Preface

Brain Injury and Cardiac Arrest

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Guest Editor

The importance of brain injury after resuscitation from cardiac arrest has been recognized since the days of the pioneering works of Peter Safar in 1958, at the Baltimore City Hospital (currently Johns Hopkins Bayview Medical Center) on airway methods of artificial respiration and Koewenhoven, Jude, and Knickerbocker at the Johns Hopkins Hospital in the early 1960s on the closed cardiac massage with external defibrillation. This gave way to the development of modern cardiopulmonary resuscitation. In their 2000 Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care, the American Heart Association highlighted brain injury by providing that “The cerebral cortex, the tissue most susceptible to hypoxia, is irreversibly damaged, resulting in death or severe neurological damage. The need to preserve cerebral viability must be stressed in research endeavors and in practical interventions.”

Advances in cardiopulmonary resuscitation and critical care contributed to the increasing success in patient survival; however, a significant number of survivors live with poor neurologic function. Numerous neuroprotection clinical trials undertaken in the last three decades failed to show functional benefit to survivors until the recent success of therapeutic hypothermia. This therapy shows that brain injury can be ameliorated, leading to improved survival and functional outcome in survivors. Although much of the research in this field has been undertaken by cardiologists, emergency medicine physicians, anesthesiologists, and intensivists, injury to the brain requires more involvement by neurologists.
The clinical practice of neurology in this area is also limited, mainly in the care of post–cardiac arrest complications and prognostication of outcome. After cardiac arrest, the neurologist is typically consulted to evaluate unresponsive patients only several days after medical stabilization. The neurologist may be called earlier if the possibility of seizures or stroke is entertained. The key questions are: When should the neurologist get involved? What can the neurologist offer other than prognostication? With the onset of brain ischemia, complex cascades of events amplify the ischemic injury during the first few hours. Early involvement of the neurologist during the very acute and early recovery period after cardiac arrest may greatly enhance multidisciplinary strategies on brain preservation and functional recovery. My experience performing both research and patient care in this area has been very encouraging. I noted that medical, critical care, and emergency medicine specialists know that the neurologist has much to contribute with regard to care for brain injury and research to further improve survival and quality of life. Despite the best efforts of specialists, irreversible brain injuries still occur in survivors that will lead to long-term morbidities. With the early recognition of the potential long-term neurologic problems, the neurologist can play a significant role in improving the quality of life of survivors.

This issue of *Neurologic Clinics* revisits brain injury after resuscitation from cardiac arrest. The goal of this issue is to provide the neurologist with a comprehensive and multidisciplinary review of the current research and clinical practices related to brain injury and cardiac arrest. It is my hope that the recent advances in cardiac arrest resuscitation and acute neurology will transform the traditional role of the neurologist as a diagnostician to a neuroclinician who can work directly with other services to provide acute interventions that will ameliorate acute brain injury. A similar change has been successfully undertaken with the acute neurologic interventions in the areas of acute stroke and neurointensive care. It is also my hope that this issue will spark more interest in neurologic research in the area to further facilitate the transformation.

As a comprehensive and multidisciplinary review, this issue is a collection of articles written by leading experts. The first article by Drs. Bhardwaj and Harukuni, renowned researchers in ischemic brain injury, does not limit itself to the mechanism of brain injury but provides therapeutic consideration related to the injury mechanisms. The next article takes the reader to the event immediately around the cardiac arrest. As leaders in the field of emergency medicine, Drs. Ornato and Peberdy provide neurologists with critical insights into resuscitation and neuroprotection out in the field and in the emergency department. From the emergency department, the patient moves to the intensive care area. The article by Dr. Schulman and colleagues on the intensive care of these patients will provide a joint cardiac and neurologic critical care approach to post–cardiac
arrest patients. After successful resuscitation, consideration for therapeutic hypothermia has to be made for all appropriate patients. Dr. Stephen Bernard, the lead author of one of the landmark clinical studies on therapeutic hypothermia, provides an authoritative review. While therapeutic hypothermia may benefit some patients, many survivors will still have a poor outcome. The following article by Drs. Popp and Böttiger provides a look into the development of very promising therapies in the area. They have highlighted in their article the clinical trial in Europe, led by Dr. Böttiger, using thrombolytics to improve functional recovery after cardiac arrest.

The succeeding articles provide updates on the traditional and novel applications of diagnostic tools that are available to enhance the care of these patients. The article by Dr. Koenig and colleagues reviews the role of neuroelectrophysiologic tests in prognostication and provides novel approaches and applications of electrophysiologic testing to enhance not only the prognostication but also the early detection of brain injury and monitoring of recovery. The article by Drs. Geraghty and Torbey reviews the serological markers of brain injury and provides novel applications of neuroimaging to enhance the prognostication.

As the patient moves out of the intensive care unit and the hospital, long-term neurologic complications become the focus of neurologic care. Movement disorder experts Drs. Venkatesan and Frucht address the clinical problems and the need for further research in the area of movement disorders after cardiac arrest. With the more advanced research on the cognitive and behavioral dysfunction in patients who have undergone cardiac bypass procedures than in survivors of cardiac arrest and the numerous similarities of the two global ischemic conditions, the article by Dr. Selnes and colleagues provides critical insight into the cognitive and behavioral dysfunction after a global ischemic injury.

The last two articles deal with special topics in this area. In many disease states, children need special consideration. The article by Dr. Hickey, a pediatric emergency physician, and Dr. Painter, a pediatric neurologist, tackles issues of brain injury after cardiac arrest in children. With death as a common outcome even in resuscitated patients, the article by Drs. Manno and Wijdicks provides approaches to withdrawal of life-sustaining therapies and the declaration of brain death in neurologic patients.

Many people contributed to this issue. My gratitude goes to the contributors, whose dedication to research and patient care has greatly moved the field forward. I would like to express my deepest gratitude to Dan Hanley and Nitish Thakor, who showed me that we can help critically ill patients and their seemingly insurmountable clinical problems through research, and to Peter Safar, whose enthusiasm and brilliance encouraged me to proceed in this path. I would also like to thank the Neurologic Clinics Editors, Don Mumford, Bob Gardler, and their staff for their patience and assistance. And most importantly, to my wife Effie
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