

Contents

Editorial: Bench to Benchside to Home: Homing-in on Therapy that Begins at Home **ix**

Ragavendra R. Baliga and James B. Young

Preface **xi**

William T. Abraham and Ragavendra R. Baliga

Clinical Assessment of Heart Failure: Utility of Symptoms, Signs, and Daily Weights **149**

Justin M. Vader and Mark H. Drazner

Heart failure is a clinical syndrome defined by the presence of characteristic signs and symptoms. History taking and physical examination have particular utility in assessing patients who have heart failure. In recent years the validity of conventional signs and symptoms of heart failure has been tested in large population studies and in clinical trials, providing an evidence basis for their utility in the clinical assessment of the patient who has known or suspected heart failure. There also has been progress in characterizing the process of acute decompensation from a previously chronic stable state. This article addresses the usefulness of signs and symptoms and daily weights in the assessment and management of patients who have heart failure.

Transthoracic Impedance Cardiography: A Noninvasive Method of Hemodynamic Assessment **161**

Melike Bayram and Clyde W. Yancy

Impedance cardiography technology, along with recent advances in the impedance cardiography (ICG) device, has become a provocative but not yet proven noninvasive alternative to invasive hemodynamic measurements. The results from stroke volume and cardiac output measurements by ICG show reasonably accurate correlation to the values calculated from direct measurements from pulmonary artery catheters. ICG may be a useful adjunct to clinical judgment for heart failure patients. The available data would not yet support supplanting invasive hemodynamic assessment in the critical care setting with ICG. Future studies and advances in technology are expected to improve impedance cardiography, thus broadening its clinical applications. Ongoing research must confirm the precise benefits of this information for ICG monitoring to become a standard assessment in heart failure.

Usefulness of B-type Natriuretic Peptide Levels in Predicting Hemodynamic and Clinical Decompensation **169**

Pam R. Taub, Lori B. Daniels, and Alan S. Maisel

Pulmonary congestion can be challenging to diagnose because of nonspecific symptoms and the blunt nature of physical examination and radiographic findings. Assessing for euvolemia following treatment of congestion also can be difficult but can improve both the inpatient and outpatient care of patients who have heart failure. Tools such as the natriuretic peptides are important adjuncts to the physical

examination and chest radiographs and often obviate the need for invasive hemodynamic assessment.

Assessment of Left Ventricular Systolic Function by Echocardiography 177

Martin G. St. John Sutton, Ted Plappert, and Hind Rahmouni

Echocardiography serves an extremely important role in the diagnosis and management of patients with heart failure. The various stages of structural and functional changes that constitute progressive left ventricle remodeling have all been characterized by two-dimensional echocardiography. In addition, echocardiography has defined the transition from compensated hypertrophy to left ventricle dilatation and progression to end-stage heart failure. Echocardiography has also played an important role in clinical heart failure trials of β -adrenergic blocking agents and angiotensin-converting enzyme inhibitors and angiotensin receptor blockers and demonstrated their efficacy in heart failure.

The Role of Echocardiography in Hemodynamic Assessment in Heart Failure 191

Jacob Abraham and Theodore P. Abraham

Echocardiography now is recommended as the most useful diagnostic test for routine evaluation and management of heart failure. This article reviews the role of echocardiography (M-mode, two-dimensional, spectral, and tissue Doppler) for qualitative and quantitative hemodynamic assessment of the patient who has heart failure. It highlights the echocardiographic parameters that have the most diagnostic and/or prognostic relevance for patients who have advanced heart failure. The importance of right heart failure and heart failure with preserved ejection fraction is increasingly recognized, and therefore the echocardiographic evaluation of these conditions is emphasized also.

Noninvasive Measurement of Cardiac Output During Exercise by Inert Gas Rebreathing Technique 209

Gaia Cattadori, Jean-Paul Schmid, and Piergiuseppe Agostoni

Reduced exercise tolerance and dyspnea during exercise are hallmarks of heart failure syndrome. Exercise capacity and various parameters of cardiopulmonary response to exercise are of important prognostic value. All the available parameters only indirectly reflect left ventricular dysfunction and hemodynamic adaptation to an increased demand. Noninvasive assessment of cardiac output, especially during an incremental exercise stress test, would allow the direct measure of cardiac reserve and may become the gold standard for prognostic evaluation in the future.

Invasive Hemodynamic Assessment in Heart Failure 217

Barry A. Borlaug and David A. Kass

Routine cardiac catheterization provides data on left heart, right heart, systemic and pulmonary arterial pressures, vascular resistances, cardiac output, and ejection fraction. These data are often then applied as markers of cardiac preload, afterload, and global function, although each of these parameters reflects more complex interactions between the heart and its internal and external loads. This article reviews more specific gold standard assessments of ventricular and arterial properties, and how these relate to the parameters reported and utilized in practice, and then

discusses the re-emerging importance of invasive hemodynamics in the assessment and management of heart failure.

Are Hemodynamic Parameters Predictors of Mortality? 229

Garrie J. Haas and Carl V. Leier

This article addresses a question that the authors consider to be somewhat rhetorical: are hemodynamic parameters predictors of mortality? It reviews the specific hemodynamic abnormalities and pathophysiologic consequences distinctive to the patient who has decompensation and addresses the data that implicate abnormal hemodynamics as a treatment target associated with increased mortality. The focus is on patients who have decompensated heart failure, defined as left ventricular systolic dysfunction and an acute, subacute, or gradual worsening of symptoms while receiving optimal medical therapy.

Role of the Pulmonary Artery Catheter in Diagnosis and Management of Heart Failure 241

Rami Kahwash, Carl V. Leier, and Leslie Miller

The pulmonary artery catheter will likely earn a place in the history of medicine as one of the most useful tools that shaped our understanding and management of various diseases. An intense assessment of its application in nonacute and nonshock decompensated heart failure has been provided by the ESCAPE trial, a landmark investigation that showed an overall neutral impact of pulmonary artery catheter-guided therapy over therapy guided by clinical evaluation and judgment alone. The current guidelines reserve the use of a pulmonary artery catheter for the management of refractory heart failure and select conditions. The pulmonary artery catheter remains a useful instrument in clinical situations when clinical and laboratory assessment alone is insufficient in establishing the diagnosis and pathophysiologic condition, and in guiding effective, safe therapy.

Using Cardiac Resynchronization Therapy Diagnostics for Monitoring Heart Failure Patients 249

Philip B. Adamson

To precisely deliver appropriate therapy, cardiac resynchronization therapy devices track vast amounts of physiologic information. This information may be useful in monitoring heart failure patients and may provide meaningful insight into physiologic stability of volume status, activity, and cardiac electrophysiology. It is presumed that frequent monitoring of heart failure patients reduces the morbidity of heart failure by providing information early on so that measures can be taken to prevent congestion leading to acute decompensation. Until recently, however, frequent monitoring required face-to-face encounters in an office setting. Acquisition of device-based diagnostic information is now possible with Internet-based information systems. This article reviews the nature of device-based diagnostic information, examines how its clinical use can be justified, and makes suggestions for work flow that can make information from implanted devices useful in a clinical setting.

Implantable Hemodynamic Monitors 261

José A. Tallaj, Ish Singla, and Robert C. Bourge

The evaluation and management of volume status in patients with heart failure is a challenge for most clinicians. In addition, such an evaluation is possible only during a personal clinician-patient interface. The ability to acquire hemodynamic data

continuously with the help of implanted devices with remote monitoring capability can provide early warning of heart failure decompensation and thus may aid in preventing hospitalizations for heart failure. The data obtained also may improve the understanding of the disease process. It is important for the clinician treating patients who have heart failure to become acquainted with this type of technology and learn to interpret and use these data appropriately. This article reviews the implantable hemodynamics monitors currently available.

Hemodynamic Monitoring in Heart Failure: A Nursing Perspective

271

Erin K. Donaho and Robin J. Trupp

Managing patients who have heart failure is challenging and requires the integration of inpatient and outpatient care. Until evidence from clinical trials of implantable hemodynamic monitors (IHMs) is available and approval from the Food and Drug Administration is received, the best available model seems to be telemonitoring in conjunction with a comprehensive heart failure disease management program. A number of issues, including established processes for data review and interpretation, must be addressed before IHMs are widely adopted and accepted. Nurses, as the most frequent and common contact for patients, have the ability and opportunity to lead this change.

Index

279