

# Assessment of Right Ventricular Function

## Echocardiography

### Regional RV Function

- TAPSE, TDI S'

### Global RV Function

- MPI, FAC, 2D/3D strain
- 3D volumes & EF

### RV-PA Coupling

- TAPSE:PASP
- RVFWLS:PASP

## MRI

### RV Volumes (e.g RVESVi)

- RV SV & SVi
- RVEF
- RV Mass
- 4D Flow
- RV Strain Imaging
- RV-PA Coupling (RVSV:RVESV)
- LGE
- T1 & ECV Mapping

## Right Heart Catheterisation

### RAP

- Cardiac output & Index
- RV SV & SVi
- PVR
- PAC
- PAPi
- RVSWI
- RV-PA Coupling (Ees:Ea)

# Assessment Of Ventricular Function

**Victor M. Corman**

A decorative graphic element consisting of a light blue horizontal bar with a rounded right end, and a red circular glow behind it.

## **Assessment Of Ventricular Function:**

**Assessment of Ventricular Function** Angelo Raineri, Robert D. Leachman, Jan J. Kellermann, 2013-11-27 This is the 3rd Course that has been organized at the prestigious E Majorana Centre The choice of the theme is not a casual one In fact after rehabilitation and prevention which were the topics discussed in the previous courses of 1979 and 1982 this Course deals with subjects more deeply connected with the mechanisms of cardiac function and the pathological aspects that under this point of view characterize many specific diseases The rapid development in the application of technology to the problems of Cardiological diagnosis has made it possible to study ventricular function in the evaluation of patients with apparent or suspected heart disease Knowing that we are facing one of the most complex subjects in modern cardiology we wish to arouse the interest of researchers and cardiologists by comparing different experiences with the aim of giving an overall survey of the problems The program has been divided into 4 chapters 1 Systolic and diastolic ventricular function 2 Specific studies of ventricular function using invasive and non invasive techniques 3 Diseases with altered ventricular function 4 Pharmacological manipulation of ventricular function Our aim is not only to stimulate useful discussions in the faculty but also among the participants I hope that we can achieve this I should like to take this opportunity of thanking the co directors of the Course Prof Jan Kellermann and Prof Robert v vi PREFACE Leachman who have played an important part in the scientific organization Assessment of Ventricular Function Angelo Raineri, Robert D. Leachman, Jan J.

Kellermann, 2014-09-01 *Blood flow specific assessment of ventricular function* Alexandru Grigorescu Fredriksson, 2017-12-06 The spectrum of cardiovascular diseases is the leading cause of morbidity and mortality globally Early assessment and treatment of these conditions acquired as well as congenital is therefore of paramount importance The human heart has a great ability to adapt to various hemodynamic conditions by cardiac remodeling Pathologic cardiac remodeling can occur as a result of cardiovascular disease in an effort to maintain satisfactory cardiac function With time cardiac function diminishes leading to disease progression and subsequent heart failure the end point of many heart diseases associated with very poor prognosis Within the normal cardiac ventricles blood flows in highly organized patterns and changes in cardiac configuration or function will affect these flow patterns Conversely altered flows and pressures can bring about cardiac remodeling In congenital heart disease even after corrective surgery cardiac anatomy and thereby intracardiac blood flow patterns are inherently altered The clinically most available imaging technique ultrasound with Doppler allows only for one directional flow assessment and is limited by the need of clear examination windows thus failing to fully assess the complex three dimensional blood flow within the beating heart Cardiovascular magnetic resonance imaging CMR with phase contrast has the ability to acquire three dimensional 3D three directional time resolved velocity data 3D time 4D flow data from which visualization and quantification of blood flow patterns over the complete cardiac cycle can be performed Four functional blood flow components have previously been defined based on the blood route and distribution through the

ventricle where the inflowing blood that passes directly to the outflow is called Direct flow. From these components various quantitative measures can be derived such as component volumes and kinetic energy (KE) throughout the cardiac cycle. In addition, the 4D flow technique has the ability to quantify and visualize turbulent flow with increased velocity fluctuations in the heart and vessels, turbulent kinetic energy (TKE). The technique has been developed and evaluated for assessment of left ventricular (LV) blood flow in healthy subjects and in patients with dilated dysfunctional left ventricles showing significant changes in blood flow patterns and energetics with disease. There is, however, still no study addressing the gap in the spectrum from the healthy cohorts to patients with moderate to severe left ventricular remodeling. In Paper III, 4D flow CMR was utilized to assess LV blood flow in patients with subtle LV dysfunction, and a shift in blood flow component volumes and KE was seen from the Direct flow to the non-ejecting blood flow components. In patients with both left and right-sided acquired and congenital heart disease, right ventricular (RV) function is of great prognostic significance; however, this ventricle has historically been somewhat overlooked. With its complex geometry, advanced physiology, and retrosternal location, assessment of the RV is still challenging, and the right ventricular blood flow is still incompletely described. In Paper I, the RV blood flow in healthy subjects was assessed, and the proportionally larger Direct flow component was located in the most basal region of the ventricle and possessed higher levels of KE at end diastole than the other flow components, suggesting that this portion of blood was prepared for efficient systolic ejection. In Paper II, the blood flow was assessed in the RV of patients with subtle primary LV disease, and even if conventional echocardiographic or CMR RV parameters did not show any RV dysfunction, alterations of flow patterns suggestive of RV impairment were found in the patients with the more remodeled LVs. With improvements of the cardiovascular health care, including the surgical techniques, the number of adult patients with surgically corrected complex congenital heart diseases increases, one of which is tetralogy of Fallot (ToF). Surgical repair of ToF involves widening of the pulmonary stenosis, which postoperatively may cause pulmonary insufficiency and regurgitation (PR). Disturbed or turbulent flow patterns are rare in the healthy cardiovascular system. With pathological changes such as valvular insufficiency, increased amounts of TKE have been demonstrated. Turbulence is known to be harmful to organic tissues and could be significant in the development of ventricular remodeling, such as dilation and other complications seen in Fallot patients. In Paper IV, the RV intraventricular TKE levels were assessed in relation to conventional measures of PR. Results showed that RV TKE was increased in ToF patients with PR compared to healthy controls, and that these 4D flow-specific measures related slightly stronger to indices of RV remodeling than the conventional measures of PR. 4D flow CMR analysis of the intracardiac blood flow has the potential of adding to pathophysiological understanding and thereby providing useful diagnostic information and contributing to optimization of treatment of heart disease at earlier stages before irreversible and clinically noticeable changes occur. The flow-specific measures used in this thesis could be utilized to detect these alterations of intracardiac blood flow and could thus act as potential markers of progressing ventricular dysfunction.

pathological remodeling or used for risk stratification in adults with early repair tetralogy of Fallot Visualizations of intracardiac flow patterns could provide useful information to cardiac thoracic surgeons pre and post operatively

**Assessment of Ventricular Function** D. H. Spodick,1985-04-10 **Heart Failure in the Child and Young Adult** Joseph Rossano,John Lynn Jefferies,Anthony C. Chang,Jeffrey A. Towbin,Robert E Shaddy,Shelley Miyamoto,2025-08-01 Heart Failure in the Child and Young Adult From Bench to Bedside Second Edition highlights unique aspects of heart failure in the young This comprehensive resource combines research from multiple contributors with current guidelines to bridge the knowledge gap for the recognition and management of heart failure in children Coverage begins with the basic science of heart failure and then progresses through diagnosis management treatment and surgery finally concluding with advanced special topics including genetics self management and nanomedicine This new edition covers advancements in the field including additional chapters and discussion on biomarkers neuromuscular disease quality of life palliative care and the impact of COVID 19 in myocarditis and multisystem inflammatory syndrome in children It will serve as an indispensable reference to basic science researchers in cardiology pediatrics cardiologists and pediatric cardiologists Combines cutting edge research with current guidelines from the field Provides coverage of the basic science of heart failure its epidemiology and economic aspects outpatient and inpatient management and advanced therapies including mechanical circulatory support and heart transplantation Includes expanded chapters on the immune system and inflammation in the development and progression of heart failure Reviews new randomized controlled trials in pediatric heart failure *Cardiovascular Imaging E-Book* Vincent Ho,Gautham P. Reddy,2010-11-09 Cardiovascular Imaging a title in the Expert Radiology Series edited by Drs Vincent Ho and Gautham P Reddy is a comprehensive 2 volume reference that covers the latest advances in this specialty It provides richly illustrated advanced guidance to help you overcome the full range of diagnostic therapeutic and interventional challenges in cardiovascular imaging and combines an image rich easy to use format with the greater depth that experienced practitioners need Online access at [www.expertconsult.com](http://www.expertconsult.com) allows you to rapidly search for images and quickly locate the answers to any questions Access the fully searchable text online at [www.expertconsult.com](http://www.expertconsult.com) along with downloadable images View 5000 full color digital images of both radiographic images and cutting edge modalities MR multislice CT ultrasonography and nuclear medicine Tap into comprehensive coverage that includes diagnostic and therapeutic options with an emphasis on cost effective imaging Consult the experience of a diverse group of experts on cardiovascular imaging from around the globe Find information quickly and easily thanks to consistent and tightly focused chapters a full color design and key points boxes [Heart Failure in Adult Congenital Heart Disease, An Issue of Heart Failure Clinics](#) Andrew R Opatowsky,Michael Job Landzberg,2014-01-28 This issue of Heart Failure Clinics focuses on Heart Failure in Adult Congenital Heart Disease As more children with congenital heart disease survive into adulthood their care is becoming an increasingly important aspect of practice for Cardiologists In this issue expert authors review the most current

information available about the work up diagnosis and treatment of adult congenital heart disease including medical therapy and percutaneous and surgical options Keep up to the minute with the latest developments in the management of heart failure in adult congenital heart disease Anesthesia for Congenital Heart Disease Emad B. Mossad, Erin A. Gottlieb, 2023-01-17 Ein umfassendes Nachschlagewerk zu den Verfahren Kenntnissen und Ans tzen in der An sthesie bei Patienten mit angeborenen Herzfehlern Mit dieser 4 Auflage von Anesthesia for Congenital Heart Disease legt eine internationale Gruppe angesehenen Fachleute f r angeborene Herzfehler einen gr ndlichen umfassenden und vollst ndig aktualisierten berblick ber die spezielle Situation von Patienten mit angeborenen Herzfehlern vor in dem auch die Feinheiten angesprochen werden die bei der an sthetischen Versorgung von Patienten zu beachten sind die unter den diversen L sionen einer angeborenen Herzkrankheit leiden In den sieben Jahren seit der Ver ffentlichung der dritten Auflage von Anesthesia for Congenital Heart Disease sind unz hlige neue Verfahren Ans tze und Patienten bei denen eine sthetische Versorgung m glich ist hinzugekommen Die vierte Auflage von Anesthesia for Congenital Heart Disease soll den Lesern ein Verst ndnis der neuesten Fortschritte und Entwicklungen in diesem Bereich vermitteln und gleichzeitig grundlegendes historisches Wissen aufbauen In den Kapiteln die mit dieser Auflage neu hinzugekommen sind werden aufregende neue Ans tze in dem sich rasch ver ndernden Bereich dargestellt Insbesondere handelt es sich um Aktualisierte Informationen im Kapitel ber angeborene Herzkrankheiten bei Erwachsenen und die mechanische Unterst tzung des Kreislaufs worin sich auch zeigt dass diese Patienten eine immer gr ere Rolle in der Versorgung spielen Neue Kapitel ber Informatik und K nstliche Intelligenz genetische Syndrome Point of Care Ultraschall und die kardiopulmonale Wiederbelebung bei Patienten mit angeborenen Herzfehlern Gr ndliche Aktualisierung aller Kapitel mit vielen neuen Abbildungen und Tabellen und Hunderten neuer Referenzen f r aktuelle Informationen Die vierte Auflage von Anesthesia for Congenital Heart Disease ist ein grundlegendes umfassendes Nachschlagewerk und eine unverzichtbare Quelle f r rzte die Patienten mit angeborenen Herzfehlern perioperativ versorgen Anesthesia for Congenital Heart Disease Dean B. Andropoulos, Stephen A. Stayer, Isobel A. Russell, 2008-04-15 Anesthesia for Congenital Heart Disease will provide a state of the art summary of the many changes occurring in this rapidly evolving field over the last decade The unique value of this book is that all chapters are written by leaders in the field of congenital cardiac anesthesia who perform large numbers of cases clinically and contribute important knowledge to the research literature both clinical and basic science A wide range of contributors from all of the major congenital heart surgery programs in North America give a broad range of perspectives not seen in previous texts in this field This text will be the leading book in this subspeciality the most comprehensive detailed and specific from the perspective of multiple institutions Emphasis on new and emerging developments in anesthetic drugs and techniques occurs in each chapter New chapters on subjects that have never before been addressed in a textbook of pediatric cardiac anesthesia include cardiac catheterization laboratory anesthesia computers and technology neurologic monitoring bleeding

and coagulation approach to the teenager and adult approach to the premature newborn the inflammatory response regional anesthesia and pain management airway and ventilatory management dysrhythmia management non cardiac surgery and cardiac magnetic resonance imaging and research teaching and administration      Nuclear Cardiology: Practical Applications, Third Edition Gary V. Heller, Robert C. Hendel, 2017-10-20 The book physicians turn to for clarification on any aspect of nuclear cardiology Nuclear Cardiology A Concise Textbook and Board Review Third Edition provides concise expert guidance on indications for nuclear cardiology procedures specification of tests and interpretation of results Completely updated with the latest techniques and procedures this well illustrated guide is essential to clinicians who require a practical understanding of this specialty as well as trainees including cardiology fellows and radiology residents Readers will learn when to refer which test to prescribe and how to interpret the results Nuclear Cardiology is a must have review for anyone seeking certification or recertification in nuclear cardiology NEW SECTION of case based scenarios with multiple choice questions NEW online video component Full color insert of radiographic images Cutting edge coverage of new and emerging techniques in nuclear medicine Emphasis on indications for tests helps readers decide which nuclear test is the best choice for a particular problem Review questions at the end of each chapter assure understanding of the material and prepare readers for certification testing      **Chest Radiographic Interpretation in Pediatric Cardiac Patients** Shi-Joon Yoo, Cathy MacDonald, Paul Babyn, 2011-01-01 Beautifully illustrated case based guide to reading chest radiographs in pediatric cardiac patients From congenital or acquired problems in newborns to cardiovascular abnormalities in older children this comprehensive text explains how to interpret chest radiographs and how to report that information in day to day practice It steers readers through this often challenging area using numerous practical case examples more than 400 high quality radiographs drawings and specimen photographs straightforward explanations of findings and the collective experience of several of the world s foremost experts on cardiac imaging and pediatric cardiology After an introductory discussion of normal cardiac anatomy and imaging the authors provide readers with a systematic approach to understanding chest images in children with congenital or acquired heart disease followed by useful bulleted synopses of basic pathologic features clinical manifestations and radiographic findings While the trend in recent decades has been toward increasingly sophisticated imaging modalities this book successfully illustrates that there is still an extraordinary amount of diagnostic and therapeutic information to be found in chest x rays Features Multiple perspectives from imagers cardiologists and cardiac surgeons on the pathology of congenital heart disease High resolution radiographs detailed drawings and specimen photographs vividly elucidate interpretative principles Summary of pediatric cardiovascular surgical procedures provides context and practical examples of what to expect when viewing post operative chest radiographs This book will improve the accuracy and confidence of any radiologist cardiologist or clinician involved in the interpretation of pediatric chest images and is ideal for residents and fellows in radiology and pediatric cardiology      Small Animal Diagnostic Ultrasound - E-Book

John S. Mattoon, Thomas G. Nyland, 2014-12-02 Now in full color with over 750 vivid images located near their text descriptions Small Animal Diagnostic Ultrasound 3rd Edition is the must have resource for coverage of the basic principles of ultrasonography in small animal medical care Using a logical body systems approach where chapters are organized from head to tail this third edition offers completely revised and up to date information regarding the latest techniques applications and developments in ultrasonography including expanded coverage of Doppler imaging principles and new gross anatomic and pathological specimen images Also new to this edition are 100 video clips housed on a companion website that demonstrate normal and abnormal conditions as they appear in ultrasound scans This is the book that any clinician that has interest in veterinary diagnostic imaging should have Reviewed by Denis Novak on behalf of European Journal of Companion Animal Practice June 2015 There will be very few clinicians who will fail to learn something new within a few minutes of opening it Reviewed by Louise McLean on behalf of Veterinary Record July 2015 Video clips accessible on the accompanying website allows the ultrasonographer to visualise organs in motion The real stuff Reviewed by Fabienne Dethioux on behalf of Royal Canin Vets Today July 2015 Head to tail chapter organization makes finding specific information quick and easy The most up to date ultrasound imaging techniques ensure you stay on top of the industry Online glossary contains over 400 terms offer a more complete understanding of ultrasonography NEW Color Design includes over 750 images appearing near their text mentions NEW Approximately 100 video clips located on the companion website demonstrate conditions as they appear to an ultrasonographer NEW Updated and expanded coverage of Doppler imaging principles and applications including non cardiac organs and abdominal vasculature keep you up to date in this critical area NEW Gross anatomic and pathological specimen images accompany the ultrasound images to help orient you to the tissues under study

**Cardiovascular Evaluation of Athletes** Bruce Frank Waller, Watkins Proctor Harvey, 1993 **The Assessment of Left Ventricular Function** Stephen Walton (M. D.), 1989 Indications for Diagnostic Procedures Albert E. Raizner, 1997 *Noninvasive Assessment of the Cardiovascular System* Edward B. Diethrich, 1982 **Clinical Manual and Review of Transesophageal Echocardiography, Second Edition** Joseph Mathew, Madhav Swaminathan, Chakib Ayoub, 2010-03-02 A complete full color clinical manual and review of TEE Clinical Manual and Review of Transesophageal Echocardiography offers concise yet comprehensive coverage of the key principles concepts and developing practice of TEE Each chapter provides a summary of the physiology pathophysiology tomographic views and the required two dimensional M Mode and Doppler echocardiography data for a number of common disease states Important clinical information is integrated with the principles of cardiovascular physiology Features Addresses all the important clinical and technical issues and major exam topics Enhanced anatomic representation of ultrasound imaging planes Increased number of chapter ending review questions An effective blend of narrative text and bulleted text charts and graphs speeds access to key clinical information Important new chapters on 3D TEE epicardial and epiaortic ultrasonography TEE in the emergency room training and

certification in perioperative TEE and the TEE board exam Valuable appendices detailing normal chamber dimensions and volumes diastolic function quantification of stenotic and regurgitant valves hemodynamic calculations and more Contributions from leading anesthesiologists cardiologists and cardiothoracic surgeons Perfect for review Condensed Table of Contents Basic Transesophageal Echocardiography Advanced Transesophageal Echocardiography Clinical Perioperative Echocardiography TEE in Nonoperative Settings Special Topics Appendices **Preanesthetic Assessment 2 E.**

Frost,1989-11-01 The primary mission of the medical school is to create new doctors Once the medical student has received his or her doctorate the medical school s interest in and acceptance of responsibility for the continued professional development of the physician ceases almost entirely Yet with scientific advances in medicine increasing exponentially and the inevitable erosion of memory with time teachings from our schools of medicine become increasingly irrelevant forgotten or both To maintain competence the physician must continuously re educate him or herself CME Continuing Medical Education will probably never attain the status of the medical school s degree granting undergraduate program but medical schools and their faculties must recognize their responsibility not only for creating competent physicians but also for maintaining that competence With these words I introduced the first volume of Preanesthetic Assessment in 1986 The series was a product of a Continuing Medical Education program initiated by the Department of Anesthesiology Albert Einstein College of Medicine Montefiore Medical Center Controversy continues to exist over the lasting educational value of conferences that bring physicians together Moreover because of time or financial constraints only a small number of anesthesiologists are able to attend seminars on a frequent basis By producing a monthly current clinical series in conjunction with Anesthesiology News over these 4 years we have been able to make state of the art analyses available to all anesthesiologists Clinical Manual of Electrophysiology Igor Singer,Joel Kupersmith,1993 *Blood Flow Specific Assessment of Ventricular Function* Alexandru Grigorescu Fredriksson,2017 The spectrum of cardiovascular diseases is the leading cause of morbidity and mortality globally Early assessment and treatment of these conditions acquired as well as congenital is therefore of paramount importance The human heart has a great ability to adapt to various hemodynamic conditions by cardiac remodeling Pathologic cardiac remodeling can occur as a result of cardiovascular disease in an effort to maintain satisfactory cardiac function With time cardiac function diminishes leading to disease progression and subsequent heart failure the end point of many heart diseases associated with very poor prognosis Within the normal cardiac ventricles blood flows in highly organized patterns and changes in cardiac configuration or function will affect these flow patterns Conversely altered flows and pressures can bring about cardiac remodeling In congenital heart disease even after corrective surgery cardiac anatomy and thereby intracardiac blood flow patterns are inherently altered The clinically most available imaging technique ultrasound with Doppler allows only for one directional flow assessment and is limited by the need of clear examination windows thus failing to fully assess the complex three dimensional blood flow within the beating heart Cardiovascular

magnetic resonance imaging CMR with phase contrast has the ability to acquire three dimensional 3D three directional time resolved velocity data 3D time 4D flow data from which visualization and quantification of blood flow patterns over the complete cardiac cycle can be performed Four functional blood flow components have previously been defined based on the blood route and distribution through the ventricle where the inflowing blood that passes directly to the outflow is called Direct flow From these components various quantitative measures can be derived such as component volumes and kinetic energy KE throughout the cardiac cycle In addition the 4D flow technique has the ability to quantify and visualize turbulent flow with increased velocity fluctuations in the heart and vessels turbulent kinetic energy TKE The technique has been developed and evaluated for assessment of left ventricular LV blood flow in healthy subjects and in patients with dilated dysfunctional left ventricles showing significant changes in blood flow patterns and energetics with disease There is however still no study addressing the gap in the spectrum from the healthy cohorts to patients with moderate to severe left ventricular remodeling In Paper III 4D flow CMR was utilized to assess LV blood flow in patients with subtle LV dysfunction and a shift in blood flow component volumes and KE was seen from the Direct flow to the non ejecting blood flow components In patients with both left and right sided acquired and congenital heart disease right ventricular RV function is of great prognostic significance however this ventricle has historically been somewhat overseen With its complex geometry advanced physiology and retrosternal location assessment of the RV is still challenging and the right ventricular blood flow is still incompletely described In Paper I the RV blood flow in healthy subjects was assessed and the proportionally larger Direct flow component was located in the most basal region of the ventricle and possessed higher levels of KE at end diastole than the other flow components suggesting that this portion of blood was prepared for efficient systolic ejection In Paper II the blood flow was assessed in the RV of patients with subtle primary LV disease and even if conventional echocardiographic or CMR RV parameters did not show any RV dysfunction alterations of flow patterns suggestive of RV impairment were found in the patients with the more remodeled LVs With improvements of the cardiovascular health care including the surgical techniques the number of adult patients with surgically corrected complex congenital heart diseases increases one of which is tetralogy of Fallot ToF Surgical repair of ToF involves widening of the pulmonary stenosis which postoperatively may cause pulmonary insufficiency and regurgitation PR Disturbed or turbulent flow patterns are rare in the healthy cardiovascular system With pathological changes such as valvular insufficiency increased amounts of TKE have been demonstrated Turbulence is known to be harmful to organic tissues and could be significant in the development of ventricular remodeling such as dilation and other complications seen in Fallot patients In Paper IV the RV intraventricular TKE levels were assessed in relation to conventional measures of PR Results showed that RV TKE was increased in ToF patients with PR compared to healthy controls and that these 4D flow specific measures related slightly stronger to indices of RV remodeling than the conventional measures of PR 4D flow CMR analysis of the intracardiac blood flow has the potential of adding to pathophysiological

understanding and thereby provide useful diagnostic information and contribute to optimization of treatment of heart disease at earlier stages before irreversible and clinically noticeable changes occur The flow specific measures used in this thesis could be utilized to detect these alterations of intracardiac blood flow and could thus act as potential markers of progressing ventricular dysfunction pathological remodeling or used for risk stratification in adults with early repair tetralogy of Fallot Visualizations of intracardiac flow patterns could provide useful information to cardiac thoracic surgeons pre and post operatively

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