Modern Cardiac Surgery

Modern Cardiac Surgery

*Based on the Proceedings of the Eighth Annual
Course on Cardiac Surgery, organised by the
British Postgraduate Medical Federation*

*Edited by
D. B. Longmore
Consultant Clinical Physiologist,
The National Heart Hospital, London*

MTP PRESS LIMITED *International Medical Publishers*

Published by
MTP Press Limited
Falcon House
Lancaster
England

Copyright © 1978 MTP Press Limited
Softcover reprint of the hardcover 1st edition 1978

All rights reserved. No part of this publication
may be reproduced, stored in a retrieval
system, or transmitted in any form or by any
means, electronic, mechanical, photocopying,
recording or otherwise, without prior
permission from the publishers.

ISBN-13: 978-94-011-6202-9 e-ISBN-13: 978-94-011-6200-5
DOI: 10.1007/978-94-011-6200-5

Contents

<i>List of Contributors</i>	x
<i>Foreword</i>	xiii
SECTION I INVITED LECTURES	
The National Heart Hospital Surgical Lecture 'Transplantation of the heart'	3
E. B. Stinson and N. E. Shumway	
The Hammersmith Cardiac Surgery Lecture 'Tissue valve grafting'. Aortic valve replacement with autologous fascia lata	19
Å. Senning	
SECTION II THE MITRAL VALVE	
1. Echocardiography	27
T. A. Traill	
2. Mitral valve disease: the case for cardiac catheterization	37
Celia M. Oakley	
3. Closed mitral valvotomy	45
W. P. Cleland	
4. Open mitral valvotomy	49
S. C. Lennox	
5. Reconstruction of the mitral valve	53
M. Paneth	
6. Fluid dynamics of prosthetic heart valves	59
D. E. M. Taylor	
7. Aortic homograft valves for mitral valve replacement	67
M. Yacoub	
8. Echocardiographic studies after mitral valve replacement	75
D. G. Gibson	

MODERN CARDIAC SURGERY

9. Haemolysis associated with prosthetic valves—cardiac haemolytic anaemia, red cell fragmentation syndrome D. A. Watson and S. M. Manohitharajah	83
10. Thromboembolism and valve failure: a multi-centre valve study R. J. Donnelly	87
11. Mitral valve replacement E. B. Stinson	93
12. Antimicrobial treatment of allograft valves W. H. Wain	103

SECTION III ENDOCARDIAL CUSHION

13. Anatomy of the common atrioventricular canal F. E. de Salamanca, M. Ugarte and M. Quero	109
14. Conducting tissue in complete atrioventricular canal malformations J. L. Wilkinson, Audrey Smith and R. H. Anderson	119
15. Atrioventricular canal: surgical anatomy and repair C. Lincoln	125
16. Correction of complete atrioventricular canal in infancy J. Stark	131
17. The results of repair of complete atrioventricular canal (a British multi-centre study) D. K. C. Cooper	135
18. Anatomy and conducting tissue in partial atrioventricular canal defects J. L. Wilkinson, Audrey Smith and R. H. Anderson	141
19. Surgery for ostium primum atrial septal defect J. K. Ross	149
20. Endocardial cushion: partial A-V canal—long-term results Å. Senning	155

SECTION IV SURGERY OF THE 4TH AND 6TH AORTIC CANAL

21. Results of patent ductus arteriosus ligation in infants and children R. J. Szarnicki	163
22. Vascular rings M. R. de Leval and L. H. Burr	167
23. Surgical relief of coarctation of the aorta in infancy using the left sub-clavian arterial flap technique D. I. Hamilton	171

CONTENTS

24. Patent ductus arteriosus: indications, operative techniques and postoperative care in infants C. Lincoln	179
25. Recoarctation of the aorta J. P. Byrne and L. H. Burr	185
26. Coarctation of the aorta in the adult W. P. Cleland	189

SECTION V PULMONARY ATRESIA

27. The development of the pulmonary circulation in pulmonary atresia Sheila G. Haworth	195
28. Surgical management of pulmonary atresia with confluent pulmonary arteries J. P. Byrne	199
29. Pulmonary atresia with non-confluent pulmonary arteries R. J. Szarnicki and M. R. de Leval	201

SECTION VI PALLIATIVE SURGERY FOR CYANOTIC HEART DISEASE IN INFANCY

30. The development of palliative operations for the tetralogy of Fallot Lord Brock	207
31. Tetralogy of Fallot: haemodynamic and angiocardiographic considerations F. J. Macartney	211
32. Late results of aortopulmonary shunts S. C. Lennox	219
33. Palliative surgery for cyanotic heart disease in infancy J. C. Lincoln	223
34. Open infundibulectomy in Fallot's tetralogy and hypoplastic pulmonary arteries H. Oelert	225
35. Anatomical correction of complete transposition of the great arteries in infancy M. Yacoub	233

SECTION VII LEFT VENTRICULAR FUNCTION AND PROTECTION

36. Non-invasive study of left ventricular function D. G. Gibson	245
---	-----

MODERN CARDIAC SURGERY

37. Factors affecting left ventricular performance Winifred G. Nayler and A. M. Slade	255
38. Elective cardiac arrest: historical perspective D. G. Melrose	271
39. The role of electrolyte and temperature changes in myocardial protection D. J. Hearse	277
40. Cold cardioplegia versus continuous coronary perfusion: clinical and cytochemical assessment M. V. Braimbridge, D. J. Hearse, J. Chayen, L. Bitensky and S. Čanković-Darracott	285
41. Low sodium-induced arrest in patients I. H. Rygg and G. Petersen	299
42. Myocardial preservation during extended periods of ischaemia. Experimental results with a new cardioplegic solution ('Sbokos 3' solution) C. G. Sbokos	309
43. Intraoperative protection of the heart: topical myocardial hypothermia E. B. Stinson	319

SECTION VIII TRANSPOSITION OF THE GREAT ARTERIES

44. The Mustard operation J. P. Byrne	327
45. A current technique for the Mustard operation J. Stark	333
46. Long-term results of the Mustard operation J. F. N. Taylor and J. Stark	339
47. Reoperation for complications of the Mustard operation: technical considerations R. J. Szarnicki	341
48. Management of transposition of the great arteries with left ventricular outflow tract obstruction R. J. Szarnicki	345
49. Rastelli operation M. R. de Leval	349
50. Atrial inversion for transposition of the great arteries using an intra-atrial dacron baffle: surgical technique and results H. Oelert	351

CONTENTS

51. Transposition of the great arteries J. F. N. Taylor	359
52. Diagnosis of double outlet right ventricle (DORV) by M-mode echocardiography D. G. Gibson	361
53. Arrhythmias after the Mustard operation: a study of 24-h tape monitoring M. Tynan, D. S. Reid and A. Goodwin	365
SECTION IX COMPLICATED ATRIOSEPTAL DEFECTS	
54. Complicated atrioseptal defects Compiled by Sally P. Allwork	371
<i>Index</i>	389

List of Contributors

SALLY P. ALLWORK

Hammersmith Hospital,
London W12 0HS

R. H. ANDERSON

Royal Liverpool Children's Hospital,
Myrtle Street, Liverpool 7

L. BITENSKY

Division of Cellular Biology,
The Mathilda and Terence Kennedy
Institute of Rheumatology,
Bute Gardens, London W6 7DW

M. V. BRAIMBRIDGE

St Thomas's Hospital,
Lambeth Palace Road,
London SE1 7EH

LORD BROCK

Brompton Hospital,
Fulham Road,
London SW3 6HP

L. H. BURR

Thoracic Unit,
Hospital for Sick Children,
Gt Ormond Street,
London WC1N 3JH

J. P. BYRNE

Thoracic Unit,
Hospital for Sick Children,
Gt Ormond Street,
London WC1N 3JH

S. ĆANKOVIĆ-DARRACOTT

Department of Cardiothoracic Surgery,
St Thomas's Hospital,
Lambeth Palace Road,
London SE1 7EH

J. CHAYEN

Division of Cellular Biology,
The Mathilda and Terence Kennedy
Institute of Rheumatology,
Bute Gardens,
London W6 7DW

W. P. CLELAND

Department of Surgery,
Cardiothoracic Institute,
Brompton Hospital,
Fulham Road,
London SW3 6HP

D. K. C. COOPER

Thoracic Unit,
Hospital for Sick Children,
Gt Ormond Street,
London WC1N 3JH

R. J. DONNELLY

Broadgreen Hospital,
Thomas Drive,
Liverpool 14

D. G. GIBSON

Brompton Hospital,
Fulham Road,
London SW3 6HP

A. GOODWIN

Department of Cardiology,
Newcastle General Hospital,
Newcastle-upon-Tyne

D. I. HAMILTON

Royal Liverpool Children's Hospital,
Myrtle Street, Liverpool 7

SHEILA G. HAWORTH

Hospital for Sick Children,
Gt Ormond Street,
London WC1N 3JH

LIST OF CONTRIBUTORS

D. J. HEARSE

The Myocardial Metabolism Research
Laboratories,
Rayne Institute,
St Thomas's Hospital,
Lambeth Palace Road,
London SE1 1EH

S. C. LENNOX

Brompton Hospital,
Fulham Road,
London SW3 6HP

M. R. de LEVAL

Thoracic Unit,
Hospital for Sick Children,
Gt Ormond Street,
London WC1N 3JH

C. LINCOLN

Brompton Hospital,
Fulham Road,
London SW3 6HP

F. J. MACARTNEY

Institute of Child Health,
Guildford Street
London WC1N 3JH

S. M. MANOHITHARAJAH

Leeds Regional Thoracic Surgical Centre,
Killingbeck Hospital,
Leeds 14

D. G. MELROSE

Royal Postgraduate Medical School,
Hammersmith Hospital,
Du Cane Road,
London W12 0HS

WINIFRED G. NAYLER

Cardiothoracic Institute,
2 Beaumont St,
London W1N 2DX

CELIA M. OAKLEY

Royal Postgraduate Medical School,
Hammersmith Hospital,
Du Cane Road,
London W12 0HS

H. OELERT

Klinik für Thorax,
Herz und Gefäßchirurgie,
D-3000 Hanover, West Germany

M. PANETH

Brompton Hospital,
Fulham Road,
London SW3 6HP

G. PETERSEN

Rigshospitalet,
Copenhagen, Denmark

M. QUERO

C. S. La Paz,
Madrid, Spain

D. S. REID

Freman Hospital,
High Heaton,
Newcastle-upon-Tyne NE7 7DN

J. K. ROSS

Western Hospital,
Oakley Road, Mill Brook,
Southampton SO9 4WQ

I. H. RYGG

Rigshospitalet,
Copenhagen, Denmark

F. E. de SALAMANCA

Ciudad Sonatorio Carlos Haya,
Malaga, Spain

C. G. SBOKOS

2nd Department of Surgery,
Athens University School of Medicine,
King Paul's Hospital,
Athens 609, Greece

Å. SENNING

Surgical Clinic A,
University Hospital of Zurich,
CH-8091, Zurich, Switzerland

N. E. SHUMWAY

Department of Cardiovascular Surgery,
Stanford University,
Stanford, California 94305, USA

A. M. SLADE

Cardiothoracic Institute
2 Beaumont St,
London W1N 2DX

AUDREY SMITH

Royal Liverpool Children's Hospital,
Myrtle Street, Liverpool 7

J. STARK

Thoracic Unit,
Hospital for Sick Children,
Gt. Ormond Street,
London WC1N 3JH

E. B. STINSON

Department of Cardiovascular Surgery,
Stanford University
Stanford, California 94305, USA

MODERN CARDIAC SURGERY

R. J. SZARNICKI

Thoracic Unit,
Hospital for Sick Children,
Gt Ormond Street,
London WC1N 3JH

D. E. M. TAYLOR

Department of Applied Physiology and
Surgical Sciences,
Royal College of Surgeons,
London

J. F. N. TAYLOR

Thoracic Unit,
Hospital for Sick Children,
Gt Ormond Street,
London WC1N 3JH

T. A. TRAILL

Brompton Hospital,
Fulham Road,
London SW3 6HP

M. TYNAN

Evelina Children's Department,
Guy's Hospital,
London SE1

M. UGARTE

Clinica Puerta de Hierro,
Madrid, Spain

W. H. WAIN

Brompton Hospital,
Fulham Road,
London SW3 6HP

D. A. WATSON

Leeds Regional Thoracic Surgical Centre,
Killingbeck Hospital,
Leeds 14

J. L. WILKINSON

Royal Liverpool Children's Hospital,
Myrtle Street, Liverpool 7

M. YACOUB

The National Heart Hospital,
Westmoreland Street,
London W1M 8BA

Foreword

Modern Cardiac Surgery is based on, but does not consist completely of, papers submitted at the annual course of cardiac surgery run by the combined Institutes and Post-Graduate Hospitals involved in cardiac surgery in London (1977). The subjects which have been chosen and included fulfil one of two criteria; either they are subjects which were not included in the previous book, *The Current Status of Cardiac Surgery*, or they cover subjects which needed to be updated.

Because this is a teaching course and not a symposium, the emphasis has been on being informative rather than on presenting masses of results. The book has been prepared partly from manuscripts submitted by the authors and partly from annotated tapes of the proceedings of the meeting. Throughout the editing and production of this book careful consideration has been given to the requirements of the readership.

The book is aimed at all students of cardiac surgery and cardiology at all levels, and as much information as possible has been packed into it. Nevertheless, the editor wishes to thank the authors for the efforts they have made to be concise and clear in their presentation and for their tremendous co-operation in alterations which have been incorporated to make it a more readable treatise. This means that this is a book which is of value to nurses interested in cardiology in intensive care, to physiotherapists and students wishing to look up particular topics before their final examinations.

The work includes a variety of authors, representing several continents and many important cardiac surgical centres, who together represent experience from many thousands of patients, and a wide range of cardiac surgical procedures ranging from the simplest through to cardiac transplantation. Since the book is based on a teaching programme, where results are presented they represent the bare facts without the optimism which is sometimes shown at surgical meetings.

The courses which have formed the basis for *The Current Status of Cardiac Surgery* and *Modern Cardiac Surgery* really exist because of the efforts and vision of Mr William Paton Cleland, and the course which formed the basis for this book was the last one organized under his chairmanship. He retires from the National Health Service this year. He qualified MB, BS (second place on the honours list), from Adelaide University in 1934 at the age of 21. His father, Sir John Cleland, was Professor of Pathology at the University of

MODERN CARDIAC SURGERY

Adelaide and was a most distinguished scientist. Bill Cleland and all his four sisters have had distinguished academic careers. After a severe attack of pneumonia he became a chest physician in 1936 and became a member of the Royal College of Physicians at that time. During World War 2 he became a thoracic surgeon under Sir Clement Price Thomas, and then became a fellow of the Royal College of Surgeons after the war. During his appointment at the Hammersmith Hospital he was associated with the group who pioneered the heart/lung machine and cardiac surgery in Europe. It is because of this broad base that courses organized by Bill Cleland have been so comprehensive and that it has been possible to publish two books covering whole subjects in considerable detail from the basis of just two courses and a modest number of extra contributions.

The Editor wishes to thank all his colleagues who have contributed to this book, particularly for their forbearance in being asked to make many additions and alterations to their original contribution. He also wishes to thank Merilyn Smith and Marie Alcorn for handling all the correspondence and manuscript-checking in their spare time. He also wishes to thank the publishers for their help and advice.

D. B. Longmore