Preface

Monitoring Tissue Perfusion and Oxygenation

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Editors

The concept of tissue perfusion and cellular oxygenation involves a fine-tuned interaction between anatomic, physiologic, and biochemical processes. These processes work to ensure oxygen delivery meets or exceeds cellular oxygen demand. The competence with which these processes occur is critical to organ functioning and ultimately determines patient survival. To estimate the adequacy of tissue perfusion, clinicians caring for critically ill patients have relied on macrovascular indices such as blood pressure and cardiac output to monitor organ perfusion. Evidence produced over the last decade has clearly shown that the microvasculature is the critical region responsible for meeting the metabolic oxygen demands of the tissues by actively and passively regulating the distribution of red blood cells and plasma throughout individual organs. Monitoring the state of the microvasculature, however, remains problematic as bedside techniques have not kept up with the pace of microvascular knowledge acquisition in the area of tissue perfusion. The concepts presented in this special issue are complex, leaving many to argue they are out of the bedside clinicians’ required scope of knowledge. The authors of this collective body of work will counter that it is imperative for clinicians to expand their knowledge beyond that of a purely macrovascular understanding and to appreciate the complex intermingling of the microvasculature and macrovasculature.

Critical care clinicians must be knowledgeable about the anatomic, physiologic, and biochemical processes that are critical to the restoration of a functioning microvascular affecting organ perfusion. These basic physiologic processes critical to tissue perfusion and cellular oxygenation are presented in this issue of Critical Care Nursing Clinics of North America on “Monitoring Tissue Perfusion and Oxygenation.” A working knowledge of oxygen delivery and oxygen consumption at the microvascular level will provide critical information needed for clinicians to continuously question the adequacy of tissue perfusion given our current lack of microvascular bedside monitoring.
techniques. The authors of this special issue have strived to broaden the readers’ knowledge and understanding that despite what may look to be a hemodynamically stable patient, an altered microvasculature may be undermining the patient’s ability to restore organ functioning.

The first article will take the reader back to our roots of tissue perfusion understanding and present an account through time of significant contributors to changing thoughts and ideas that have influenced our modern understanding of physiologic circulatory and metabolic models. The next three articles provide a basic understanding of microvascular oxygen transport and utilization in physiologic states. The important role of the erythrocyte in oxygen delivery is highlighted along with blood flow behavior as it relates to the erythrocyte. Having a base knowledge of physiologic tissue perfusion and cellular oxygenation concepts allows a better understanding of alterations in blood flow and oxygenation.

The next three articles found in this special issue focus on tissue blood flow and oxygenation monitoring techniques, including noninvasive monitoring, which has evolved over the last 15 years to become a more accurate and precise method for monitoring tissue perfusion. The patient’s family perspective concerning extensive hemodynamic monitoring is presented as a qualitative study in the next article. As clinicians are focused more on patient-centered and family-centered care, the perspective of the family who experience their loved one connected to extensive high-tech monitoring can have significant implications for family coping and the added need for improved family education surrounding the intensive care unit environment.

The final three articles highlight tissue perfusion and oxygenation abnormalities in patients with brain injury and shock states. The final article in our series addresses a common question of how best to wean vasopressors in patients with septic shock, providing evidence-based recommendations.

Each of the articles presented in this special issue provides important information to the care of critically ill patients. A paradigm shift now focuses our attention on the microvasculature as the center of organ dysfunction and failure. As such, critical care clinicians should be wary of microvascular perfusion and consider microcirculation dysfunction when global hemodynamic parameters suggest a stable macrocirculation despite persistent organ function decline. Perhaps in the near future we can anticipate newer bedside technologies that will better monitor the state of microvascular perfusion and cellular oxygenation.

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