



# **TOWARDS SAFER CARDIAC SURGERY**

Edited by  
D.B. Longmore

# TOWARDS SAFER CARDIAC SURGERY

EDITED BY

**D. B. Longmore**

*Consultant Clinical Physiologist  
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**TOWARDS  
SAFER  
CARDIAC  
SURGERY**

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# Introduction

D. B. LONGMORE

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The concept of the meeting on which this book is based is unique. There has never before been a multi-disciplinary meeting based entirely on the concept of making a major branch of surgery safer. Hopefully, this meeting will be archetypal and will set a precedent for similar attempts in other disciplines as well as future efforts to make cardiac surgery safer. Cardiac surgery is still a rapidly growing discipline even after a quarter of a century of experience. Like any new area of science, or medicine, initially there is an exponential growth of work, publications, meetings, options of available equipment and all the ancillary and peripheral disciplines associated with it. The ideas of the handful of original surgical pioneers, some of whom have contributed to this book, formed the basis of a still rapidly growing young branch of surgery with a whole new medical discipline of total extracorporeal circulation involving biochemical and haemodynamic control of a patient.

Unlike any other branch of surgery, progress is now completely dependent on large numbers of associated staff – the pump technician, the anaesthetist, the sister in charge of intensive care, the nurse at the bedside, the radiologist, the physiologist, the surgical assistant, the bioengineer, the cardiac diagnostician and many others. All these people make such a large contribution to the management of the patient that it is impossible to pinpoint which parts of the preoperative, operative and postoperative procedure contribute most importantly to the outcome – hopefully a patient with more than just a palliative operation but a person who can look forward to a normal life span with a high quality of life.

Cardiac surgeons were quick to recognise that surgical results can be adversely influenced by factors beyond the control of the medical and other staff. The equipment and the very plastics which are used in the extra corporeal apparatus may severely impair the prognosis of our patients. We are fortunate that the majority of equipment manufacturers are ethical and strive to produce safe and reliable apparatus to use directly on the patient and to monitor his progress. The pioneer cardiac surgeons had to develop new surgical techniques but in addition they had to produce new engineering

designs for bypass equipment and to learn the new established techniques of post-operative management. Naturally at that stage surgeons were pleased if a proportion of their patients could be fought through the postoperative stage and discharged home fit.

Those of us who have been involved since the beginning of cardiac surgery and those who take the trouble to look at films which were made over 20 years ago showing cardiac surgical technique notice how little of what we do as routine today has changed in principle. PVC apparatus, the bubble oxygenator and silicone antifoam are still commonplace. The most common techniques enabling the chambers of the heart to be opened are only different in detail from those originally used. A modest degree of hypothermia is often still used, as are cold solutions to still the heart and to modify the myocardial cellular metabolism.

After the initial phase of surgery with the horrendous mortality rate there have been few fundamental, conceptual changes. There have been variations of the basic apparatus, which for a period became extremely complex. Many of the electronic autoregulators of bypass and the cumbersome screen roller and disc oxygenators have been discarded in favour of the well founded simpler earlier techniques. There have, however, been many refinements of technique with gradual increments of knowledge with a consequential improvement in surgical results. Death was replaced by severe multi-organ damage as the common postoperative complication. Cerebral devastation was a frequent occurrence in the early sixties, often associated with renal failure. Moderate cerebral impairment was, for a time, almost routine. Gradually the results have improved, so that now the mortality rates compare very favourably with routine, simple general surgical operations. The post-operative morbidity is remarkably low. Even operations involving the implantation of large prosthetic implants are not commonly infected. Failure to return to work and some degree of cerebral dysfunction remains as the most common complication. The frequency with which cerebral damage is diagnosed depends on the care when monitoring the patient's post-operative course. There are still sporadic outbreaks in most cardiac surgical units of serious cerebral and multi-organ complications. These intermittent problems usually disappear as soon as they are investigated, suggesting that attention to the adherence to accepted safety standards is all that is required.

The view could have been taken by the International Group of Cardiac Surgeons that the procedure had reached a plateau of safety from which there could always be an irreducible minimum of lethal and debilitating complications due to unavoidable accidents. Cardiac surgeons could have been forgiven for taking this view, especially when it is remembered that the most commonly performed operations in cardiac surgery are for a lethal disease, occlusive coronary vascular disease. The mortality rate for coronary vein grafting in the best units is comparable with the accepted mortality rate for appendicectomy. Happily, this has not been the view adopted by cardiologists, cardiac surgeons and others involved in the discipline. Cardiac surgeons still strive to make their procedures safer. There are as many different approaches to safety in cardiac surgery as there are cardiac surgical units. All depend on the intellectual honesty of the surgeon in overall charge of the patient, who

## INTRODUCTION

has to recognise and admit the role of the procedure in the genesis of the postoperative illness of the patient. The surgeon starts with the basic premise that there is a great potential for iatrogenic disease in the whole open heart procedure, for example a patient who has an open mitral valvotomy is always more ill postoperatively than the patient who has a closed operation. Cardiac surgery undoubtedly presents the biggest single safety problem there has yet been in medicine. In addition to all the usual hazards of major surgery, powerful pre-operative medical therapy can cause fundamental electrolyte disturbances. Complex anaesthesia, sometimes massive blood transfusion and psychological stress are all added to the complications of extra-corporeal circulation. This is compounded by the multidisciplinary involvement which can lead to communication difficulties between the staff who have different backgrounds.

Cardiac surgery now attempts to cope with the problems of occlusive vascular disease. Thus it now potentially encompasses over half of all disease. It is the one branch of surgery which will continue to expand rapidly. In other forms of surgically treatable disease such as trauma or carcinoma, most patients receive surgical care. Only a few percent of patients with occlusive vascular disease are presently operated on. There are historical reasons for this treatment gap – insufficient open heart units and inadequate diagnostic procedures. Lack of understanding of the potential of bypass operations and the sometimes poor results all contribute. Non-invasive techniques for the early detection of heart disease are currently not widely available or adequate. If these were to become so it would be possible to monitor preventive measures to find which of these techniques are really beneficial, apply them with the aid of public education programmes and thus reduce the incidence of occlusive disease and the need for surgical treatment. Such a goal is not within sight. Even when the natural history of occlusive disease is known and when prevention is effective there will still be a time lag of a generation during which the existing diseased population will need treatment.

There are special groups of 'super-specialists' in cardiac surgery who concentrate on different aspects of the subject. The surgical group which specializes in correcting transposition of the great vessels will have little knowledge of the problems faced by the coronary vein grafting groups. For these reasons and because of the individuality of surgeons, throughout this book it may appear that there are differing views of how the discipline might be made even safer. The surgeon who is interested in the safety of a particular type of valve used by him may give the impression that he is concerned only about complications arising from prosthetic or homograft valves whilst another who is involved with coagulation studies will give the impression that he feels that the introduction of platelet stabilizing agents, such as prostacyclin, may be the only approach to revolutionize the safety aspects of open heart surgery. Of course, such views are much too simplistic. The success of the procedure depends on meticulous attention to detail of all aspects of the techniques involved and the overall safety of the patient depends as much on care as on the introduction of new technology. No excuse is made for the many different approaches to the problem of safety within the following

chapters, nor has any attempt been made to rank the hazards to patients in order of potential severity of incidence.

Any person who undergoes cardiac surgery for virtually symptomless occlusion of one of his coronary arteries in order to possibly extend his useful life span, cannot entertain an operation which may render him unable to hold down his job or to live in normal harmony with his family and friends. Even the most rare and unlikely complication of cardiac surgery is, at the moment, occasionally capable of such a devastating consequence to an individual patient.

The contributions to this book have been chosen from the wide range of disciplines associated with cardiac surgery on the heart; including nurses, a patient, biochemists, perfusionists, computer scientists, intensivists and many others. They represent a proportion of those people striving to make cardiac surgery even safer than herniorrhaphy or appendicectomy. The feeling of urgency amongst cardiac surgeons and their colleagues about the subject of safety was so great that many other willing contributors who could have taken part in a larger meeting on this subject had to be left out of the programme. It became clear from the enthusiasm of those present that the meeting could have been many times longer and more comprehensive than it was. This book will doubtless be the first in a series on this vital topic.

### **Acknowledgements**

I express the views of the authors in thanking the staff of Travenol for giving the organizing committee a free hand and generous help in setting up the meeting. Virtually all the chapters were received on time. This unprecedented effort must be indicative of the importance attached to the subject by the contributors.

There have been many books of varying value produced from the proceedings of symposia. The Editor and Publishers have produced previous books on cardiac surgery in which the contributors have concentrated on the teaching aspects of their subjects rather than the more usual surgical format usually designed to demonstrate the excellent results of the surgeon's favourite procedure. On this occasion the contributors have made even greater efforts to impart useful knowledge about safety and to set aside any opportunities of championing their favourite subject. Once more I thank them all for making such a great effort to help me to disseminate their unique knowledge.

# **SECTION I**

## **Aspects of Cardiac Surgery**

