Georges Baikoff, MD,
Centre d'Ophthalmologie,
Clairval-Saugeaie,
36 Boulevard du Redon,
13009 Marseille,
France

Dr Graham Barrett, MD,
Lions Eye Institute,
2 Verdun Street,
Perth 6009,
Australia

Prof. Michael Blumenthal, MD,
Goldschleger Eye Institute,
Sackler School of Medicine,
Tel Aviv University,
Tel Aviv,
Israel

Mr Tom Casey, FRCS,
Queen Victoria Hospital,
East Grinstead,
Sussex,
England

Dr Varda Chen, MD,
Goldschleger Eye Institute,
Sackler School of Medicine,
Tel Aviv University,
Tel Aviv.
Israel

Mr D. Peter Choyce, MS, FRCS, FCOphth,
9 Drake Road,
Westcliff-on-Sea,
Essex SS0 8LR,
England

Dr Patrick I. Condon, FRCS,
Regional Eye Department,
Ardkeen Hospital,
Waterford,
Ireland

Prof. Ulrich Demeler, MD,
Eye Department,
Augenklinik Zentralkrankenhaus,
St-Juergen-Strasse,
D-2800 Bremen 1,
Federal Republic of Germany

Prof. Robert C. Drews, MD,
Washington University School of Medicine,
211 North Merame Avenue,
Clayton, Missouri 63105,
United States of America

Dr Richard J. Duffey, MD,
The Mobile Eye, Ear, Nose and Throat Center,
2880 Dauphin Street,
Mobile, Alabama,
United States of America

Dr John Dunphy, FFARCS,
Regional Eye Department,
Ardkeen Hospital,
Waterford,
Ireland

Dr Henry F. Edelhauser, PhD,
Emory University Eye Center,
1327 Clifton Road NE,
Atlanta, Georgia 30322,
United States of America

Dr Richard Erdey, MD,
Rochester Eye Institute,
Rochester,
New York,
United States of America

Dr Albert Galand, MD,
Centre Hospitalier Universitaire et Clinique Sainte Rosalie,
Rue des Wallons 72,
B-4000 Liège,
Belgium

Mr Michael Hayward, FRCS,
Leeds General Infirmary,
Great George Street,
Leeds LS1 3EX,
England

Prof. David A. Hiles, MD,
3518 Fifth Avenue,
Pittsburgh, Pennsylvania 15213,
United States of America

Prof. Richard H. Keates, MD,
Professor and Chair,
Department of Ophthalmology,
University of California,
Irvine, California 92717,
United States of America

Dr Manus C. Kraff, MD,
Northwestern University,
JFK Eye Institute,
5600 W. Addison St, 4th Fl,
Illinois 60634,
United States of America

Dr Marvin L. Kwitko, MD,
Assistant Professor of Ophthalmology,
McGill University,
5591 Cote des Neiges Road,
Montreal, Quebec H3T 1Y8,
Canada

Mr Arthur Lim, FRCS,
Chief, Dept of Ophthalmology,
National University Hospital,
Lower Kent Ridge Road,
Singapore 0511

Dr Richard L. Lindstrom, MD,
Clinical Professor of Ophthalmology,
University of Minnesota,
Attending Surgeon, Philips Eye Institute and Veteran's Administration Medical Center,
Minneapolis, Minnesota,
United States of America

Dr Ole J. Lorenzetti, PhD,
University Texas South Western,
1945 Berkley Place,
Fort Worth, Texas 76110,
United States of America

Dr Kensaku Miyake, MD,
Shohzankai Medical Foundation,
Miyake Eye Hospital,
1070 Kami 5,
Higashiozone-Cho Kita-Ku,
J-462 Nagoya,
Japan

Dr Robin Morgan, MD,
Department of Ophthalmology,
Medical University of South Carolina,
171 Ashley Avenue,
Charleston, South Carolina 29425,
United States of America

Dr Cosme I.N. Naval, MD,
61 Buchanan Street,
North Greenhills,
San Juan,
Metro Manila,
Philippines

Mr Bruce A. Noble, FRCS,
Consultant Ophthalmic Surgeon,
Leeds General Infirmary
Great George Street,
Leeds LS1 3EX
England

Dr Terry O'Brien, MD,
The Wilmer Ophthalmological Institute,
The Johns Hopkins University School of Medicine,
The Johns Hopkins Hospital,
601 N. Broadway,
Baltimore, Maryland 21205,
United States of America

Dr Stephen Obstbaum, MD,
Department of Ophthalmology,
Lenox Hill Hospital,
100 East 77th Street,
New York, New York 10021,
United States of America

Dr Robert Osher, MD,
Cincinnati Eye Institute,
10494 Montgomery Road,
Cincinnati, Ohio 45242,
United States of America

Mr John Pearce, ChM, DO, FCOphth,
2 Windsor Street,
Bromsgrove,
Worcestershire B60 2BG,
England

Mr Clive Peckar, MSc, FRCS, FCOphth,
Warrington District Hospital,
Lovely Lane,
Warrington,
Cheshire WA5Y 1QG,
England

Mr Piers Percival, FRCS
Scarborough Hospital,
Scarborough,
North Yorkshire YO12 6QL,
England

Dr John Retzlaff, MD
91 Black Oak Drive,
Medford,
Oregon 97504,
United States of America

Mr Emanuel Rosen, MD, FRCS(E),
10 St John Street,
Manchester M3 4DY,
England

Dr Donald R. Sanders, MD, PhD,
University of Illinois at Chicago,
Center for Clinical Research,
815 W. Van Buren St, Suite 300,
Chicago, Illinois 60607,
United States of America

Dr C. William Simcoe, MD, PC,
Utica Square Medical Building,
Suite 110,
Tulsa, Oklahoma 74114,
United States of America

Dr William Smiddy, MD,
Boscom Palmer Eye Institute,
University of Miami School of Medicine,
P.O. Box 016880,
Miami, Florida 33101,
United States of America

Dr Leon D. Solomon, MD, FRCS(C),
Assitant Professor
McGill University, Montreal,
5775 Cote des Neiges Road 107,
Montreal, Quebec H3S 2S9,
Canada

Prof. Walter Stark, MD,
John Hopkins Hospital,
No 100 Baltimore,
Maryland 21205,
United States of America

Prof. Ahti Tarkkanen, MD,
Helsinki University Eye Hospital,
Haarthaninkatu 4,
SF-00290 Helsinki,
Finland

Dr Spencer P. Thornton, MD, FACS,
Department of Ophthalmology,
Baptist Hospital,
2010 Church Street, Suite 207,
Nashville, Tennessee 37203,
United States of America

Dr Julie Tsai, MD,
Department of Ophthalmology,
Medical University of South Carolina,
171 Ashley Avenue,
Charleston, South Carolina 29425,
United States of America

Dr Daniel Vörösmarthy, MD,
Head of Department of Ophthalmology,
Semmel Weiss Hospital,
1085 Budapest,
Gyulai Pal u 2,
Hungary

Mr Hugh Williams, FRCS,
5 Harmont House,
20 Harley Street,
London W1N 1AL,
England

Dr Mark Wood, DO, FRCS(C),
Consultant Ophthalmologist,
Presbyterian Church of East Africa
Kikuyu Hospital Eye Department,
P.O. Box 45,
Kikuyu,
Kenya

Dr Jan G.F. Worst, MD,
Refaja Hospital Stadskanaal,
Julianalaan 11,
97510 BM Haren,
The Netherlands

Dr Akio Yamanaka, MD,
Kobe Kaisei Hospital,
11–15 Shinihara-Kitamachi,
3 Chome,
Nada-Ku,
Kobe 657,
Japan

Dr Ralph Zabel, MD,
Department of Ophthalmology,
9-240 Health Sciences Unit C,
Box 493 UMHC,
516 Delaware Street SE,
Minneapolis, Minnesota 55455,
United States of America

Dedication

To my family,
and to the International Friendship
of Ophthalmic Surgeons

Section 1:
EXTRACTION OF CATARACT

1: Basic concepts and evolution

Aziz Anis

Our concept of any object of matter or mind depends on the diligence of our research, our background information, our faculties of deduction and our personal convictions and philosophies. All these factors are variable and thus concepts of the same object of interest can be differently perceived by different individuals.

It is not unusual, however, for a large number of individuals working in the same field to come up with similar concepts of the same object, thus establishing a basic concept but sometimes erroneously considering it to be a fact.

The point is that our so-called basic concepts are directly related to our times and the intellectual plane in which we function. We should always, therefore, be sufficiently open-minded when new evidence is convincing enough to challenge established ideas, not to hang on to them stubbornly, hiding behind a facade of false conservatism.

An exaggerated illustration of this point is the comparison between our concept of a cataract and that of the ancient Egyptians. They perceived it to be a miniature watershed, the frothy white foam of which cascaded behind the pupil, turning it white and obstructing vision. We still keep the literal name of the waterfall phenomenon 'Cataract' to indicate the state of clouding of the crystalline lens.

Evolution, which is a state of perpetual change when applied to disciplines and techniques, is also necessary for progress. We should always seek to evolve our methods in the direction of eliminating shortcomings and enhancing benefits. If we ever reached a stage where we considered our methods to need no further evolution, however elaborate and sophisticated, we would deny our patients all hope of progress. Imagine where we would be if couching had been accepted as the ultimate method of surgical treatment!

Now the basic concepts concerning cataract are as follows:

- Cataract is a structural, physical, biochemical, and optical change in the crystalline lens of the eye that interferes with the normal transmission and refraction of light rays. This interference affects the overall sharpness of definition of the retinal image.
- Long before substantial decrease in the visual acuity is detected, functional visual acuity may be reduced under certain levels of light. This is due to the drop in contrast of the retinal image induced by abnormal light distribution resulting from aberrant light scattering within the vitreous cavity.
- In order to restore normal visual acuity the visual axis must be cleared.
- So far the only means known to clear the visual axis is the surgical removal of the defective lens. The refractive power should be replaced and so far the intraocular lens (IOL) has proved to be the best option.
- Prior to contemplating the surgical removal of a cataract, the potential for improvement in functional visual acuity should be tested and proven to be significant enough to justify the surgical risk.
- Whatever method the surgeon elects to achieve this objective, it should be with the minimum of damage to or interference with the neighboring structures in the eye.

Until the late 1950s, extracapsular cataract extraction (ECCE) of relatively mature cataracts was the preferred method. The anterior capsule was grasped with a toothed capsule forceps to tear off the central portion and the nucleus expressed. The anterior and posterior chamber were then copiously irrigated to wash out the degenerated cortex. The 10 mm limbal incision, usually made with a Graefe knife, was then closed with a single silk suture.

Intracapsular extraction flourished and saw its golden age during the 1960s and early 1970s. The lens was grasped by smooth capsule forceps or the erysiphake. Later, the cryoprobe became fashionable and removal of the lens was facilitated by the use of the enzyme α-chymotrypsin to dissolve the zonular fibers.

About 20 years ago, Kelman introduced phacoemulsification. Using an ultrasonic vibrating cannula he was able to emulsify the nucleus in the inflowing irrigating fluid in the anterior chamber and aspirate the emulsion. The instrument was introduced through a 3 mm limbal incision. This was the first return to ECCE. However, because of the intricacies of the machine and the technique, it was practiced by only a limited number of surgeons.

The resurrection of IOLs during the 1960s by Binkhorst, Choyce and others further reduced interest in phacoemulsification, since the incision had to be enlarged to introduce the implant and thus negated the main advantage, which was the small incision.

Nevertheless, evidence was accumulating in favor of ECCE as a safer operation that leaves the eye in a more normal physiologic state with its anatomic compartmentalization intact. Moreover, the posterior chamber and the capsular bag in particular proved to be a reliable and more stable location for IOL fixation.

This led to the development of several manual techniques for ECCE. Lately there has been a resurgence of interest in phacoemulsification due to the development of new concepts for IOL implants that can be introduced through small incisions. It is also conceivable that the future will provide an injectable lens implant that would fill the emptied and cleaned intact capsular bag. In anticipation of these new approaches and techniques, phacoemulsification and its alternatives that can be performed through a small incision are in an active stage of development. Also, the instrumentation for standard phacoemulsification has been greatly improved to reduce the damage from excessive fluid turbulence in the anterior chamber.

Initially, removal of a large part of the anterior capsule was recommended, but the realization that the adhesions of the anterior capsule to the posterior capsule, sandwiching the implant haptics between them, provided strong fixation and reliable stability led to alternative methods.

Kelman advocated a triangular or 'Christmas tree' shape but the majority of extracapsular surgeons preferred a circular anterior capsulectomy.

In 1980, intercapsular cataract extraction was introduced by Baikoff and Sourdille. The same year Galand and I adopted the technique and taught it widely. The technique has flourished and presently claims a very substantial following.

In this technique a linear anterior capsulotomy is performed from 10 to 2 o'clock through which the contents of the capsular bag are removed and the lens implant is inserted. A small central semicircular portion of the inferior anterior capsular flap is then removed after insertion of the IOL.

This technique, even though it requires some training and practice, has proved to be superior to any other technique in protecting the

corneal endothelium and the rest of the anterior segment structures, since all the surgical manipulations are performed within the cavity of the capsular bag. It also provides the best conditions for foolproof placement of the implant totally within the capsular bag.

In its standard form, continuous flow irrigation to maintain the anterior chamber is used, just like all other standard manual or machine extracapsular techniques.

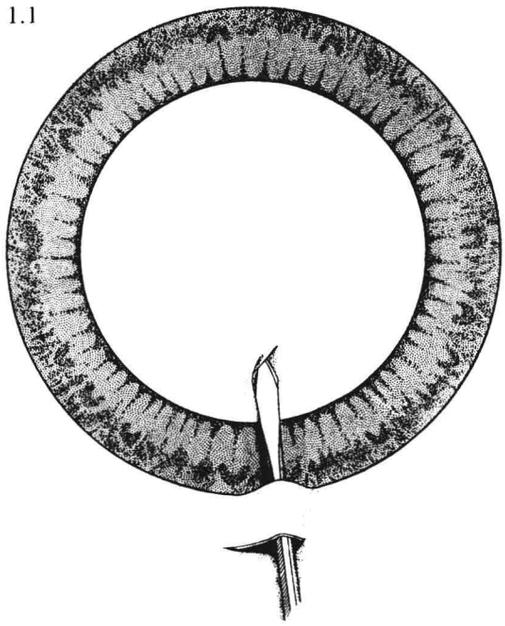
The Dry Intercapsular Cataract Extraction (DICE) technique, in which the anterior chamber is maintained with a viscoelastic compound so avoiding turbulence of the irrigating fluid, is one modification (see Chapter 6).

In all these techniques, the initial anterior capsulectomy or capsulotomy may be performed with a cystitome or bent needle of 25 to 30 gauge. Small punctures are made very close to each other; each one is connected to the previous one in what has come to be known as the 'can-opener' technique. This leaves a scalloped edge with tears or cracks running from the edge of the capsulotomy between adjacent tags and ending blindly in the anterior capsular flap. Any slight pull or stretch of the capsule is liable to extend one or more of these cracks radially towards the capsular fornix.

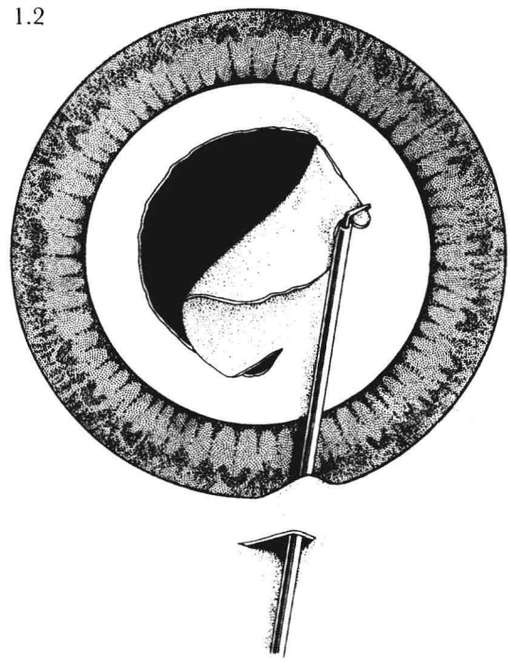
We now know that a smooth edge to the anterior capsulotomy has an extraordinary strength which preserves the integrity of the flaps and enhances the strength of the capsular bag as a whole. The fashioning of a smooth break in the anterior capsule has come to be termed capsulorhexis. Modern capsulorhexis is an evolutionary concept which may be tailored to different circumstances. The following illustrates some methods now in use.

Round capsulorhexis suitable for ECCE or phacoemulsification

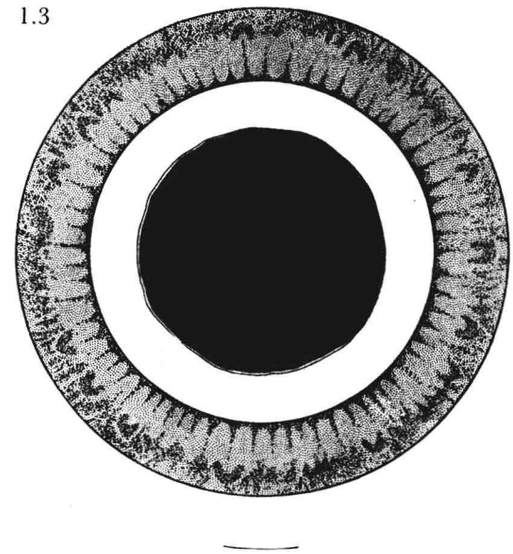
1.1



1.2



1.3



1.1 A small incision is made in the anterior capsule diagonal to the vertical meridian of the pupil. This is done using a double-edged, very sharp lance. While the tip of the blade is underneath the peripheral end of the incision, it is lifted slightly anteriorly to extend the tear circumferentially for a small distance, thus fashioning a small triangular flap. The position of this flap determines the eventual diameter of the final round capsulectomy.

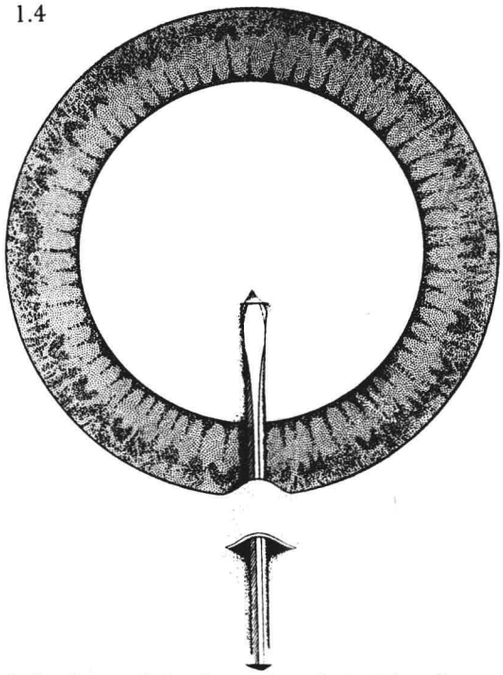
1.2 Using the Anis® microforceps, the capsular flap is held and the tear extended circumferentially slowly and deliberately. It is released and repositioned several times to grasp the central flap closer to the end of the extending tear in order to have better control, until it joins the start of the tear at the junction between the diagonal and circumferential components.

1.3 The completed round capsulectomy with smooth edge. For phacoemulsification the diameter may be up to 1 mm smaller than the diameter of the implant's optic. The capsule is resistant to extension by tearing, provided its edges remains smooth. If the overall diameter of the compressed or folded implant is larger than the diameter of the opening, the implant will stretch the capsulotomy during insertion, producing an oval rather than a round shape. Care must be taken as this may put a substantial stress on the zonular fibers positioned 90° to the long axis of the oval.

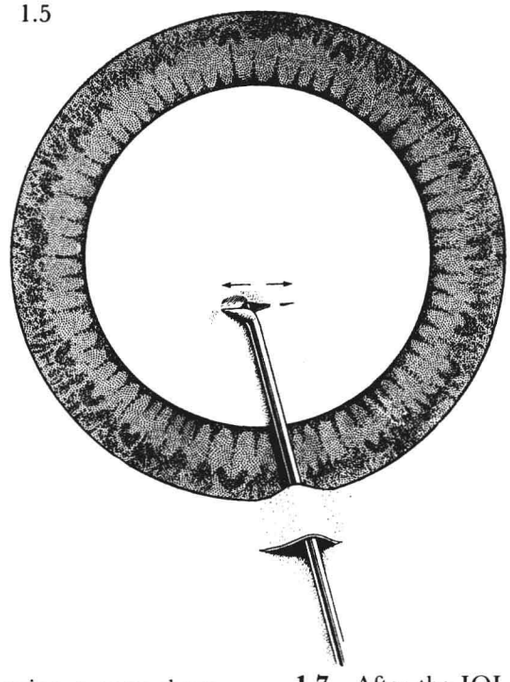
For nucleus extraction, the nucleus, provided it is not too hard, may be made smaller by hydrodissection to separate the core from its outer shell. The diameter of the capsulotomy should be large enough to permit exit of the nucleus or an obstructed delivery may result in rupture of the zonules.

Linear and arcuate capsulorhexis suitable for large incision intercapsular cataract extraction

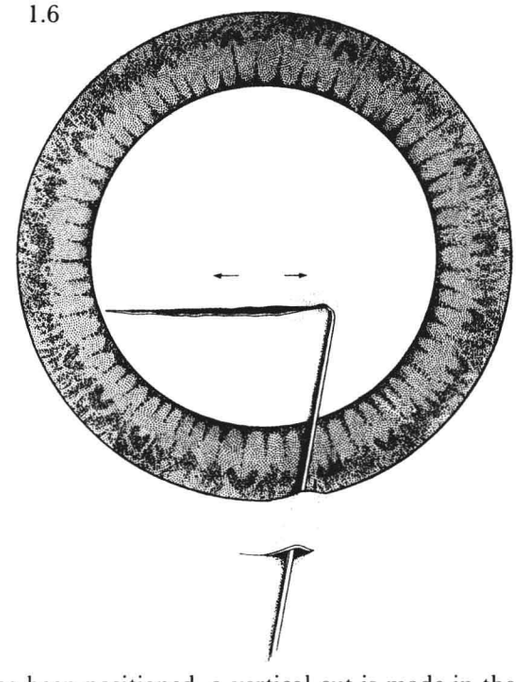
1.4



1.5



1.6



1.4 A small horizontal stab incision is made using a very sharp, double-edged narrow lance at the junction of the superior third and inferior two-thirds of the vertical diameter of the pupil.

1.5 The Anis® microscissors are used to make a horizontal extension of the incision to either side.

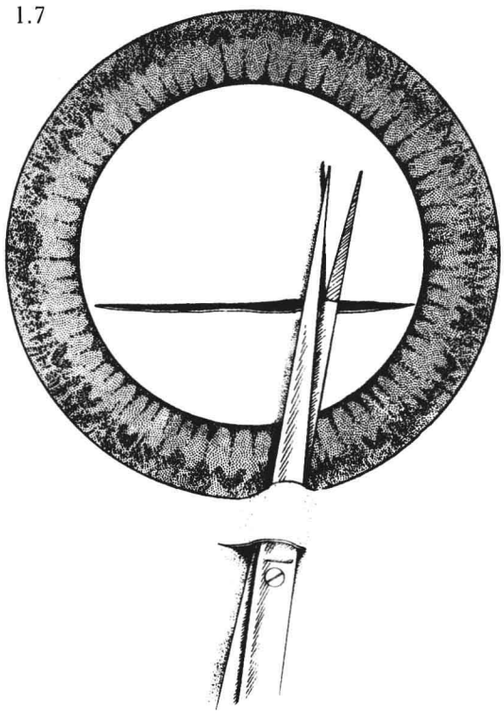
1.6 The bent tip of the Sinskey hook or capsulotomy needle is inserted in the capsular incision and controlled extension of the linear tear is made to either side. This fashions a clean linear capsulotomy extending from 10 to 2 o'clock free of capsular tags. Through this capsulotomy the nucleus is extracted, the cortex is aspirated and the intraocular lens implant is introduced.

1.7 After the IOL has been positioned, a vertical cut is made in the inferior flap with fine long-bladed scissors.

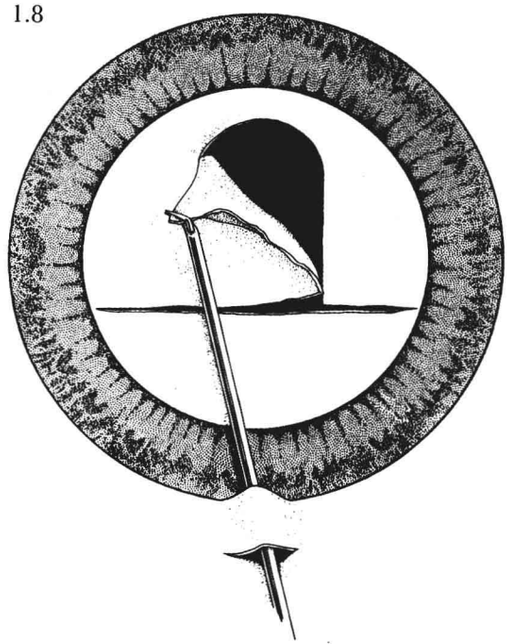
1.8 Using microforceps the central flap is held near the end of the vertical cut and the tear is extended in an arcuate fashion by changing the vectors of pull until the tear joins the horizontal capsulotomy.

1.9 The final, U-shaped capsulectomy opposite the center of the IOL optic.

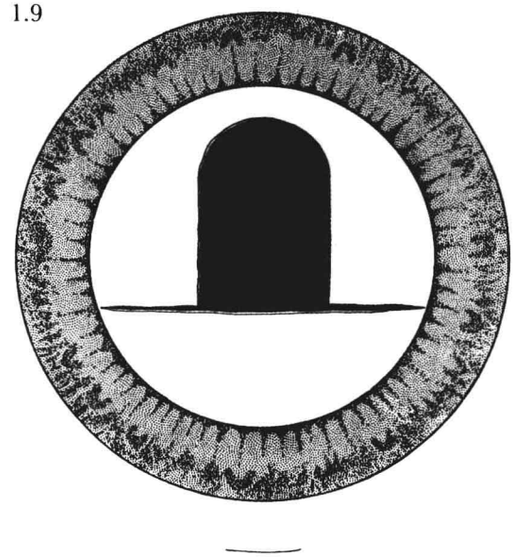
1.7



1.8



1.9

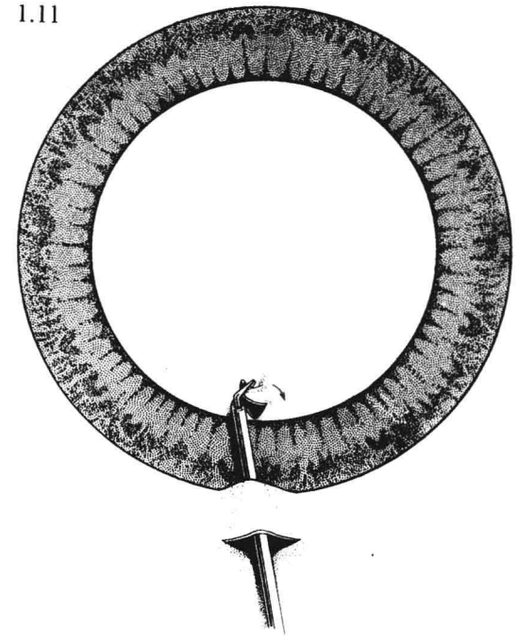


Capsulorhexis suitable for small incision intercapsular cataract extraction including intercapsular phacoemulsification or DICE

1.10

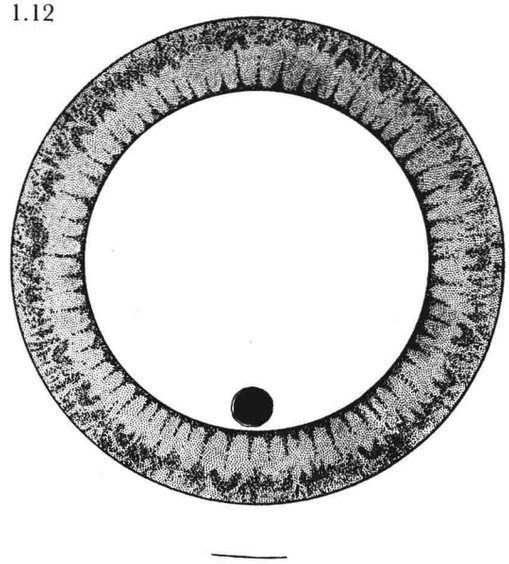
1.10 A small diagonal stab incision in the anterior capsule is performed with a fine lance at 12 o'clock, close to the border of the fully dilated pupil. The point of the knife is placed underneath the upper end of the incision and lifted slightly anteriorly to extend the tear circumferentially, thus fashioning a small, tongue-like flap.

1.11



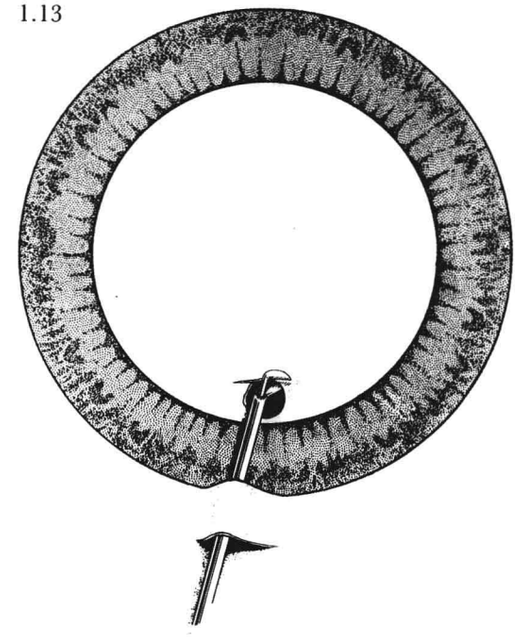
1.11 With the Anis® microforceps the capsular flap is extended in a circular fashion to form a small round capsulectomy 1–2 mm in diameter.

1.12



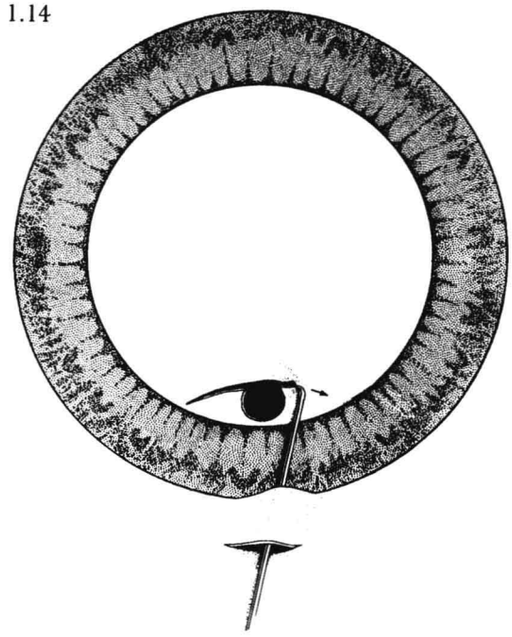
1.12 Small round capsulectomy at 12 o'clock with smooth edge without breaks. Through this the lens content is removed, and the capsular bag cleaned. Sometimes a radial extension occurs at 12 o'clock towards the fornix of the capsular bag. This is not critical and should not extend further during the intercapsular manipulations.

1.13

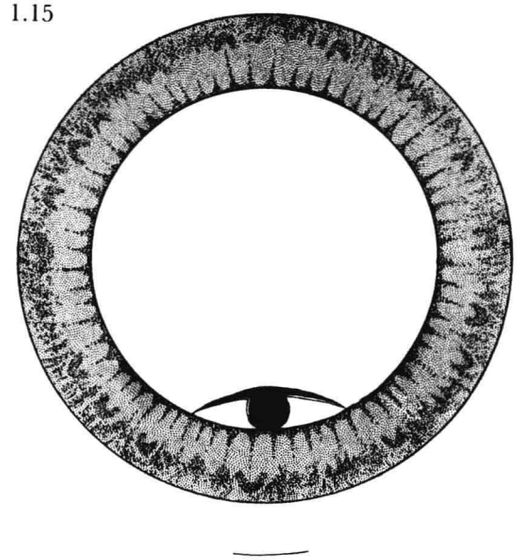


1.13 To implant a small incision IOL, a small cut with microscissors is performed to either side tangential to the central edge of the small round capsulectomy.

1.14



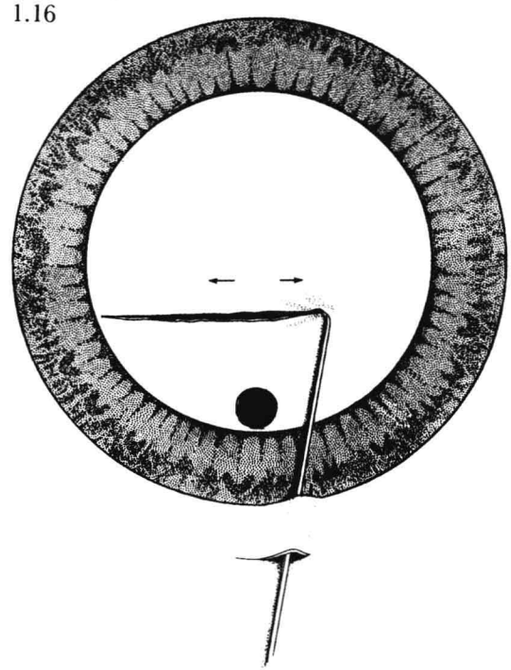
1.15



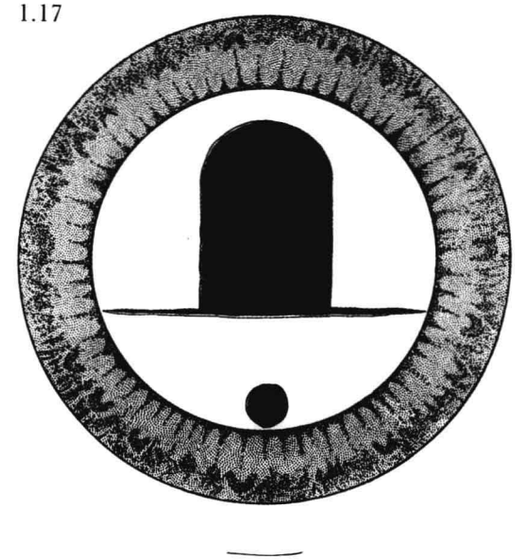
1.14 A Sinskey hook is inserted and the capsulorhexis extended to either side to form an entry large enough for the lens implant.

1.15 Opening for small incision IOL.

1.16



1.17



1.16 To implant a standard size IOL, repeat **1.10–1.12** above then introduce a viscoelastic compound through the small round capsulectomy to create a wide separation between the anterior and posterior capsules. A stab incision is made and extended as in **1.4–1.6**.

1.17 After insertion of the IOL, capsulorhexis is completed as in **1.7–1.9**.