How Hemostatic Agents Interact With the Coagulation Cascade

DOUGLAS M. OVERBEY, MD; **EDWARD L. JONES,** MD, MS; **THOMAS N. ROBINSON,** MD

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Purpose/Goal

To provide the learner with knowledge specific to surgical hemostasis and the coagulation cascade.

Objectives

1. Discuss surgical hemostasis.
2. Describe the normal coagulation cascade.
3. Identify blood products for intraoperative blood loss resuscitation.
4. Discuss hemostatic agents.

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Douglas M. Overbey, MD, and Edward L. Jones, MD, MS, have no declared affiliations that could be perceived as posing potential conflicts of interest in the publication of this article.

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ABSTRACT

Hemostasis is a critical component of the preservation of hemodynamic stability and operative visibility during surgery. Initially, hemostasis is achieved via the careful application of direct pressure to allow time for the coagulation cascade to create a fibrin and platelet plug. Other first-line methods of hemostasis in surgery include repair or ligation of the bleeding vessel with sutures, clips, or staples and coagulation of the bleeding site with a thermal energy-based device. When these methods are insufficient to provide adequate hemostasis, topical hemostatic agents can be used to augment the creation of a clot during surgery. A basic understanding of how and where these products interact with the coagulation cascade is essential to achieving optimal hemostasis outcomes. *AORN J* 100 (August 2014) 149-156. © AORN, Inc, 2014. http://dx.doi.org/10.1016/j.aorn.2013.12.012

Key words: *hemostasis, clotting cascade, hemodynamic stability, coagulation, hemostatic agents.*

The goals of surgical hemostasis are to preserve the patient's hemodynamic stability and provide operative field visibility by limiting blood loss. The surgeon can begin hemostasis by mechanically applying careful pressure on the bleeding site using a single digit. He or she can repair or ligate large and medium vessels using sutures, clips, or staples or coagulate the bleeding site with thermal energy-based devices (eg, electrosurgery). Hemostasis of smaller vessels relies on the body's innate ability to coagulate bleeding sites. This complex process is known as the *coagulation cascade,* which culminates in fibrin plug formation. The coagulation cascade can be augmented by a variety of surgical hemostatic agents that assist in either thrombin or fibrin formation or that provide additional scaffolding to which platelets and a clot can adhere.

COAGULATION CASCADE

The classic end point of the coagulation cascade—otherwise known as the clotting cascade—is fibrin formation, which is achieved via two distinct mechanisms: extrinsic and intrinsic pathways. Both pathways involve a series of enzymatic reactions that coalesce in thrombin formation, which cleaves

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