The Clotting Factor

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NURS 310

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June 11, 2021

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Introduction

Blood is the serum that is essential for us to all live happy lives. A body has many ways to make sure that blood stays where it should. The body is sophisticated enough to create clots nearly instantly to keep blood in. What happens when our body employs these life-saving measures at the wrong time? The causes of blood clots and how to identify and prevent clots will be addressed with the intent to educate in lay terms.

Causes of Blood Clotting

There are many reasons why our blood clots typically happen through two pathways. Number one is the clotting cascade; secondly, to have a clot, platelet aggregation needs to occur. The clotting cascade consists of enzyme activation events. The outcome is the polymerization of fibrin and the activation of platelets, leading to a blood clot. This process is

protective, as it prevents excessive blood loss following injury. But it can also lead to unwanted blood clots inside blood vessels (Smith et al. 2015).

Another way blood clots is through Platelets are a type of blood cell, and hundreds of thousands of them are circulating a healthy body. When multiple come together and connect, they aggregate to form a clot. The formation of wall-adherent platelet aggregates is a critical process in arterial thrombosis. A growing aggregate experiences frictional drag from the flow of blood, and the higher magnitude of the forces on the aggregation influence if a clot will form or if it will be broken apart and pushed downstream (Du, et al. 2020). That being said, platelets are more likely to spontaneously aggregate if the venous blood flow is reduced. This is why those on bed rest are more at risk for a deep vein thrombosis (DVT)

A third way blood clots can occur is a protein S deficiency. Protein S is an essential component in the downregulation of Thrombin formation. It is a vitamin K- dependent glycoprotein produced by the various part of the body. Factors such as age and gender influence the protein S levels (Elizabeth Simon, Inseon Hwang 2019). Protein S, when supplied and working correctly, acts as an enzyme that blocks the clotting cascade. If Protein S is not working, then the clotting cascade can trigger with one less thing to stop it, resulting in an unwanted clot.

Clinical Manifestations of Blood Clotting

There are many ways a blood clot can manifest. A Pulmonary Embolism (PE) is a scary manifestation of a blood clot. It happens when a clot forms in some of the more prominent veins in the lower extremities, and as that clot travels back to the heart, it gets stuck in the small arteries in the lungs, causing a blockage. A PE can show signs such as Headaches, seizures, coma, and vomiting (Elizabeth Simon, Inseon Hwang. 2019).

An additional manifestation of a blood clot is venous thromboembolism (VTE). It is a complex multifactorial disease and a significant cause of preventable mortality and morbidity (Al-Khafaji, et al. 2020). A VTE occurs when venous blood slows down or if damage occurs to the vein that yields a clot. The clot then travels to a part of the body it can't fit through, causing problems such as edema, pain, shortness of breath, and syncope. VTE is often underdiagnosed but is preventable if taken care of properly.

Currently, in 2021 Covid-19 has been a big issue worldwide. Covid-19 is a severe disease mainly due to the injury of nonpulmonary organs at the shadow of coagulopathy leave no choice. While Covid-19 is still being studied, there is some indication that covid-19 can cause derangement of hemostasis resulting in either excessive bleeding or clotting. (Kohansal Vajari, et al. 2021)

Medical Interventions for Blood Clotting

While clotting is essential in survival, it can also be very deadly if clotting happens at the wrong time. One medication that helps battle unwanted clotting is Warfarin (Coumadin). Warfarin is a vitamin K synthesis inhibitor. Vitamin K is used to make many of the plasma proteins in the blood that are the clotting factors (Houtman, Et al. 2021). If there is less vitamin K, then the body won't be able to clot correctly. Therefore, warfarin is an effective treatment for someone at risk for blood clotting complications.

A non-invasive intervention to help prevent unwanted blood clotting are Sequential Compression devices (SCDs) SCDs are wrappings that cover the legs from the thigh down or the knee down. They are connected to a machine that sequentially pumps air and out of different compartments repeatedly. The purpose of these devices is to compress the veins in the legs to

aid the blood flow in the legs to create less chance for the blood to be static and form unwanted clotting.

The third intervention for blood clotting is encouraging patients to be active. When a person is active, their muscles are moving and compressing the veins in the body, thus propelling the blood throughout the body, promoting good circulation, and avoiding venous stasis. Unfortunately, many thromboembolic diseases such as myocardial infarction and ischemic stroke are associated with lack of exercise (Lawrence, et al., 2018). If patients have limited mobility, then Physical therapy and range of motion exercise are beneficial to reduce the risk of unwanted blood clotting.

Conclusion

While the body is a very sophisticated organism, it has its faults and drawbacks. Creating a blood clot can happen in many ways and has many natural built-in checks and balances. However, deficiencies of tiny proteins can cause massive effects. Many problems with clotting can be resolved through modern medicine and living a healthy lifestyle. However, even with our advanced medical knowledge, prevention is vital in avoiding deadly problems with clots. Early diagnosis and treatment will help to identify and protect patients who may have blood clotting complications.

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