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Editorial Comment

THE TRAUMA HEMOSTASIS AND OXYGENATION RESEARCH NETWORK'S REMOTE DAMAGE CONTROL RESUSCITATION SYMPOSIUM

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ABSTRACT—This year, the Trauma Hemostasis and Oxygenation Research Network had its third annual conference from June 17 to 19 at the Solstrand Hotel, near Bergen, Norway. It was sponsored and organized by the Norwegian Naval Special Operation Commando together with the Norwegian Air Ambulance Foundation. The Trauma Hemostasis and Oxygenation Research Network is composed of more than 150 members from 16 countries who all have a common interest in the prevention and treatment of traumatic hemorrhagic shock. The network is multidisciplinary to include members from both the military and civilian medical community representing areas of surgery, critical care, emergency medicine, transfusion medicine, anesthesiology, hematology, and basic science.

KEYWORDS—Trauma, transfusion, prehospital, resuscitation

The mission of the Trauma Hemostasis and Oxygenation Research (THOR) Network is to reduce morbidity and mortality for patients with traumatic hemorrhagic shock in the prehospital phase. Our main focus is to improve resuscitation strategies through research, education, and training (www.rdcr.org). The annual Remote Damage Control Resuscitation (RDCR) symposium is the main venue for the network to achieve this goal (1, 2).

The goal of the 2013 RDCR symposium was to focus on training methods to improve implementation of RDCR principles, to present current research on RDCR, and provide practical information from international leaders in trauma resuscitation on their approach to RDCR. During the 3-day symposium, the development of research protocols were discussed and refined. For example, Dr Alan Murdock presented his initial concept of a whole blood compared with blood component pilot trial for patients with massive traumatic bleeding (3). Dr Jean Louis Vincent focused on alternatives to randomized controlled trials to examine the effect of RDCR principles (4), and Dr Mitchell Cohen presented how a systems biology approach can be used to improve outcomes in this population (5). The symposium also allowed for the dissemination of results from previously performed studies to educate our members on the latest science in the field. Dr Andre Cap, director of the Blood Research Division at the US Army Institute of Surgical Research, presented in vitro and in vivo data that compared platelet function for platelets stored at 4°C versus 22°C (6, 7). There were presentations and roundtable discussions led by international experts in transfusion medicine that highlighted the ongoing paradigm shift from using crystalloids and colloids for hemorrhagic shock to the use of blood products and hemostatic agents in the prehospital arena (8–11). Of particular interest were presentations that included discussions regarding how alternative processing of blood products, for example, by lyophilization of plasma or solvent detergent treatment of large pools of plasma, may improve availability and safety of plasma products (9,12). Practical information regarding the application of RDCR principles in both military and civilian scenarios as well as for rapid versus prolonged evacuation times was presented by internationally respected subject matter experts from Great Britain, United States, Israel, Austria, Germany, and Norway (8, 10, 13–18). The annual RDCR symposium also provides an opportunity for the first responder whether that is a military medic or a civilian paramedic to describe limitations in the field to apply RDCR principles and to share what new research, products, or devices are necessary for them to improve care in the field. Methods in training prehospital providers were presented during the conference providing evidence in a live demonstration showing the feasibility of collecting and administering fresh whole blood in a far forward scenario (19).

Damage control resuscitation (DCR) concepts have been reported in detail previously, but can be summarized by combining the appropriate use of hypotensive resuscitation and hemostatic resuscitation with the goal of reducing death from shock and coagulopathy (20, 21). Hemostatic resuscitation is the use of a balanced amount of red blood cells, plasma, and platelets to simultaneously and adequately treat or prevent the progression of shock and coagulopathy. As described previously in the supplement for the 2012 RDCR symposium, exporting DCR concepts to the prehospital arena is the essence of RDCR (22). Remote DCR can involve either short or long transport times, which can affect the application of RDCR principles. For example, the application of hypotensive resuscitation, which allows for a limited use of fluids to maintain systolic blood pressure between 80 and 90 mmHg to prevent overresuscitation and continued bleeding, may not be appropriate if applied to patients in austere environments who required prolonged evacuations. During this year's symposium, Dr Kevin Ward led a pro/con debate on this topic.

The ideal prehospital resuscitation strategy for patients with life-threatening bleeding is controversial. There are some data

to guide RDCR principles. Civilian and military trauma reports indicate that the majority of deaths occur before reaching a surgical facility (23–26). Hemorrhage is a major mechanism of death in combat injuries, and death from hemorrhage represents 80% to 90% of those potentially salvageable (27). In the civilian community, trauma represents the leading cause of death in the age from 1 to 44 years, and 50% of deaths within the first 24 h are due to hemorrhage (28). Trauma-induced coagulopathy occurs quickly after injury and is highly lethal (29–31). These facts lead us to the conclusion that one of the most important "gaps" to be filled in the management of the exsanguinating patient appears in the prehospital phase. Making blood products available as far forward as possible might improve survival, especially from noncompressible injuries. In addition, improvements in identifying and monitoring for shock and coagulopathy during the prehospital phase of resuscitation would also likely dramatically impact outcomes in this population.

Many believe the next large breakthrough in improving outcomes for patients with traumatic injuries will come from improvement in prehospital survival (32). The THOR network through the annual Solstrand RDCR symposium is committed to promoting the research, training, and education needed to determine optimal prehospital resuscitation strategies with the ultimate goal of reducing morbidity and mortality from traumatic hemorrhage.

The following supplement is a collection of manuscripts from speakers at the 2013 RDCR symposium. As cochairs of THOR and the RDCR symposium, we are very proud of the quality of manuscripts provided for this supplement by many leaders in the world on this topic of RDCR. We hope that this supplement is informative and stimulates investigation, training, and education in this important clinical topic.

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