
Aortic Valve Preservation

Takashi Kuniyara • Shuichiro Takanashi
Editors

Aortic Valve Preservation

Concepts and Approaches

 Springer

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Foreword (Japanese Version)

The first attempts at aortic valve repair were undertaken in the 1950s. At that time understanding of the normal and pathologic anatomy and function of the aortic valve was still limited; consequently the results of repair were unpredictable and replacement became the standard of care. Later better imaging techniques and more detailed understanding of aortic valve form and function provided the basis for further development.

In the past 30 years reconstructive procedures for aortic regurgitation have evolved into an increasingly practiced alternative to valve replacement. Initially this was an approach primarily for patients with aortic dilatation and preserved cusps. In the past 15 years the evolution has progressed, and repair is now increasingly performed also in patients with isolated cusp disease or the combination of aortic dilatation and cusp prolapse. Thus, aortic valve repair is currently where mitral valve repair was 30 years ago.

Many colleagues have participated in this evolutionary process, and a number of these dedicated surgeons have come together to generate this book. It covers all important facets dealing with aortic valve repair, and the authors have made an excellent effort to cover the topic thoroughly. The result is an excellent overview and current description of the state of the art. It will help those who want to refresh their memory or focus on specific details of this changing area. Even more it will help those surgeons who plan to start or expand their repair activities on the aortic valve. They must thus be congratulated for this excellent accumulation and description of current knowledge.

Homburg, Germany

H.-J. Schäfers

Foreword (English Version)

Aortic valve-sparing and repair procedures have emerged in the last 25 years as alternative options to root and valve replacement with prostheses for patients with root dilatation with or without aortic regurgitation and those with isolated aortic insufficiency. Nowadays there is a wealth of data on the results of root and valve replacement with prostheses whether in the context of the Bentall procedure or isolated valve replacement. It is well established that with the currently available prostheses and protocols, mechanical valves bring the risk of the complications associated with life-long oral anticoagulation (mainly bleeding and thromboembolic events) whereas the bioprostheses mainly have the risks of valve deterioration and reoperation over time. Nonetheless, recent large studies show that survival is similar regardless of the type of prosthesis used and is suboptimal compared to the expected survival of a matched general population. There is also an increasing amount of data on the results of aortic valve-sparing and repair procedures, and we now have the results at 20 years. Available studies show that valve-sparing and repair procedures are associated with much lower rates of thromboembolism, bleeding events, and infective endocarditis but carry a certain risk of reoperation on the valve over time that seems nonetheless very reasonable and acceptable. Further and more importantly, long-term survival of these patients is significantly improved, most likely due to the lower incidence of valve-related complications.

Since its first description, valve-sparing root replacement procedures (the remodeling technique—the Yacoub operation—and the reimplantation technique—the David operation) have very much evolved and improved so much so that on the one hand, an external annuloplasty is now routinely added to the remodeling, and on the other, we are at the fifth modification of the original David operation (David-V) along with having the Stanford modification and our specific Brussels technique. Also, the techniques of cusp repair and annuloplasty, particularly for patients with isolated aortic regurgitation, have greatly evolved.

Extensive research works have allowed a better understanding of the aortic valve anatomy and function, particularly the role of the functional aortic annulus and the mechanism of leaflet coaptation. Currently, we have reference measures for the size of the aortic annulus, the geometric and effective height of the leaflet, and the length of coaptation. We also have new tools in the operating room, such as the caliper, to quantitatively assess the impact of the repair.

However, the acceptance of these techniques by both the surgical community and the referring physicians has progressed quite slowly compared to that for the mitral valve repair techniques and even now, these procedures are performed only in highly specialized centers by a handful of surgeons. Consequently, the number of patients that indeed benefit from these procedures remains very low. Therefore, every initiative aimed to promote advancement in the field of aortic valve repair and the diffusion of these techniques is to be praised and supported.

Kunihara, Takanashi, and colleagues are within this handful of surgeons who routinely perform aortic valve repair procedures and have largely contributed to the advancement of this field. In this book, they have done great work in presenting and discussing the indications for valve sparing and repair, the techniques in a large variety of clinical settings and valve phenotypes, current annuloplasty techniques, and finally, a full section on specific situations. We believe that this book shows that aortic valve repair techniques are nowadays well described and are currently standardized and reproducible. We are sure that cardiologists, cardiac surgeons, and anesthesiologists will enjoy reading this text and benefit from it. Cardiologists will learn how to improve echo assessment to precisely define the mechanism of regurgitation and help the surgeon plan the repair. Cardiac surgeons will learn the principles behind the techniques of repair and the goals to pursue during the procedure. Anesthesiologists will learn what to expect after repair and how to reveal potential pitfalls predictive of late failure. We hope that this book will have the large diffusion that it deserves.

Brussels, Belgium

Gebrine El Khoury

Preface (Translation of the Japanese Version)

According to statistics published by the Japanese Association for Thoracic Surgery in 2012, mitral valvuloplasty accounted for 66% of the total number of isolated mitral valve surgeries during that year in Japan, whereas aortic valvuloplasty accounted for only 4%. Aortic valvuloplasty was also only performed in 23% of patients who underwent isolated aortic root surgery for non-dissecting aneurysm. Our special survey also indicated that both groups only comprised 8% and 30%, respectively. It is presumed that the majority of lesions in patients who require aortic root replacement are ectatic, and when accompanied by aortic regurgitation, this is still presumed to represent a good indication for valvuloplasty. Among the surgeons who are active at the forefront of clinical practice, we believe that at least some of these individuals must be disappointed with the fact that valves in some patients could have been preserved instead of replaced. Many wonder why these differences exist between the mitral and aortic valves.

First, aortic valvuloplasty is by no means a novel technique. Concerted efforts were already being made by some surgeons in the 1970s, although the long-term outcomes were abysmal. So for quite some time thereafter, it was not possible to appreciate the fact that this form of surgery would eventually achieve superior outcomes to valve replacement. However, in the early 1990s, the outcomes of aortic valvuloplasty that included the aortic root were reexamined, and at the start of the 2000s, an objective method was proposed to evaluate the morphology of the aortic valve. Since then, aortic valvuloplasty has become standardized and recognized as a reproducible surgical technique, and in recent years it has rapidly increased in popularity.

However, aortic valvuloplasty has not been well disseminated in Japan, and it is no exaggeration to say that this is because Japanese surgeons lack experience in and knowledge of aortic valvuloplasty. If we can increase the degree of comprehension of this type of surgery among cardiologists, then going forward, the surgical indications will gradually increase. If patients are also referred to surgeons at an early stage before valve leaflet degeneration or annuloaortic ectasia has occurred, then valvuloplasty can be performed with greater precision, and this should result in a virtuous cycle. The main point of publishing this book is that by popularizing and developing aortic valvuloplasty in Japan, patients who would have been treated with valve replacement to date can undergo valvuloplasty instead, and if this occurs, we believe this will be a great boon to patients.

For this book, we mainly worked with coauthors who are members of the Aortic Valve Academy established in December 2013. However, to improve surgical outcomes, it is essential to have a good understanding of aortic valve anatomy and pathophysiology and its diagnosis, so we also added authors who are expert cardiologists. The main target readers are cardiovascular surgeons and cardiologists; however, to make the book accessible to other readers, such as cardiac anesthesiologists, medical interns, clinical engineering technicians, and scrub nurses, we aimed to make the contents as easy as possible to understand by including numerous illustrations. It would be a great delight to everyone involved in the planning of this book if it would become the standard reference text for cardiovascular surgery teams who are starting to perform aortic valvuloplasty.

On a fine day in November 2015

Tokyo, Japan
Tokyo, Japan

Takashi Kunihara
Shuichiro Takanashi

Preface (English Version)

This book was originally published in Japanese in November 2015 with the aim of popularizing aortic valvuloplasty in Japan. This field of practice has subsequently increased in visibility, although actual dissemination of the techniques is progressing slowly. As we see abroad, successive leaders in the field are continuing to publish new findings while the gap between them and surgeons in the general community level continues to widen. For this reason, we received numerous, fervent requests for an English translation of this book from top foreign surgeons who knew of its existence, and we are now pleased to finally release the English edition of the book. These requests arrived just as we were considering the incorporation of new knowledge into the book, so it was very convenient for us, and we started the project immediately.

Although this new knowledge has been incorporated throughout the English edition, we specifically expanded the general considerations and added new chapters. This also includes attempts to clarify our current positions and address global trends in the field. It will be extremely interesting to see how this data will change in the near future. Originally, all of our authors were Japanese nationals, but we wanted to include the latest knowledge on computational models in this edition, so for the first time, we have invited a foreign author to contribute. In addition, the limited number of references present in the Japanese edition has been expanded in the English edition so that we can better support the readers in their research.

We are deeply grateful to all of the authors who contributed to the current revision.

This book will be available not only to foreign surgeons but also to staff members on multidisciplinary cardiac treatment teams. If we are hereby able to deepen the common understanding of this type of surgery, improve surgical outcomes, and popularize aortic valvuloplasty, we believe that achieving these goals will be of enormous benefit to patients around the world suffering from aortic regurgitation as well as to editors and authors working in the field.

Tokyo, Japan
Tokyo, Japan

Shuichiro Takanashi
Takashi Kunihara

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Tokyo, Japan
Tokyo, Japan

Takashi Kunihara
Shuichiro Takanashi

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