Blood Clotting

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Introduction

Blood clotting is an important sequence of events within blood vessels. Although its usually a helpful and necessary occurrence, it can result in life-threatening conditions if uncontrolled. Protein S deficiency, smoking, and pregnancy can cause excessive clot formation resulting in conditions such as pulmonary embolism, deep vein thrombosis, and ischemic stroke. Even though these fatal conditions can occur, there are treatments used to resolve these serious manifestations. Several of which involve the administration of medication such as rivaroxaban, low molecular weight heparin, and thrombolytics. These treatments help provide and protect patients from their clotting disorders and sudden mortality.

Causes of Blood Clotting

Protein S Deficiency

Many kinds of factors and proteins are involved in blood clotting. One of them is known as protein S (Simon & Hwang, 2019). Protein S plays a very important role concerning the halting of thrombin formation. Thrombin is an enzyme, created in the liver, that causes blood clotting. If a person is found with under 65% of protein S in their bloodstream, then they are more susceptible to clotting. This is because the lack of protein S promotes increased and uncontrolled thrombin formation. Therefore, patients with low blood protein S will be more likely to experience venous thrombotic events such as pulmonary embolisms and deep vein thrombosis. Protein S shares a large responsibility with many other blood proteins and factors that prevent excess of clot formation.

Smoking

Smoking is usually associated with harmful effects to the cardiovascular system.

One of the most well-known adverse effects being increased blood clotting (Kufner et al., 2021). Smoking causes the destruction of endothelial cells on blood vessel walls. This triggers clot formation in the blood vessel. It is also suspected that smoking reduces the ability of tissue plasminogen activator; otherwise known as tPA. Without tPA, blood clots cannot be broken down. They remain in full form inside the bloodstream. Therefore, smokers not only increase blood clotting, but also prevent the body's ability to breakdown clots. This causes a reduction of thrombolysis and an increase of venous thrombotic events. Smoking can cause a myriad of health-related issues. The inability to breakdown clots is one of its most lethal adverse effects.

Pregnancy

Pregnancy is usually accompanied with a varying number of health-related challenges. One of the most common themes of pregnancy is increased blood clotting (Shreeve et al., 2016). Though the mechanisms are not well understood, women usually establish hypercoagulability during pregnancy, labor, and the postpartum period. Studies show, using a thromboelastography, that pregnancy cause women to enter a prothrombotic state. This will typically increase throughout pregnancy and even through the first 24 hours after delivery. Therefore, pregnant women are very susceptible to venous thrombotic events. Especially since this prothrombotic state is gradually rising throughout the duration of the pregnancy. Pregnant women should be highly monitored for increased clotting since their ability to clot is heightened. The dangers of increased clotting can become a fatal reality for the mother and the child if preventative measures are not taken.

Clinical Manifestations of Blood Clotting

Pulmonary Embolism

Manifestations of blood clotting can occur in the respiratory system. A pulmonary embolism can be caused from the clotting of blood (Simon & Hwang, 2019). This occurs when a clot gets into the lungs causing a blockage in the pulmonary artery. When the body realizes it cannot get enough air due to the blockage, shortness of breath becomes a compensatory reflex. Signs of chest pain and dyspnea are usually present with this condition. This manifestation can be fatal if not treated immediately. Therefore, when people are at risk for excessive blood clotting, it is important to monitor for the signs and manifestations of pulmonary embolisms. Recognizing shortness of breath, chest pain, and dyspnea, especially when there is a clot risk, could indicate a life-or-death situation if not treated immediately.

Deep Vein Thrombosis

An additional clinical manifestation of blood clotting is another related venous thrombotic event (VTE). Deep vein thrombosis is a type of VTE where a clot blocks blood flow in a major vessel of the extremities (Musco et al., 2021). Typically, this can occur in the legs or arms during long periods rest. This can cause long-term complications such as pulmonary embolism and stroke if not treated accordingly. Therefore, patients who are diagnosed with deep venous thrombosis are susceptible to life-threatening effects if inappropriately managed. Symptoms include swelling, pain, discoloration, and warmth in the afflicted area. Nurses need to be aware of these venous thrombotic events because most patients will be susceptible to them if they require extended hospitalization. Deep vein thrombosis can be prevented and should be treated with the best care possible.

Ischemic Stroke

Another clinical manifestation of blood clotting involves potential damage to the brain. An ischemic stroke is a condition caused by a blood clot (Wu et al., 2020). When a clot becomes

an embolism, it can enter the blood vessels leading to the brain. The clot can harm the brain by blocking the cerebral vasculature preventing blood flow to the tissues. When the brain is unable to receive blood, the tissues will start to die, and the patient can suffer an ischemic stroke. Symptoms can include sudden confusion, difficulty speaking or ambulating, and weakness in the face. Therefore, patients who are suffering from ischemic strokes should be cared for and treated immediately since lifelong effects can occur. Ischemic strokes are a serious condition that can be prevented if proper measures are accounted for with patients undergoing coagulation therapy.

Medical Interventions for Blood Clotting

Rivaroxaban (Xarelto)

People with protein S deficiencies are often in need of a medication that can assist with decreasing the clotting ability of blood. One of the best medications for this is Rivaroxaban (Simon & Hwang, 2019). It is a factor Xa inhibitor that works by acting on thrombin while allowing protein S and C to continue their anticoagulating mechanisms of action. It is usually taken orally and insures fewer drug to drug, drug to food, and drug to disease complications. Although warfarin and low molecular weight heparin (LMWH) are used for the treatment and management of veinous thrombotic events, the use of direct oral anticoagulants are being increasingly used instead. Therefore, Rivaroxaban is one of the most used agents of anticoagulation. It lowers the risk for adverse effects while allowing the body's endogenous anticoagulation mechanism to assist. People who use Rivaroxaban often find better therapeutic effects compared to other similar medications.

Low Molecular Weight Heparin (LMWH)

Deep vein thrombosis has been treated in a variety of ways in the past. Unfractionated heparin (UFH) used to be given through continuous intravenous infusion (Musco et al., 2021).

However, overtime a switch occurred to low molecular weight heparin (LMWH). These provided better outpatient management as well as the availability of prefilled syringes. LMWH is an anticoagulant used to prevent and treat deep vein thrombosis. It works by acting as antithrombin and accelerating the prevention of prothrombin conversion into thrombin. Therefore, the use of LMWH prevents clot formation by interfering with the clotting cascade. LMWH is a medication widely used for its therapeutic effect against deep vein thrombosis. The correct administration of this drug can prevent venous thrombotic events for patients with clotting issues.

Thrombolytics

There are several different treatments used for ischemic stroke caused by an embolus. One of these interventions is through a class of medications called thrombolytics. These kinds of medications cause the lysis of clots (Wu et al., 2020). Usually recombinant tissue plasminogen activator (r-tPA) is used to dissolve the clots. Once the clots are dissolved, the patient is at a lower risk for venous thrombotic events and mortality. Therefore, patients taking thrombolytics can eliminate their risk for ischemic stroke and other serious clot blocking conditions. Although thrombolytics can dissolve clots, the patient should remain cautious until the health care provider discontinues the order. Thrombolytics are an effective treatment against ischemic strokes.

Conclusion

Blood clotting is typically a necessary and integral part to our body's vascularization. However, when out of control, life-threatening situations can arise very quickly if careful prevention and monitoring are not maintained. Whether patients have protein S deficiency, smoking, or pregnancy, it is important to constantly be monitoring the risk of pulmonary embolism, deep vein thrombosis, and ischemic stroke. If these clinical manifestations occur, then

the patient should receive, from the health-care providers order, rivaroxaban, low molecular weight heparin, and thrombolytics depending on the situation. Blood clotting plays an important role in preventing excessive bleeding and hypovolemia. However, medical professionals should remain cautious during the treatments of excessive clot formation.

References

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