A Comprehensive Overview of Blood Coagulation Causes, Manifestations, and Treatments

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Blood coagulation is a normal process of the body. In a healthy body, damage to vascular tissue activates a complex clotting system that prevents hypovolemic shock. However, excessive or absent clotting can be harmful or even fatal to a patient. There are several ways to recognize and intervene to maintain a patient's therapeutic hemostasis.

Causes of Blood Clotting

The formation of blood clots can have "multiple risk factors, both genetic and acquired ones, (that) predispose a patient to venous thrombosis" (Jilma, pg. 1). Genetics can cause mutations of clotting proteins, and, as a result, the body will produce more clotting factors than is needed to maintain hemostasis. Because there are more clotting factors in the blood than normal, thrombosis occurs more readily--putting the patient at risk for clot-related injuries. Thrombosis is also caused by vascular trauma. There are five clotting factors that are involved in the clotting cascade including "(1) endothelial cells; (2) platelets for plug formation; (3) coagulation factors for formation of insoluble fibrin clot; (4) coagulation inhibitors; and (5) fibrinolysis" (Das, pg. 1). When the blood vessels experience damage, they will release von Willebrand Factor which cues platelets in the blood to initiate the clotting cascade. Once the clotting cascade is initiated, all five of the key components listed above will function to form a clot. The last major cause for the formation of a blood clot is blood-pooling. When blood is circulating in the same area, the likelihood of coagulation increases due to the risk of epithelial damage and platelet activation.

Clinical Manifestations of Blood Clotting

When identifying signs and symptoms that a blood clot has formed or is at risk for forming, the main diagnostic test is a complete blood count. This test provides information about how concentrated your blood is with platelets, white blood cells, red blood cells, as well as their size and shape. Laboratory tests can also include a von Willebrand factor antigen test which tests for the concentration of von Willebrand factor present in the blood. This could indicate clotting problems because "Very high levels of...von Willebrand factor may also play a role in further attracting leukocytes to the injured endothelium, facilitating complement activation, and promoting adhesion of microorganisms to the surface of the vessel wall" (Levi, pg. 4). In short, increased levels of von Willebrand factor causes increased clotting. Another way to test for the formation of blood clots is to watch for certain symptoms. The most common symptoms of blood clots include "tachypnea, dyspnea, tachycardia, chest pain, hypertension or hypotension, anxiety, hemoptysis, leg edema, erythema, leg tenderness with edema, low-grade fever, and jugular venous distention" (Elisha, pg. 8). Specifically, dyspnea could indicate a blood clot has formed in the lungs and is interrupting blood-gas exchange. Also, watching for jugular vein distention could indicate that the patient's blood flow has been compromised and is building up pressure on the right side of the heart. This causes a backflow into the jugular vein and therefore distention from increased pressure. When blood flow is slowed, the risk of blood clotting increases.

Medical Interventions for Blood Clots

The most common medical intervention for clot formation is antithrombic therapy. "Baseline antithrombotic therapy consist(s) of warfarin, aspirin, and, in some cases,

dipyridamole or clopidogrel" (Hohner, pg. 6). All of these drugs function to prevent the formation of a thrombus. While they cannot dissolve a clot that has already formed, these drugs can prevent clots from getting bigger and are mainly used as a preventive measure. Medical interventions for treating a blood clot also includes vitamin K therapy. When vitamin K is too low, "the composition of coagulation factors II, VII, IX, and X (is altered) and PT and APTT (is increased)" (Itagaki, pg. 2). On the other hand, high levels of vitamin K can cause increased coagulation and decreased clotting time. Carefully adjusting vitamin K levels in the body through diet and supplementation can help aid in hemostasis. Another common medical intervention used to prevent blood clots is the use of warfarin and heparin therapy. Heparin is "overlapped with warfarin until an international normalized ratio of 2.0-3.0 is reached on 2 consecutive days" (Simon, pg. 4). This helps to prevent excess clotting factors from being produced by the liver and therefore help to prevent thrombus formation.

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