

Zaiping Jing
Huajuan Mao
Weihui Dai
Editors

Endovascular Surgery and Devices



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Foreword 1

This book is a much-needed and excellent addition to the fields of endovascular treatments, vascular surgery, and vascular interventions. In many ways, it is a treasure.

Since the world's first and well-recognized description of mini-invasive endovascular treatment of an abdominal aortic aneurysm in 1991, the endovascular treatment of most vascular diseases have made explosive progress, becoming an overriding trend in vascular surgery and other disciplines. The combination of creativity, ingenious technology, and wonderful manufacturing skills have given birth to the innovative endovascular devices that serve as the basis of developing endovascular procedures to benefit patients.

This book is an important part of the theoretical system of endovascularology, which was first proposed by the prominent and well-known Chinese vascular surgeon Zaiping Jing in 1997. This volume expands on this system and introduces for the first time the new term of “endovasodevicolology.” It also provides excellent guidance and important information about endovascular devices and their clinical application in the treatment of vascular diseases.

China has an old saying: “Spend 10 years grinding a sword.” This means that outstanding achievements come from diligent persistence. This book provides a clear and excellent classification of numerous endovascular devices and gives precise information about their optimal clinical usage. It also provides a rich source of clear and artful illustrations. Many of these illustrate the application of these endovascular devices in the treatment of particularly difficult cases. This book could not have been conceived and written without the authors' decades of rich experience focusing on the progressive development of these endovascular devices, or without their systematic and creative contributions as this experience accumulated. Professor Jing and all the authors deserve to be congratulated on the great and successful effort that went into this important volume.

This book represents the combined effort of expert vascular surgeons and leaders in nursing and management. Their cooperation reflects their multidisciplinary knowledge and participation in the efficient clinical application of these endovascular devices. This volume also analyzes the characteristics and requirements of the various devices during different endovascular procedures. It introduces the use of an agile supply-chain management system, autonomous intelligence technology, and other advanced information techniques to assure the availability of the devices when they are needed. These systems assure that device supply will automatically be adjusted to endovascular procedural needs. Finally, this device supply model will integrate with external supply-chain resources to provide the “best supply strategy” and assure that vascular surgeons will have the endovascular devices they need, even in urgent circumstances. This supply-chain model will also make the selection of endovascular devices more scientific and economical. In addition, it will provide data-mining technology to facilitate analysis and reporting of results with appropriate statistical aids. In this way, early warning of poorly-chosen devices will be provided and clinical outcomes optimized.

As the first description of endovasodevicolology (Endovascular Surgery and Devices), this book will provide a knowledge system and scientific research method for the optimal clinical application of endovascular devices. As such, it should prove useful to individuals around the world who are interested in improving outcomes of endovascular procedures in the future. It should also further advance the field of endovascularology (first proposed by Professor Jing)—a

field that continues to evolve and grow exponentially. As it does, this originally surgical discipline must merge with and incorporate the skills of device management and information technology. This merger and cross-disciplinary integration is begun by this book, which should prove beneficial to all the vascular patients that we serve globally.



A handwritten signature in black ink that reads "F. J. Veith".

Frank J. Veith

New York, USA
May 2018

Frank J. Veith is Professor of Surgery, New York University, and the William J. von Liebig Chair in vascular surgery at the Cleveland Clinic. He graduated from Cornell University Medical School with honors before completing an internship at Columbia–P&S and his surgical residency training at Peter Bent Brigham Hospital and Harvard Medical School. Thereafter, he achieved success with his pioneering work in experimental and clinical lung transplantation. In the 1970s and 1980s, his attention turned toward vascular surgery with an emphasis on lower extremity revascularization procedures, many of which he innovated. He and his colleagues were the first to advocate an aggressive approach to saving limbs threatened by arteriosclerosis and gangrene when most patients with this problem were being treated by major amputation. His group were recognized as world leaders in this field and had more than 300 published articles related to it. In the early 1990s, Dr. Veith, long an advocate of endovascular treatments, became involved with endovascular grafts, using them to treat a variety of vascular lesions. Many of these procedures he and his associates performed were “firsts.” He and his group were the first to perform an endovascular graft repair of an abdominal aortic aneurysm, or EVAR, in the USA. They were also the first in the world to perform an EVAR for a ruptured abdominal aneurysm. In 1995, he was elected President of the Society for Vascular Surgery (SVS) and had a major role in promoting the endovascular treatment of many vascular diseases. He was a driving force behind the endovascular revolution. Dr. Veith held positions as Chief of Vascular Surgery and Chairman of Surgery at Montefiore Medical Center—Albert Einstein College of Medicine for many years. He was also the William J. von Liebig Chair in vascular surgery at these institutions. In 2006, he was appointed to his present positions at New York University and the Cleveland Clinic. Over the years, he has received numerous awards and honors as a leader, outstanding teacher and innovator in vascular surgery. He chairs the largest vascular meeting, the VEITH symposium, held annually in New York City. In 2018, the meeting will celebrate its 45th year. In 2010, Dr. Veith received the SVS Distinguished Lifetime Achievement Award. In 2013, an endowed chair, the Frank J. Veith Chair in Vascular and Endovascular Surgery, was established at Langone New York University Medical Center to honor him. Dr. Veith received the Lifetime Achievement Award at the Houston Aortic Symposium in 2013, the ISET Lifetime Achievement Award in 2016, and the Charing Cross Lifetime Achievement Award in 2018.

Foreword 2

This book focuses on the endovascular devices field, including not only arterial procedures but also the entire venous area. Today, the modern heart and vascular surgeon is faced with challenges not only in the endovascular treatment of thoracic and abdominal aneurysms, but also in minimally invasive heart valve repair.

Prof. Jing is one of China's leading vascular surgeons. I first got to know him on my visit to China in March 1997. I was accompanied by Prof. Müller-Wiefel (Duisburg) and Mrs. Agatha-Lindenthal, representing BsC. Professor Jing, along with his team, and I were first to introduce the EVAR procedure to China at Changhai Hospital (affiliated with the Second Military Medical University, Shanghai). Since then, I have visited Shanghai several times a year to perform an EVAR surgery with Prof. Jing. Over this time, Prof. Jing and his team have proven to be highly qualified. In fact, Prof. Jing and his team not only helped to improve the surgical techniques of EVAR surgery, but they also offered valuable contributions for improving pre- and postoperative care.

Prof. Jing was ahead of the times by realizing the value and importance of vascular treatment for arterial and venous diseases. He had already opened a vascular surgery department at Changhai Hospital in 1989. Then, in 1998, Prof. Jing completed the first domestic thoracic endovascular aneurysm repair case in a patient with aortic dissection. Prof. Jing's department has grown famous for treatment focusing on the thoracic aorta and its branches, including the aortic arch and the ascending aorta. As a logical consequence, Prof. Jing and his team also specialize in minimal invasive transcatheter heart valve surgery.

Numerous presentations, publications, and frequent visits from different vascular surgeons at his clinic have greatly contributed to the growth of vascular surgeons all over China. Since 1997, the Endovascology congress has taken place in Shanghai annually in October. This congress has continued to grow, with a steadily increasing number of attendees from China and especially from overseas. Prof. Jing's work has been honored with numerous awards, including one from President Jinping Xi in 2017 and his induction into the Hall of the People in Beijing.

Besides the supraaortic trunk, this book also covers endovascular therapy of the extra- and intracranial carotid artery. Additional chapters cover the intestinal arteries, obliterations of the

lower extremity, and the management of venous occlusive disease, including malformations. Unfortunately, these procedures have never been sufficiently recognized in Western cultures. I am pleased that this important book is now also offered in English thanks to Springer Verlag/Heidelberg. This will contribute to further recognition all over the world.



A handwritten signature in dark ink, appearing to read 'Dieter Raithel'.

Dieter Raithel

Erlangen, Germany
May 2018

Professor Dr Dieter Raithel is former Head of the Germany Society for Vascular Surgery (1999–2000), former Director and Head of the Department of Vascular Surgery from (1984–2010) at the University of Erlangen-Nuremberg School of Medicine, and honorary professor at the Second Military Medical University, Shanghai, China. He is also honorary doctor at the University of Cluj-Napoca, Romania. Prof Raithel is an expert in the diagnosis and surgical treatment of difficult and complex carotid artery diseases, and has done more than 40000 carotid endarterectomies. Because of the short time and low complication rate of carotid endarterectomy, he is known as “the European fast shooter” and used to be awarded a medal from the German President (Bundesverdienstkreuz) and was honored with the medal of Bavaria (Bayerischer Verdienstorden).

Preface 1

Devices integrated with technology and art.



Shanghai, China
July 2018

Zaiping Jing
Zaiping Jing

Preface 2

Having engaged in research on translational medicine and medical information management for more than 20 years, I have always been focusing on the clinical application and information-based management of endovascular devices. Modern endovascular devices are the combined efforts of various high and new technologies and advanced techniques, which not only promote the translation of technological developments in minimally invasive endovascular treatment to clinical applications, but also refuel the technological innovation of the endovascular device itself. These two aspects acting together give rise to a sustainable and innovative eco-chain. Medical information is evolving from information-based management toward big data-driven intelligent decision-making, from rational machine intelligence to smart health-care integrated with emotional intelligence and from in-hospital management to patient-centered ubiquitous service integration, triggering in-depth reform to traditional medical management patterns.

Ever-changing multifarious endovascular devices have become the most extensive and most sophisticated invasive devices for human bodies. However, they have complex requirements and peculiarities in terms of research, development, design, production, storage, selection, use, and surgical skills. In particular, in distribution coordination for clinical procedures, we must not only take into account the dynamically changing requirements and the use habits of doctors, but also build an agile supply-chain system centered on personalized scale demands in relation to its stocking pattern and emergency distribution patterns, where decision-making involves the multi-sided benefits to patients, doctors, suppliers, and hospitals. Information-based management of endovascular devices is a field of clinical application that requires the widest coverage, the highest intelligence level, and the most sophisticated decision factors. Therefore, professional study and talent development for the above-mentioned devices and their management are urgently required for the disciplinary development and clinical application of medical devices.

Endovascocodology, as proposed in this book, constitutes an important part of the endovascology founded by Professor Zaiping Jing, China's well-reputed expert in vascular surgery. It is a subdiscipline following the cross-development of modern medical devices and related disciplines with the clinical application of endovascology. The unique contents, knowledge structure, theoretical system, research direction and fields, and other issues regarding the above-mentioned discipline need to be further investigated and discussed. However, its research and development will inevitably provide richer contents for endovascology, create an organic eco-chain between scientific innovation and application translation of endovascular devices, and produce a far-reaching influence on the close integration between medical device disciplines and clinical applications, as well as the development of relevant professional talents.



Shanghai, China
July 2018

Weihui Dai

Preface 3

As China steps into an aging society, various vascular diseases with fast-growing mortality rates have become a common problem that seriously threatens national health in China. Since the first minimally invasive endovascular aortic aneurysm repair (EVAR) surgery succeeded in 1991, minimally invasive endovascular surgery has become the first choice for many patients, especially elderly high-risk patients, and represents a development trend for the surgical treatment of relevant diseases. The success of EVAR depends largely on the innovative development of endovascular devices. Meanwhile, device management and their distribution coordination during clinical operation are not only fundamental for surgical success, but also exert a direct influence on the satisfaction of the patients, physicians, and suppliers, as well as the quality of medical service and economic benefits of hospitals.

Endovascular devices are of multifarious types and specifications, so their storage and indication selections are very complicated. Various accidents may happen at any time during clinical operations; thus, there exist different requirements for distribution coordination of devices. This book has been written with the knowledge of doctors, nurses, and suppliers involved in minimally invasive endovascular surgery; it is China's first professional publication in the field of endovascular devices. Based on many years of clinical experiences in the Vascular Surgery of Changhai Hospital (affiliated with the Second Military Medical University) and written from a fundamental, practical, technical, pioneering and standardized management perspective, this book provides a systematic description of the existing management of endovascular devices in the vascular surgical suite. It consolidates relevant new theories, new technologies, new experiences, and special cases, while vividly expounding the structures, functional characteristics, use conditions, and management essentials of various devices with rich texts and illustrations.

This book was conceived and written under the personal guidance of Professor Zaiping Jing from the Vascular Surgery of Changhai Hospital (affiliated with the Second Military Medical University) and under the auspices of our affiliated hospitals and device suppliers. It is a great achievement after 4 years of painstaking efforts by the editorial group of clinical specialists and medical workers of the Vascular Surgery of Changhai Hospital (affiliated with the Second Military Medical University) and particularly, my tutor, Professor Weihui Dai from the School of Management, Fudan University. The achievements in this book have yielded excellent results in practical use; for example, the Distribution Coordination and Management System Based on Agile Supply China was honored with second prize for the Science and Technology Progress Award of Shanghai Municipal Government in 2015, significantly fueling advancements in management innovation and technological progress. For this, I am very grateful for the support and help from our affiliated hospitals and suppliers. My thanks go to all the editorial members for their wisdom and hard work! In particular, special thanks must be given to my assistants Meiqing Shi and Fuxiang Wang, who contributed greatly to compiling this book by data collection and sorting. I also thank my family because their support and concern contributed to the success of the book.

Because innovations in endovascular devices develop very quickly, many clinical experiences from other hospitals have not been incorporated and there is still much imperfection in this book. Thus, corrections and advice from readers and experts are appreciated.



Huajuan Mao

Shanghai, China
July 2018

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