

Operative Mitral and Tricuspid Valve Surgery

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Foreword by
Tirone David

 Springer

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*For Vanessa, Sam and Rohan,
and Lada*

Foreword

I thoroughly enjoyed reading *Operative Mitral and Tricuspid Valve Surgery* by Narain Moorjani, Bushra Rana and Francis Wells, from the Royal Papworth Hospital, Cambridge, UK. The authors present the topics in 18 separate chapters, each one written in a consistent and comprehensive style. This book covers all aspects of the mitral and tricuspid valves, from basic sciences and imaging to an extensive surgical armamentarium of operative techniques to treat the entire range of pathologies of both valves.

The authors give the reader a wonderful historical perspective on the anatomy of the atrioventricular valves. The chapter on echocardiography contains numerous pearls for the student of both valves. Indications for surgery for mitral and tricuspid valve disease continue to evolve, and practitioners need to stay abreast of current information regarding the timing of surgery. The literature has plenty of guidelines that are frequently updated to incorporate newer knowledge. The next chapter deals with operative approaches to the mitral and tricuspid valves, detailing surgical ‘tips and tricks’ that can significantly enhance the surgeons’ view of the valve, the most important aspect of surgery being ‘vision’.

The other 13 chapters are written in an innovative and unique style, where a patient is presented with diagnostic images and other tests, and the authors discuss the operative procedure used and alternative methods in a very comprehensive and complete way. The format enables surgeons to reach a better understanding of the multiple considerations involved in the evaluation and management of these complex patients. All of the techniques are beautifully explained, and one cannot add much to what they have described. The text is supported by the important references from the literature.

A picture is worth a thousand words and this is true for the chapters on operative techniques making the text easy to interpret, with the presence of exceptional illustrations and operative images. One of the key messages of this book is for the surgeon operating on the mitral and tricuspid valves to have a great understanding of the pathophysiology of the valve disease process and to be well versed in the different options available to obtain a durable repair.

In summary, this book succinctly presents an overview of the surgical therapeutic options used for patients presenting with a wide variety of mitral and tricuspid valve pathologies. *Operative Mitral and Tricuspid Valve Surgery* is a book for all novice and experienced surgeons who operate on the mitral and tricuspid valves.

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Preface

The field of mitral and tricuspid valve surgery continues to evolve and is recognised as a subspecialty of cardiac surgery, with dedicated groups of surgeons, cardiologists who are expert in imaging and clinical diagnosis, radiologists and electrophysiologists bringing to bear their expertise to the benefit of the patient with mitral and tricuspid valve disease. The specialist heart valve team is now the gold standard for care of these often highly complex patients.

The surgical approach to mitral and tricuspid valve disease has significantly evolved, and the challenge for surgeons is to maximise repair rates in the context of the highest standards of clinical care and stringent outcome measures. No longer is it acceptable for one to ‘simply replace the valve’. There is continued development of new techniques and operations, as well as the refinement of established surgical procedures. In parallel with this, the demand for knowledge regarding how these new procedures are performed is increasing.

In the context of actual clinical cases, *Operative Mitral and Tricuspid Valve Surgery* sets out to describe the gamut of surgical techniques that are currently available as a guide and aid to surgeons wishing to develop their experience and skill sets in the real world. This book provides a contemporary text that systematically covers all the surgical techniques in the field of mitral and tricuspid valve surgery. Each chapter contains detailed echocardiographic imaging, a pathophysiological description of the underlying disease process and a surgical strategy on management of the common mitral and tricuspid valve pathologies. Each surgical procedure is accompanied by photographic images and drawings to illustrate the surgical technique, supported with important references for further reading and a greater depth of knowledge. In addition, there are individual chapters on anatomy and physiology, echocardiographic imaging and evidence-based indications for surgery of the mitral and tricuspid valves.

It is our hope that *Operative Mitral and Tricuspid Valve Surgery* will be a valuable contribution to the training of the next generation of surgeons and as an aid to practising surgeons who wish to expand their clinical care for patients with often complex underlying pathologies.

Cambridge, UK

Narain Moorjani
Francis C. Wells

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Anatomy and Physiology of the Mitral Valve

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Keywords

Anatomy · Physiology · Embryology · Leaflet · Chordae tendinae · Papillary muscle · Commissure · Annulus · Cleft · Trigone

Introduction

The heart is a dynamic living pump that has evolved in such a way that the whole organ functions as a holistic unit, which can adapt to the constantly changing demands of flow and pressure. Efficient function of this pump requires the presence of unidirectional valves. Nature has evolved valves that both operate under the highest pressure that the heart can generate and that also maintain the structural integrity of the muscle chambers that house them. Of all the cardiac valves, the mitral has the biggest task. It has to withstand the highest closing pressure and support the left ventricle, the powerhouse of the heart.

In framing our thoughts about the mitral valve, it may be constructive to think of the valve unit as a machine. Whilst this may initially sound somewhat nonsensical, consideration of the definition will illustrate the point. A machine is an apparatus using or applying mechanical power, having several parts, each with a definite function and together performing certain kinds of work. With respect to the atrioventricular valves and in particular the mitral valve, although of course the

same applies to the tricuspid valve, the particular function of valve competence cannot be separated from its unitary function as the ‘linchpin’ of normal ventricular function. The ventricle and valve components work together to give valve competence and ventricular stability under all working conditions. Any surgical interference with the valve must be cognisant of this relationship if disorder of either valve or ventricular function is not to result.

The dynamic nature of the valve is revealed by the way it responds to maximal exercise. As oxygen demands of the body rise, the cardiac output increases in response, and at maximal cardiac output, the atrioventricular valve orifices can exceed the natural surface areas of the leaflets that close them. To achieve this, the left ventricular basal muscle, which acts as a sphincter at the base of the heart, will open widely in diastole to allow maximum flow through the valve. The valve orifice can change by up to 40% of the resting area through the cardiac cycle (Fig. 1.1).

This dynamic orifice area is enhanced by the presence of the normal clefts in the posterior leaflet, which extend for about 30% of the height of the leaflet. Exaggerated clefts extending to the annulus are very frequently found in regurgitant valves, the relevance of which will be discussed later.

Synchronised ventricular muscular relaxation allows the valves to open and diastolic ventricular filling to occur, partially passively but also