

Coagulopathy in and Outside the Intensive Care Unit

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KEYWORDS

• Coagulopathy • ICU • Sepsis • Acute traumatic coagulopathy

KEY POINTS

- Coagulopathy is life threatening.
- Through technological advances of today, early recognition of the signs and symptoms of coagulopathy and the complicating factors is possible in most settings.
- By implementing appropriate treatment modalities early, the progression of coagulopathy can be halted, reducing morbidity and mortality.

INTRODUCTION

Coagulopathy occurs both inside and outside the intensive care unit (ICU). Early recognition of this condition is essential in the care and treatment of these patients. Coagulopathy is a disease or condition affecting the blood's ability to coagulate.¹ This bleeding disorder is a major contributor to morbidity and mortality. Many factors contribute to coagulopathy, including acidosis, blood loss, hypothermia, hemodilution, consumption and dilution of coagulation factors, tissue trauma, and shock.^{2,3} When there is prolongation of prothrombin time (PT) greater than 18 s and activated partial thromboplastin time (APTT) greater than 60 s, coagulopathy occurs.² Without treatment, coagulopathy is life threatening (Fig. 1).

Coagulopathy is precipitated via several different mechanisms. This article presents the continuum of coagulopathy and interventions necessary to treat this deadly event in illness.

COAGULOPATHY OF CRITICAL ILLNESS

Sepsis

In septic patients, a key event leading to coagulopathy is the body's overwhelming response to a pathogen, leading to an overexpression of the inflammatory system.⁴

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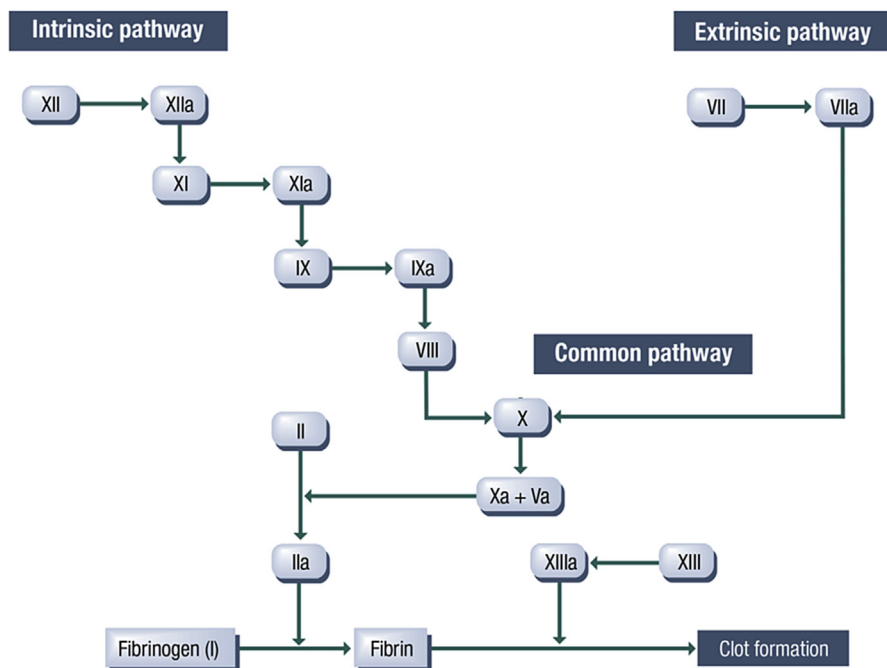


Fig. 1. Coagulation cascade.

Hypercoagulation occurs initially, leading to the formation of microthrombi. Microthrombi cause vascular occlusion and cell death, which result in multiorgan failure. In the late stages of sepsis, hypocoagulation results in the uncontrolled consumption of platelets and coagulation factors.⁵ Microvascular breakdown leads to organ failure and death, disseminated intravascular coagulation (DIC).⁵ Treatment of the underlying pathogen is essential. In addition to sepsis, another cause of coagulopathy is major trauma.

Trauma

Acute traumatic coagulopathy (ATC) is the leading cause of death in trauma victims as a result of uncontrolled bleeding and exsanguination. Risk factors for trauma-induced coagulopathy include metabolic acidosis, hypothermia, hypoperfusion, hemodilution, and fluid replacement.^{6,7} In a consumptive coagulopathy, fibrinogen and factor V are the most depleted clotting factors.⁸

When tissue trauma and inflammation occur, hypothermia and shock ensue. Hypothermia worsens coagulopathy by inducing hepatic sequestration of platelets, reducing platelet function, and decreasing rate of fibrin formation,⁹ resulting in a weak, slowly formed clot that is inadequate for hemostasis.¹⁰ Fewer than 9% of trauma patients are hypothermic on presentation, so aggressive measures to prevent radiant heat loss during resuscitation are indicated.¹¹

Hypothermia, acidosis, and hemodilution lead to activation of the endothelium and the release of heparin-like substances that impair the body's ability to clot.⁷ This potentiates the coagulopathy spiral that is complicated by hemodilution from aggressive volume resuscitation. Left untreated, ATC results in death.

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