Acute Traumatic Coagulopathy in Severe Injury

Incidence, Risk Stratification, and Treatment Options

Marc Maegele, Thomas Paffrath, Bertil Bouillon

SUMMARY

Background: Clinical observation and research findings show that acute traumatic coagulopathy (ATC) is a major factor that must be addressed in the care of severely injured patients. In this review article, we discuss the incidence and causes of ATC, the potential means of early risk stratification for it, and recommendations for its treatment.

Methods: We selectively reviewed the pertinent literature and retrospectively analyzed data from the Trauma Registry of the German Trauma Society (Traumaregister der Deutschen Gesellschaft für Unfallchirurgie, TR-DGU) relating to the incidence, causes, and outcome of ATC. We provide an overview of current treatment recommendations, supplemented by our own findings regarding the ratio of packed red blood cell concentrate (pRBC) to fresh-frozen plasma (FFP) transfusion and regarding coagulation-factor-based treatments for coagulopathy in the acute phase after trauma.

Results and conclusion: ATC, a condition associated with increased morbidity and mortality, is seen on admission in one out of four patients with major trauma. The main causes of ATC are tissue damage, hypoperfusion, hemodilution, hypothermia, acidosis, and inflammation. It may be possible to identify patients at risk for ATC early on through the use of rapidly calculable, predictive numerical scales (McLaughlinScore, TASH, and ABC), laboratory tests, and imaging studies (FAST and CT). Acute treatment is focused on the control of bleeding and support of the coagulation system according to the current guidelines. Patients at high risk may benefit from a balanced transfusion strategy. Innovative strategies currently under study include point-of-care-guided treatment and coagulation-factor-concentrate-based treatment.

Cite this as:

Ten percent of deaths worldwide are caused by trauma (1). In Europe alone, almost a million people each year die as the result of an injury (1). Apart from head injury, the most frequent cause of death in the acute post-traumatic period is uncontrolled hemorrhage. Of the patients who die in the acute phase after trauma, 30 to 40% bleed to death (2).

Clinical observation and recent research findings underline the key part played by acute traumatic coagulopathy in the care of severely injured patients. Acute traumatic coagulopathy is now viewed as an independent entity and as a problem regularly encountered immediately after trauma (3). Multiple factors combine to cause acute traumatic coagulopathy. Six factors have been proposed as “drivers”; tissue damage-trauma, hypoperfusion, hemodilution, hypothermia, acidosis, and inflammation (3, 4) (Figure 1). Above all, the combination of hypotension, acidosis, and hypothermia results in a vicious circle that leads to exacerbation of the coagulopathy (5). Mortality from acute traumatic coagulopathy can be lowered by early detection and aggressive management (6, 7). This requires timely risk assessment and standardized treatment protocols.

Method

This article is based on a selective review of the recent literature, together with retrospective analysis of data on severely injured patients from the Trauma Registry of the German Trauma Society (Traumaregister der Deutschen Gesellschaft für Unfallchirurgie, TR-DGU).

Pertinent publications were retrieved from the Medline (PubMed) and Cochrane databases using various combinations of relevant search terms (e.g., “bleeding/hemorrhage,” “coagulopathy,” “management,” “mortality,” “outcome,” “transfusion,” and “trauma”). The search was restricted to the past 10 years due to the topicality of the subject. We also considered the current, recently revised and published European guidelines.

Clinical incidence

On average, every fourth severely injured patient already has an acute trauma-related coagulation disorder at the time of admission to the shock room (8–10, 12) (Figure 2). Depending on definition, rates of up to