

Review

Exploring the Utility of Renal Resistive Index in Critical Care: Insights into ARDS and Cardiac Failure

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Abstract: The renal resistive index (RRI), a Doppler ultrasound-derived parameter measuring renal vascular resistance, has emerged as a promising non-invasive tool to evaluate renal hemodynamics in critically ill patients, particularly those with acute respiratory distress syndrome (ARDS) and heart failure (HF). This narrative review examines the current evidence for RRI measurement in these conditions, exploring its physiological bases, methodology, clinical applications, and limitations. In ARDS, RRI reflects the complex interactions between positive pressure ventilation, hypoxemia, and systemic inflammation, showing a role in predicting acute kidney injury and monitoring response to interventions. In HF, RRI is able to assess venous congestion and cardiorenal interactions and can also serve as a prognostic indicator. Many studies have shown RRI's superiority or complementarity to traditional biomarkers in predicting renal dysfunction, although its interpretation requires consideration of multiple patient-related factors. Key challenges include operator dependency, lack of standardization, and complex interpretation in multi-organ dysfunction. Future research should focus on measurement standardization, development of automated techniques, investigation of novel applications like intraparenchymal renal resistive index variation, and validation of RRI-guided management strategies. Despite its limitations, RRI represents a valuable tool that offers bedside and real-time insights into renal hemodynamics and potential guidance for therapeutic interventions. Further research is needed to fully clarify its clinical potential and address current limitations, particularly in critical care settings involving multiple organ dysfunction.

Keywords: renal resistive index; critical care; ARDS; heart failure; duplex Doppler sonography



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1. Introduction

Renal resistive index (RRI), an ultrasound vascular Doppler-derived parameter, evaluates renal resistance and compliance; it was first described by Pourcelot in 1974 [1,2].

RRI was primarily explored as a diagnostic tool in situations in which intrarenal impedance is altered, particularly renovascular and chronic kidney disease; however, it

Renal Problems In Critical Care

Yatin Mehta



Renal Problems In Critical Care:

Renal Problems in Critical Care Lynn Schoengrund, Pamela Balzer, 1985 A comprehensive source for the critical care nurse dealing with patients with acute renal failure The book includes anatomy and physiology of the normal kidney pathophysiology of acute renal failure nutritional needs and drug therapy in renal failure treatment of renal failure and specific nursing interventions for all treatments *Critical Care Nephrology* Claudio Ronco, Rinaldo Bellomo, John A. Kellum, 2009-01-01 This 2nd edition of Critical care nephrology continues to provide comprehensive coverage of the latest advances in critical care procedures for the adult or pediatric patient with renal diseases or disorders It presents a common language and standardized guidelines to help multi disciplinary physicians caring for the critically ill communicate more effectively **BOOK JACKET** *Renal Problems in Critical Care* Lynn Schoengrund, Pamela Balzer, 1985 A comprehensive source for the critical care nurse dealing with patients with acute renal failure The book includes anatomy and physiology of the normal kidney pathophysiology of acute renal failure nutritional needs and drug therapy in renal failure treatment of renal failure and specific nursing interventions for all treatments **Renal Problems in Critical Care** Lynn Schoengrund, 1985-01-01 Critical Care Nephrology E-Book Claudio Ronco, Rinaldo Bellomo, John Kellum, Zaccaria Ricci, 2017-12-14 Comprehensive and clinically relevant the 3rd Edition of Critical Care Nephrology provides authoritative coverage of the latest advances in critical care procedures for patients with renal diseases or disorders Using common guidelines and standardized approaches to critically ill patients this multidisciplinary reference facilitates better communication among all physicians who care for critically ill patients suffering from kidney disease electrolyte and metabolic imbalances poisoning severe sepsis major organ dysfunction and other pathological events Offers detailed discussions of different forms of organ support artificial organs infections acute illness occurring in chronic hemodialysis patients and much more Places a special emphasis on therapeutic interventions and treatment procedures for a hands on clinical reference tool Presents information clearly in a format designed for easy reference from basic sciences to clinical syndromes to diagnostic tools Covers special populations such as children diabetic patients and the elderly An exceptional resource for nephrologists intensivists surgeons or critical care physicians anyone who treats critically ill renal patients Shares a combined commitment to excellence lead by Drs Claudio Ronco Rinaldo Bellomo John Kellum and Zaccaria Ricci unparalleled leaders in this field Addresses key topics with expanded coverage of acute kidney injury stress biomarkers and sepsis including the latest developments on mechanisms and management Provides up to date information on extracorporeal therapies from new editor Dr Zaccaria Ricci Expert Consult™ eBook version included with purchase This enhanced eBook experience allows you to search all of the text figures and references from the book on a variety of devices *Critical Care Medicine* Michael James Murray, 2002 This authoritative reference published under the auspices of the American Society of Critical Care Anesthesiologists ASCCA is now in its Second Edition More than 100 internationally recognized experts present

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Critical Care Update 2010 Vineet Nayyar, John V Peter, Roop Kishen, S Srinivas, 2011-06 This knowledge of basic sciences coupled with a keen clinical sense attention to detail and good decision making skills is the defining characteristic of Critical Care However medical knowledge of the nature needed for an exacting practice of Critical Care also requires renewal as technology in the ICU and understanding of disease processes evolve with the passage of time This monograph has been created to fill this gap While Critical Care is an established specialty in many parts of the world only in recent years it has received some attention in India It is therefore appropriate that this monograph has been planned keeping in view the growing interest in this specialty Some of the chapters are detailed while others provide an overview of the subject but each one has been written in keeping with the challenges of our present times Many of the important issues related to the practice of Critical Care in our country have been covered in this monograph This publication has been made possible through the untiring efforts of all faculty members and with the help of a grant from one of the companies Critical Care Update will hopefully serve consultants junior doctors nurses and paramedical staff as a handy book to guide practice and decision making in the future

Core Knowledge in Critical Care Medicine Wolfgang Krüger, Andrew James Ludman, 2014-08-25 This book provides a detailed review of state of the art knowledge on critical care topics as well as the latest research findings It covers the core aspects in excellent detail but is not so comprehensive as to make its daily use unfeasible For each condition considered discussion of the pathophysiology is integrated with observations on diagnosis and treatment in order to allow a deeper understanding The book is scientifically based with extensive references to published research This will allow readers to investigate their individual interests further and will enable physicians to justify measures by providing a coherent evidence based strategy and relevant citations where needed Core Knowledge in Critical Care Medicine will appeal to experienced practitioners as an aide m moire but will also be of great value to a wide range of more junior staff wishing to complement their background knowledge with important facts applicable to everyday practice

Renal Failure and Replacement Therapies Sara Blakeley, 2007-12-03 Increased recognition of the overlap between critical care and renal medicine and recent advances in the understanding of acute renal failure and the application of renal replacement therapies have brought increased attention to the nephrologist s role in the intensive care unit ICU This book is written to provide an approach for the resident in nephrology at any level of training with regards to critically ill patients This text provides the information necessary to provide care for the nephrology patient in the ICU

Textbook of Critical Care: First South Asia Edition - E-Book

Jean-Louis Vincent, Edward Abraham, Frederick A. Moore, Patrick Kochanek, Mitchell P. Fink, 2017-03-27 Comprehensive concise and readable Textbook of Critical Care First South Asia Edition brings you fully up to date with the effective management of critically ill patients providing the evidence based guidance you need to overcome a full range of practice challenges Drs Jean Louis Vincent Edward Abraham Frederick A Moore Patrick Kochanek and Mitchell P Fink are joined by other international experts who offer a multidisciplinary approach to critical care sharing expertise in anesthesia surgery pulmonary medicine and pediatrics This highly acclaimed text offers ICU clinicians a new understanding of the pathophysiology of critical illness and new therapeutic approaches to critical care Features a wealth of tables boxes algorithms diagnostic images and key points that clarify important concepts and streamline complex information for quick reference

Evidence-Based Practice of Critical Care Clifford S. Deutschman, MS, MD, FCCM, Patrick J. Neligan, 2015-12-18 Evidence Based Practice of Critical Care 2nd Edition presents objective data and expert guidance on managing critically ill patients in unique question based chapters that focus on best practices Now thoroughly updated by Drs Clifford S Deutschman Patrick J Neligan and nearly 200 critical care experts this highly regarded title remains the only book of its kind that provides a comprehensive framework for translating evidence into practice making it a valuable resource for both residents and practitioners Tap into the expertise of nearly 200 critical care experts who discuss the wide variety of clinical options in critical care examine the relevant research and provide recommendations based on a thorough analysis of available evidence Think through each question in a logical efficient manner using a practical consistent approach to available management options and guidelines Find the information you need quickly with tables that summarize the available literature and recommended clinical approaches Navigate a full range of challenges from routine care to complicated and special situations Stay up to date with new issues and controversies such as the redefinition of sepsis changing approaches to fluid administration immune suppression in sepsis monitoring the microcirculation the long term sequelae of critical illness minimizing ventilator associated lung injury the benefits of evidence based medicine management guidelines rapid response teams and more Benefit from all new sections covering persistent critical illness and the role of advanced practice nurses and physician assistants in the ICU

Textbook of Critical Care Yatin Mehta, 2015-08-31 Textbook of Critical Care is an extensive two volume guide to all aspects of critical care The first volume covers systems of the human body in individual sections the second volume continues to cover other vital topics for those working in an intensive care unit The two volumes are subdivided into fourteen sections with 112 chapters in total The book begins with general principles before covering cardiovascular respiratory renal and gastrointestinal systems as well as neurology and endocrinology The post surgical critical care section includes a range of surgeries and organ transplants Further topics include obstetric critical care haematology rheumatology oncology and trauma with detailed advice on the design of and research in the ICU With over 100 international contributors ensuring authoritative content throughout and full colour illustrations across 1500 pages Textbook

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Advanced Practice in Critical Care Sarah McGloin, Anne McLeod, 2010-04-26

Advanced Practice in Critical Care provides experienced critical care nurses with a clear and distinct evidence base for contemporary critical care practice Central to the book is the application of research and evidence to practice and therefore case studies and key critical care clinical situations are used throughout to guide the reader through the patient care trajectory Each chapter introduces an initial patient scenario and as the chapter progresses the patient scenario develops with the theoretical perspectives and application In this way it is evident how multi organ dysfunction develops impacting upon and influencing other body systems demonstrating the multi organ impact that is often experienced by the critically ill patient In this way consequences of critical illness such as acute renal failure haemostatic failure and liver dysfunction are explored Throughout the text key research findings and critical care treatment strategies are referred to applied and evaluated in the context of the given patient case study Advanced assessment techniques are explained and the underlying pathophysiology is discussed in depth Advanced Practice in Critical Care is an essential resource for experienced practitioners within critical care whom primarily care for patients requiring high dependency or intensive care

Controversies in Intensive Care Medicine Ralf Kuhlen, 2008 In recent years many clinical interventions in intensive care medicine have been based on clear scientific evidence However at least as many clinical interventions still remain the subject of controversy either due to a lack of rigorous data or due to the existence of conflicting data In this book these controversies are discussed by experts of international renown in their respective fields The goal is twofold To provide us with a balanced and unbiased presentation of the subject explaining the different schools of thought relevant to the controversy To summarise the data with a clinically useful and valid recommendation for our practice Virtually all fields of intensive care medicine are covered in over 50 chapters dealing with controversies over treatment options in acute illness states organising and providing care for acutely ill patients as well as how to answer ethical questions arising in critical care medicine every day

Oxford Textbook of Critical Care Derek Angus, Simon Finfer, Luciano Gattioni, Mervyn Singer, 2019-12-03 Now in paperback the second edition of the Oxford Textbook of Critical Care addresses all aspects of adult intensive care management Taking a unique problem orientated approach this is a key resource for clinical issues in the intensive care unit

Blood Purification in Intensive Care C. Ronco, R. Bellomo, Claudio Ronco, G. La Greca, 2001-07 In the last twenty years critical care medicine has been established as a specialty with its own therapies and procedures with significant implications for clinical nephrology regarding severe acute renal failure This typically multi factorial condition is today predominantly

seen in intensive care units The complex knowledge and skills necessary to handle it have resulted in a field called Critical Care Nephrology where nephrologist and intensivist either work side by side or have formally acquired expertise and training in both specialties Extracorporeal renal replacement therapies although originally used to treat end stage renal disease patients rapidly gained importance for acute patients This has had far reaching implications for the initiation and possible role of blood purification in the management of critically ill patients widening the scope of interaction between the nephrologist and the intensivist Experts in the field have contributed to the present book providing a comprehensive review of the different blood purification techniques relevant in the intensive care unit in the case of multiple organ failure The resulting mix of established knowledge and recent results from both clinical trials and basic research constitutes a valuable tool for all professionals involved in the care of the critically ill patient

Blood Purification in Intensive Care Claudio Ronco,Rinaldo Bellomo,G. La Greca,2001-01-01 In the last twenty years critical care medicine has been established as a specialty with its own therapies and procedures with significant implications for clinical nephrology regarding severe acute renal failure This typically multi factorial condition is today predominantly seen in intensive care units The complex knowledge and skills necessary to handle it have resulted in a field called Critical Care Nephrology where nephrologist and intensivist either work side by side or have formally acquired expertise and training in both specialties Extracorporeal renal replacement therapies although originally used to treat end stage renal disease patients rapidly gained importance for acute patients This has had far reaching implications for the initiation and possible role of blood purification in the management of critically ill patients widening the scope of interaction between the nephrologist and the intensivist Experts in the field have contributed to the present book providing a comprehensive review of the different blood purification techniques relevant in the intensive care unit in the case of multiple organ failure The resulting mix of established knowledge and recent results from both clinical trials and basic research constitutes a valuable tool for all professionals involved in the care of the critically ill patient

Textbook of Pulmonary and Critical Care Medicine SK Jindal,2017-07-17 The second edition of the comprehensive two volume set brings respiratory medicine specialists fully up to date with the latest advances and information in their field Beginning with an introduction to lung development and physiology of the respiratory system the next chapters discuss pharmacology symptoms and respiratory diagnosis Each of the following sections is dedicated to a specific type of respiratory disease or infection further divided to provide in depth detail on every aspect of the topic The text also explains how each respiratory disorder may be associated with other medical specialties such as critical care cardiology sleep medicine and infectious diseases This two volume set features numerous pulmonary radiographs including CT nuclear images bronchoscopy and thoracoscopy as well as tables and diagrams to enhance learning Key Points Fully updated new edition of two volume set providing latest advances in pulmonary and critical care medicine Covers numerous respiratory diseases and infections and their comorbidity with other medical specialties Highly illustrated with radiographic images

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