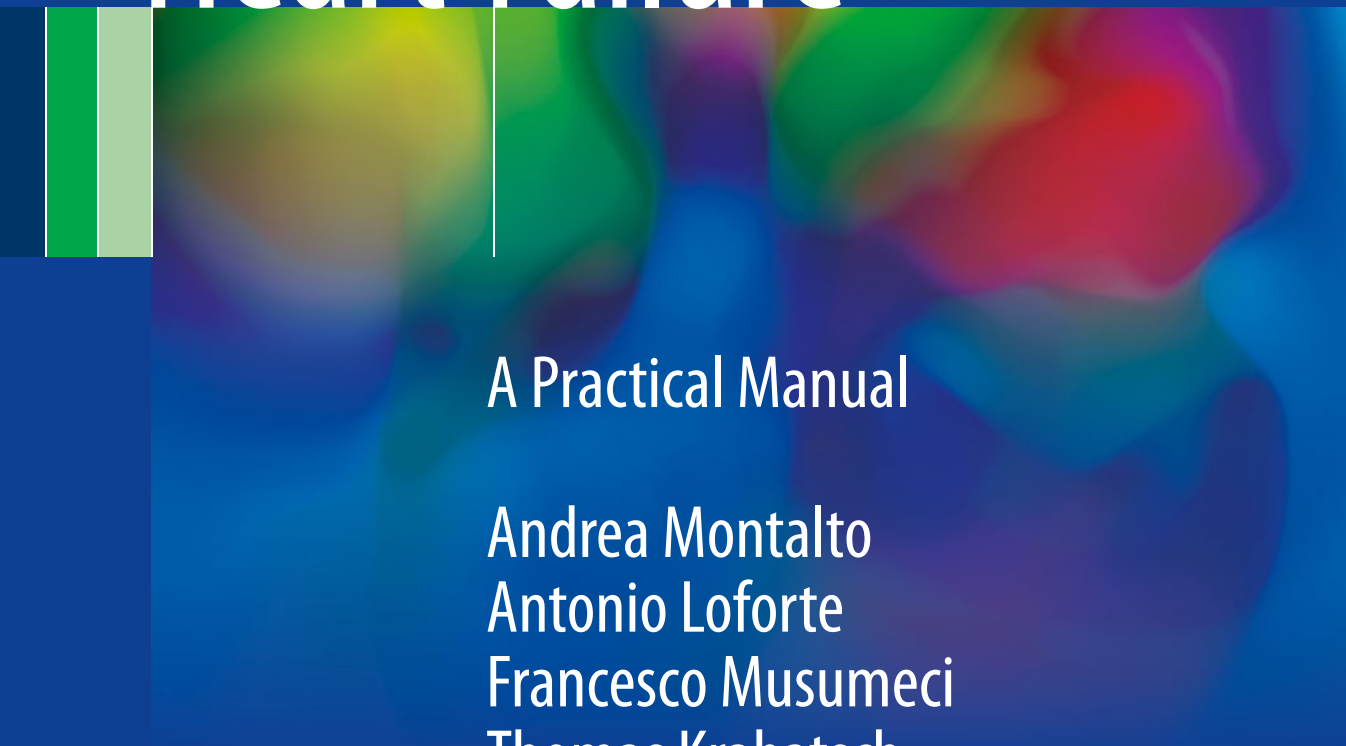
Mechanical Circulatory Support in End-Stage Heart Failure



A Practical Manual

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Mark S. Slaughter *Editors*

Springer

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In collaboration with Cristiano Amarelli

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To all patients whose desire for a better life inspired me

Andrea Montalto

To my beloved daughter, Alessandra, and wife, Elisa

Antonio Loforte

To my relatives and friends
who cared and loved me, supporting my curiosity and perseverance after the loss of my father

Cristiano Amarelli

Preface

» *We are all God's knights and knights of life.*
This is my destiny, this is the message that God tells me to bring.
A message of life and hope for me and for others.
Whatever happens do not close my sufferings in a drawer or a sad thought.
I was always smiling. Remember my smile and my will to live.
Go ahead and tell it so that it can be of relief and hope for others.
It should be a happy memory.
So in the worst case a knight will become an angel.
Mario C.

End-stage acute and chronic heart failure refractory to maximal pharmacological therapy carries a poor chance of survival for patients unless they undergo heart transplantation. Heart transplantation is restricted by age and comorbidities to a small group of patients, and the actual donor's shortage does not meet properly the demand of patients on waiting list. Mechanical circulatory support is a valid temporary solution before heart transplantation, whose results are playing the role of a game-changer in such a challenging field. The choice and management of the right device for every patient remains tricky. Giving the equipoise of the short and even the midterm results between LVADs and heart transplantation experienced in the last decade, the use as destination therapy is gaining space, permitting to promptly treat a wider patient population. Prompt availability and cost-effectiveness as unique constraint are the mainstreams of the mechanical solution. The proper selection of candidates for VAD or TAH implantation remains a challenging clinical decision. Patients who are too compromised may have an elevated risk of mortality postoperatively while patients with an early heart dysfunction scenario may have a poor benefit, thus being more exposed to device-related complications. Preoperative hemodynamic and clinical scenarios which may occur are extremely different from those the clinicians routinely have to face up to with traditional cardiac surgery therapy. Proper management and interpretation of MCS-related complications is an additional concern to deal with particularly in the case of non-hub and well-trained centers. Moreover, the psychological aspects and views of long-term VAD/TAH recipients which may influence the overall outcome should not be underestimated.

The complexity of MCS therapy and its clinical landscape, as well as the devotion of free minds in discovering, always case by case, the adequate treatment of such a delicate patient population, stimulated all of us to develop such an ambitious project. We aimed at building a textbook that would be a practical guide in terms of correct and well-accepted management of patients undergoing implantation of VAD and TAH. Our goal was to move up from a pioneer's phase of MCS adopted in few centers in the world to a world-wide standardized and shared management of a such effective therapy. In order to accomplish all of the above, we approached all those renowned centers and physicians worldwide who, over the years, have spent interest and time mostly in studying deeply such a delicate medicine field which is heart failure mechanical treatment. We encouraged all authors to enrich their contributions with tables and algorithms in order to render each chapters adoptable as a guiding protocol, thus providing keys for the resolution of any kind of traditionally discussed issue. Our goal has been

welcomed with great enthusiasm by all authors who have fully grasped the essence of this project. It is therefore with great satisfaction that we thank all those who, despite the onerous work commitments, have devoted their time to the realization of this book which we hope will be a valuable tool to improve survival and quality of life of those people who are living thanks to an artificial heart support system.

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Contents

II Intraoperative Tips and Pitfalls

IV Postoperative Recommendations

V Adverse Events Management

VI Miniaturization and Future Technologies

VII Health-Economic Aspects

VIII Registries Perspectives

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Dr. Krabatsch is senior cardiac surgeon at the Deutsches Herzzentrum in Berlin with expertise in the surgical treatment of a variety of cardiovascular diseases in adults including severe diffuse coronary artery disease and valvular heart diseases, in mechanical circulatory support, and in transplantation. He is the director of the Deutsches Herzzentrum Berlin's mechanical circulatory support team, which has carried out over 2800 implants. Dr. Krabatsch's basic science research interests include processes and mechanisms at the machine-human body interface, pump technology, and heart failure. He is a member of the ISHLT, EACTS, DGTHG, the German Society for Gene Therapy, and the BBGHK and author or coauthor of more than 150 scientific articles. Dr. Krabatsch also collaborates with several universities and cardiosurgical hospitals in Eastern Europe, such as Russia, Belarus, Bosnia, and Hungary. He is honorary professor in one of the Russian largest medical schools.

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Dr. Loforte is currently staff surgeon and cochair of the mechanical circulatory support program at the Department of Cardiothoracic, Transplantation and Vascular Surgery, S. Orsola Hospital, University of Bologna, Italy. He completed his cardiothoracic surgery residency at the University of Bologna, S. Orsola Hospital (Italy); at St. Antonius Ziekenhuis, Nieuwegein (the Netherlands); and the Deutsches Herzzentrum Berlin (Germany). He additionally joined the Michael E. DeBakey Department of Surgery, Division of Transplant and Assist Devices, in Houston, Texas, USA. Dr. Loforte is member of a number of professional organizations including the prestigious STS, ISHLT, ASAIO, EACTS, RHICS, and SICCH among others. His bibliography lists over 60 peer-reviewed original articles, 180 abstracts (communications) for international meetings and 10 book chapters. He serves as a reviewer for 21 international journals and is on the editorial board in 9. He got a "European PhD label" in organ transplantation and three international awards in Europe and the USA.

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Dr. Montalto obtained his medical degree at the University of Naples "Federico II" School of Medicine in Naples, Italy. After completing the residency in cardiac surgery at the University of Naples Federico II, he completed his training at the Cardiac Surgery Center of the San Camillo Hospital in Rome, Italy. Since 2006, he is permanent staff surgeon at the Department of Cardiac Surgery and Transplantation of the San Camillo Hospital. Dr. Montalto has shown particular interest in the field of surgical treatment of advanced heart failure, becoming familiar with the management of patients implanted with mechanical devices and is head of the VAD program of the Cardiac Surgery Center at the San Camillo Hospital since 2012. He is an active member of SICCH and EUROMACS.

Francesco Musumeci, MD, FECTS

Dr. Musumeci is director of the Cardiac Surgery and Transplantation and director of the Department of Cardiovascular Medicine at the San Camillo Hospital in Rome, Italy. He had his cardiac surgical training in London and between 1987 and 1990 he was senior registrar at the Harefield Hospital. In 1991 he was appointed consultant cardiac surgeon at the University Hospital of Wales. In 1998 moved back to Rome as director of Cardiac Surgery at the San Camillo Hospital. His clinical interests have been focused on heart failure surgery including transplantation and mechanical circulatory support and on minimally invasive surgery which is the standard surgical approach for all valve pathologies. In November 2011 the Robot Assisted Cardiac Surgical Program was started. The department has also a large experience in TAVI. Dr. Musumeci is elected president of the SICCH (Italian Society of Cardiac Surgery) for the years 2017–2018.

Dr. Mark S. Slaughter, MD

Dr. Slaughter is professor of surgery and chair of the Department of Cardiovascular and Thoracic Surgery at the University of Louisville, KY, USA, and is an adjunct professor in the Department of Bioengineering. Dr. Slaughter currently serves as a consultant to the FDA Medical Device Review Panel and a National Science Foundation SBIR/STTR grant reviewer and previously served two terms for the Health and Human Services Medicare Coverage Advisory Committee. In addition, he serves on the Ethics Committee and the Education Committee for the American Association for Thoracic Surgery and is a councilor for the Southern Thoracic Surgical Association. Dr. Slaughter has served as the president of the American Society for Artificial Internal Organs and president of the International Society for Rotary Blood Pumps. He currently is the editor in chief of the *American Society for Artificial Internal Organs* journal and also serves as an associate editor for the *Annals of Thoracic Surgery*.

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