3

Types of Thrombosis

Public Education

Correspondence: Exon Publications, Brisbane, Australia; Email: books@exonpublications.com

Cite as: Types of Thrombosis. In: *Thrombosis: Public Education*. Brisbane (AU): Exon Publications. Online first 2024 May 19. ISBN: 978-0-6458663-7-7

DOI: https://doi.org/10.36255/types-of-thrombosis

ABSTRACT

This chapter explores the different types of thrombosis, including deep vein thrombosis (DVT), pulmonary embolism (PE), arterial thrombosis, and other less common forms. Each type is examined in terms of its causes, symptoms, and treatments. Understanding the distinctions between these types of thrombosis is crucial for recognizing the condition and seeking appropriate medical care.

Keywords: arterial thrombosis; cerebral venous sinus thrombosis; coronary artery thrombosis; D-dimer test; deep vein thrombosis; portal vein thrombosis; pulmonary embolism; renal vein thrombosis; retinal vein occlusion

INTRODUCTION

Thrombosis can occur in various parts of the body, each with its own set of challenges and health risks. This chapter explores the different types of thrombosis, such as deep vein thrombosis (DVT), which typically occurs in the legs, and pulmonary embolism (PE), where clots travel to the lungs. It also examines arterial thrombosis, which affects the arteries, and other less common types. By exploring these different forms, this chapter aims to provide a comprehensive understanding of how blood clots can impact the body and highlight the importance of early detection and treatment (1-10).

DEEP VEIN THROMBOSIS (DVT)

Deep Vein Thrombosis, commonly known as DVT, is a condition where a blood clot forms in a deep vein, typically in the legs. These clots can cause pain, swelling, and other complications. DVT occurs when blood thickens and clumps together in a deep vein. These veins are not near the surface of the skin but are instead located deep within the muscles. When a clot forms in one of these veins, it can block the flow of blood. This blockage can lead to pain and swelling in the affected area. The danger of DVT lies in the possibility that the clot can break loose and travel through the bloodstream. If it reaches the lungs, it can cause a life-threatening condition known as a pulmonary embolism (PE).

Risk factors

Several factors can contribute to the development of DVT. One major factor is prolonged immobility. When people sit

or lie down for long periods, such as during a long flight or hospital stay, blood flow in the legs can slow down, making it easier for clots to form. Surgery, especially major operations like hip or knee replacements, can also increase the risk of DVT because it often involves long periods of immobility and can cause damage to blood vessels.

Other risk factors for DVT include age, family history, and certain medical conditions. People over the age of 60 are more likely to develop DVT, although it can occur at any age. If someone in your family has had DVT, you may be at higher risk due to genetic factors that affect blood clotting. Medical conditions such as cancer, heart disease, and inflammatory bowel disease can also increase the risk. Pregnancy and the use of birth control pills or hormone replacement therapy can make blood more likely to clot, increasing the risk of DVT.

Symptoms

The symptoms of DVT can vary but often include pain, swelling, and tenderness in the affected leg, usually in the calf or thigh. The skin over the clot may feel warm to the touch and appear red or discolored. Sometimes, DVT can occur without any noticeable symptoms, making it even more important to be aware of the risk factors and seek medical advice if you suspect you might have a clot.

Diagnosis

Diagnosing DVT typically involves a combination of medical history, physical examination, and diagnostic tests. During the physical exam, a doctor will look for signs of swelling, tenderness, and changes in skin color. One of the most common diagnostic tests for DVT is an ultrasound. This non-

invasive test uses sound waves to create images of the blood flow in the veins, helping to detect the presence of a clot. In some cases, a blood test called a D-dimer test may be used to measure a substance released when a blood clot breaks down. Elevated levels of D-dimer can indicate the presence of an abnormal clot, but further imaging tests are usually needed to confirm the diagnosis.

Treatment

Treatment for DVT aims to prevent the clot from growing, reduce the risk of complications, and prevent new clots from forming. Anticoagulant medications, commonly known as blood thinners, are often prescribed. These medications do not dissolve existing clots but help prevent new ones from forming and stop the existing clot from getting larger. In some cases, thrombolytic therapy, which involves the use of drugs to dissolve clots, may be necessary, especially for severe cases.

Compression stockings are another common treatment for DVT. These stockings help improve blood flow in the legs and reduce swelling. They can also help prevent the long-term complication of post-thrombotic syndrome, which can cause chronic pain and swelling in the affected leg. In some cases, a doctor may recommend placing a filter in the large vein (vena cava) in the abdomen to prevent clots from traveling to the lungs. This procedure is usually reserved for patients who cannot take anticoagulant medications or who have had recurrent blood clots despite treatment.

Preventing DVT involves managing risk factors and making lifestyle changes. Staying active and avoiding prolonged periods of immobility are crucial. During long trips, it is important to take breaks to walk around and stretch your legs. If you are in the hospital or recovering from surgery,

your doctor may recommend exercises or physical therapy to keep your blood flowing. Maintaining a healthy weight, avoiding smoking, and staying hydrated can also help reduce the risk of DVT.

PULMONARY EMBOLISM (PE)

Pulmonary Embolism, commonly known as PE, is a serious condition that occurs when a blood clot blocks a blood vessel in the lungs. This can cause significant damage to the lungs and other organs because it restricts blood flow and reduces oxygen levels in the body. PE usually begins with a blood clot that forms in the deep veins of the legs, a condition known as deep vein thrombosis (DVT). If part of the clot breaks off, it can travel through the bloodstream and lodge in the blood vessels of the lungs. When this happens, it blocks blood flow, which can cause severe breathing problems and strain the heart. The severity of a PE depends on the size of the clot and the extent of the blockage. Large clots can cause significant damage and can be life-threatening if not treated promptly.

Risk factors

Several factors can increase the risk of developing a pulmonary embolism. One major factor is prolonged immobility. When people are inactive for long periods, such as during long flights, car rides, or bed rest after surgery, blood flow in the legs can slow down, making it easier for clots to form. Surgery, particularly major operations like hip or knee replacements, also increases the risk of PE because it often involves long periods of immobility and can damage blood vessels.

Certain medical conditions can also raise the risk of PE. Cancer is a significant risk factor because some types of cancer and cancer treatments can increase the tendency for blood to clot. Heart disease and stroke also increase the risk because these conditions affect blood flow and can lead to clot formation. Other risk factors include smoking, which damages blood vessels and increases clotting, and obesity, which puts extra pressure on veins and can slow down blood flow. Hormonal changes, such as those during pregnancy or while taking birth control pills or hormone replacement therapy, can also increase the risk of blood clots.

Symptoms

The symptoms of PE can vary widely depending on the size of the clot and how much of the lung is affected. Common symptoms include sudden shortness of breath, which can occur even at rest or become worse with exertion. Sharp chest pain that may become worse when taking deep breaths, coughing, or bending over is another common symptom. Other signs include a rapid or irregular heartbeat, coughing up blood, and feeling lightheaded or faint. In severe cases, a PE can cause a sudden collapse, leading to loss of consciousness or death.

Diagnosis

Diagnosing a pulmonary embolism involves several steps. The first step is a thorough medical history and physical examination. The doctor will ask about symptoms, risk factors, and any previous history of blood clots. During the physical exam, the doctor will look for signs of DVT in the legs, such as swelling, tenderness, and changes in skin color.

To confirm a diagnosis of PE, several diagnostic tests may be performed. A common test is a CT pulmonary angiography (CTPA). This imaging test involves injecting a contrast dye into the blood vessels and taking detailed images of the lungs to detect clots. Another diagnostic test is a ventilation-perfusion (V/Q) scan, which compares airflow and blood flow in the lungs to identify any blockages. Blood tests, such as the D-dimer test, can also be used to measure a substance released when a blood clot breaks down. Elevated D-dimer levels can indicate the presence of an abnormal clot, but further imaging tests are usually needed to confirm the diagnosis.

Treatment

Treatment for PE aims to dissolve the clot, restore blood flow to the lungs, and prevent new clots from forming. The most common treatment is anticoagulant medications, also known as blood thinners. These medications do not dissolve existing clots but help prevent new ones from forming and stop the existing clot from getting larger. In severe cases, thrombolytic therapy may be used. This involves the use of drugs that dissolve clots and can be life-saving in emergencies.

In some situations, surgical intervention may be necessary. A procedure called catheter-directed thrombolysis involves inserting a thin tube (catheter) into the blocked blood vessel and delivering clot-dissolving medication directly to the clot. Another option is a surgical embolectomy, where the clot is physically removed from the blood vessel. For patients who cannot take anticoagulant medications or have had recurrent clots despite treatment, a vena cava filter may be placed in the large vein in the abdomen to catch clots before they reach the lungs.

Preventing pulmonary embolism involves managing risk factors and making lifestyle changes. Staying active and avoiding prolonged periods of immobility are crucial. During long trips, it is important to take breaks to walk around and stretch your legs. If you are in the hospital or recovering from surgery, your doctor may recommend exercises or physical therapy to keep your blood flowing. Maintaining a healthy weight, avoiding smoking, and staying hydrated can also help reduce the risk of DVT and PE.

ARTERIAL THROMBOSIS

Arterial thrombosis is a serious condition where a blood clot forms in an artery, blocking the flow of oxygen-rich blood to vital organs and tissues. This can lead to severe health problems, including heart attacks and strokes. Arteries are blood vessels that carry oxygenated blood from the heart to the rest of the body. When a clot forms in an artery, it can obstruct blood flow, depriving tissues of oxygen and nutrients. This blockage can cause significant damage and, if not treated promptly, can be life-threatening.

One of the most common types of arterial thrombosis is coronary artery thrombosis, which occurs in the arteries that supply blood to the heart. When a clot blocks one of these arteries, it can cause a heart attack. A heart attack happens when the heart muscle is starved of oxygen, leading to chest pain, shortness of breath, and potentially severe damage to the heart muscle. Symptoms of a heart attack include a squeezing or crushing chest pain that may radiate to the neck, jaw, shoulder, or arm, usually on the left side. Other symptoms can include nausea, sweating, dizziness, and a sense of impending doom.

Another type of arterial thrombosis occurs in the arteries that supply blood to the brain, leading to a stroke. A stroke happens when a blood clot blocks a blood vessel in the brain, cutting off the oxygen supply to brain cells. Symptoms of a stroke can appear suddenly and include weakness or numbness in the face, arm, or leg, particularly on one side of the body. Other signs include confusion, trouble speaking or understanding speech, difficulty seeing in one or both eyes, and loss of balance or coordination. Recognizing these symptoms and seeking immediate medical attention is critical because prompt treatment can reduce the risk of long-term damage.

Risk factors

Several factors can increase the risk of arterial thrombosis. One major risk factor is atherosclerosis, a condition where fatty deposits, known as plaques, build up on the inner walls of the arteries. These plaques can narrow the arteries and make them more susceptible to clot formation. When a plaque ruptures, it can trigger the clotting process, leading to the formation of a clot that can block the artery. High cholesterol levels, high blood pressure, smoking, and diabetes are significant contributors to atherosclerosis and, consequently, arterial thrombosis.

Lifestyle factors also play a crucial role in the risk of arterial thrombosis. Smoking is a major risk factor because it damages the lining of the arteries, making them more prone to atherosclerosis and clot formation. A sedentary lifestyle and poor diet can contribute to obesity, high blood pressure, and high cholesterol levels, all of which increase the risk of arterial thrombosis. Regular physical activity, a healthy diet, and avoiding smoking can significantly reduce the risk.

Medical conditions such as atrial fibrillation, an irregular heartbeat, can also increase the risk of arterial thrombosis. Atrial fibrillation can cause blood to pool in the heart, leading to clot formation. If a clot travels from the heart to the brain, it can cause a stroke. Managing atrial fibrillation and other heart conditions with appropriate medications and lifestyle changes can help reduce this risk.

Diagnosis

Diagnosing arterial thrombosis involves several steps. A thorough medical history and physical examination are essential. The doctor will ask about symptoms, risk factors, and any previous history of heart disease or stroke. During the physical exam, the doctor may look for signs of reduced blood flow, such as weak or absent pulses in the affected area.

Imaging tests are often used to confirm the diagnosis of arterial thrombosis. For coronary artery thrombosis, an electrocardiogram (ECG) can detect changes in the heart's electrical activity, indicating a heart attack. Blood tests that measure cardiac enzymes released when the heart muscle is damaged can also support the diagnosis. A coronary angiogram, where a special dye is injected into the blood vessels and X-ray images are taken, can show the location and extent of the blockage.

For diagnosing stroke, a computed tomography (CT) scan or magnetic resonance imaging (MRI) can provide detailed images of the brain and help identify the location of the clot. A carotid ultrasound can be used to examine the carotid arteries in the neck, which supply blood to the brain, to check for narrowing or blockages.

Treatment

Treatment for arterial thrombosis focuses on restoring blood flow and preventing further clot formation. Medications such as antiplatelet agents and anticoagulants are commonly used to reduce the risk of new clots. For heart attacks, thrombolytic therapy, which involves the use of clot-dissolving drugs, can be administered to dissolve the clot and restore blood flow to the heart. In some cases, procedures such as angioplasty, where a small balloon is used to open up the blocked artery, or the placement of a stent, a small wire mesh tube, may be necessary to keep the artery open.

For strokes, immediate treatment with clot-busting drugs can improve outcomes if administered within a few hours of the onset of symptoms. Mechanical thrombectomy, a procedure to remove the clot using a device inserted through a blood vessel, may also be performed in certain cases.

Preventing arterial thrombosis involves managing risk factors and making lifestyle changes. Controlling high blood pressure, cholesterol levels, and diabetes is crucial. This can be achieved through medications, regular exercise, a healthy diet, and avoiding smoking. Regular check-ups with a healthcare provider can help monitor and manage these risk factors.

OTHER TYPES OF THROMBOSIS

Thrombosis can occur in various parts of the body beyond the commonly known forms like deep vein thrombosis (DVT) and pulmonary embolism (PE). Some of these less common types include cerebral venous sinus thrombosis, portal vein thrombosis, and renal vein thrombosis.

Cerebral venous sinus thrombosis

Cerebral venous sinus thrombosis (CVST) is a rare type of thrombosis that occurs in the brain's venous sinuses. These sinuses are channels that drain blood from the brain. When a blood clot forms in these sinuses, it can block the flow of blood, leading to increased pressure in the brain. This can cause a stroke. Symptoms of CVST can vary but often include severe headache, blurred vision, fainting or loss of consciousness, and seizures. Some people may experience symptoms similar to those of a stroke, such as weakness or numbness in one part of the body, difficulty speaking, or confusion.

CVST can be caused by several factors, including infections, head injuries, and conditions that make the blood more likely to clot, such as cancer or genetic clotting disorders. Hormonal factors, like those during pregnancy or while taking birth control pills, can also increase the risk. Diagnosing CVST typically involves imaging tests such as magnetic resonance imaging (MRI) or computed tomography (CT) scans, which can show the blood clots in the brain. Treatment usually involves anticoagulant medications to prevent further clotting and reduce the risk of complications.

Portal vein thrombosis

Portal vein thrombosis is another type of thrombosis that occurs in the portal vein, which is a major vein that carries blood from the digestive organs to the liver. When a blood clot forms in the portal vein, it can block blood flow to the liver and cause serious complications. Symptoms of portal vein thrombosis can include abdominal pain, swelling of the

abdomen due to fluid accumulation (ascites), and enlarged spleen. In some cases, portal vein thrombosis may lead to liver dysfunction and increase the risk of gastrointestinal bleeding.

Several factors can increase the risk of portal vein thrombosis. These include liver diseases such as cirrhosis, which can cause scarring of the liver and disrupt blood flow. Infections, inflammation of the pancreas (pancreatitis), and certain cancers can also contribute to the risk. Blood disorders that increase clotting tendencies, such as polycythemia vera or thrombophilia, are additional risk factors. Diagnosing portal vein thrombosis usually involves imaging tests like Doppler ultrasound, CT scans, or MRI, which can visualize the clot and assess blood flow in the portal vein. Treatment often includes anticoagulant medications to prevent further clotting and manage symptoms.

Renal vein thrombosis

Renal vein thrombosis occurs when a blood clot forms in one or both of the renal veins, which carry blood away from the kidneys. This condition can impair kidney function and lead to kidney damage. Symptoms of renal vein thrombosis can include pain in the side of the abdomen, blood in the urine, reduced urine output, and sometimes swelling in the legs. In severe cases, it can lead to kidney failure.

The risk factors for renal vein thrombosis include kidney diseases such as nephrotic syndrome, which causes the kidneys to leak large amounts of protein into the urine. Other risk factors include dehydration, certain cancers, and conditions that increase blood clotting tendencies. Diagnosing renal vein thrombosis involves imaging tests like ultrasound, CT scans, or MRI, which can show the presence

of clots in the renal veins. Treatment typically involves anticoagulant medications to prevent further clotting and protect kidney function.

Retinal vein occlusion

Another important type of thrombosis is retinal vein occlusion, which occurs when a blood clot blocks a vein in the retina, the light-sensitive tissue at the back of the eye. This can cause sudden vision loss or blurred vision in the affected eye. The condition is more common in older adults and is associated with risk factors such as high blood pressure, diabetes, glaucoma, and smoking. Diagnosing retinal vein occlusion involves a detailed eye examination and imaging tests like fluorescein angiography, which uses a special dye to highlight blood vessels in the retina. Treatment may include medications to reduce swelling and improve blood flow, as well as laser therapy to prevent further vision loss.

CONCLUSION

Thrombosis can manifest in several forms, each posing unique health risks. Deep vein thrombosis (DVT) and pulmonary embolism (PE) are common types that can lead to serious complications if not treated promptly. Arterial thrombosis and other less common forms also require careful management to prevent significant health issues. Understanding the causes, symptoms, and treatments for each type of thrombosis is essential for effective prevention and care. This chapter has provided a detailed look at the various forms of thrombosis, helping readers recognize and address this condition in its different manifestations.

NOTICE TO THE USER

This article was written by professional medical writers for the general public based on peer-reviewed articles indexed in PubMed and further peer-reviewed for factual accuracy by independent experts. It is intended solely for informational purposes and is not to be considered medical advice. The views and opinions expressed in this article are believed to be accurate at the time of publication, but the publisher, editors, or authors cannot be held responsible or liable for any errors, omissions, or consequences arising from the use of the information contained in this article. The publisher makes no warranties, implicit or explicit, regarding the contents of this article or its use.

COPYRIGHT AND LICENSE

REFERENCES

1. Konstantinides, SV et al. ESC Scientific Document Group. 2019 ESC Guidelines for the diagnosis and management of acute pulmonary embolism developed in collaboration with the European Respiratory Society (ERS). Eur Respir J. 2019 Oct;54(3):1901647. https://doi.org/10.1183/13993003.01647-2019

2. Prandoni P, Lensing AW, Prins MH. Long-term outcomes after deep vein thrombosis of the lower extremities. Vasc Med. 1998;3(1):57-60. https://doi.org/10.1177/1358836X9800300112

3. Goldhaber SZ. Pulmonary embolism. Lancet. 2004 Apr 10;363(9417):1295-305. https://doi.org/10.1016/S0140-6736(04)16004-2

4. Nicolaides AN, Kakkar VV, Field ES, Ruckley CV. The origin of deep vein thrombosis: a venographic study. Br J Radiol. 1971 Aug;44(524):653-63. https://doi.org/10.1259/0007-1285-44-525-653

5. Righini M, Robert-Ebadi H, Le Gal G. Diagnosis of pulmonary embolism. Presse Med. 2015 Sep;44(9):e385-91. https://doi.org/10.1016/j.lpm.2015.10.007

6. Cushman M. Epidemiology and risk factors for venous thrombosis. Semin Hematol. 2007 Apr;44(2):62-9. https://doi.org/10.1053/j.seminhematol.2007.02.004

7. Rosendaal FR. Venous thrombosis: a multicausal disease. Lancet. 1999 Apr 3;353(9159):1167-73. https://doi.org/10.1016/S0140-6736(98)10266-0

8. Saposnik G, et al. American Heart Association Stroke Council and the Council on Epidemiology and Prevention. Diagnosis and management of cerebral venous thrombosis: a statement for healthcare professionals from the American Heart Association/American Stroke Association. Stroke. 2011 Apr;42(4):1158-92. https://doi.org/10.1161/STR.0b013e31820a8364

9. Boccatonda A, et al. Portal Vein Thrombosis: State-of-the-Art Review. J. Clin. Med. 2024, 13(5), 1517. https://doi.org/10.3390/jcm13051517

10. Asghar M, Ahmed K, Kanwar Z, Iqbal S, Mumtaz A, Bhandari S, Munir K. Renal vein thrombosis. Eur J Vasc Endovasc Surg. 2007 Feb;33(2):217-23. https://doi.org/10.1016/j.ejvs.2007.02.017