

# A Patient's Guide to Antithrombotic and Thrombolytic Therapy

## What is a blood clot?

- ◆ A blood clot is a solid mass consisting of blood cells and other material that forms inside a vein and blocks the flow of blood. The medical term for a blood clot is a “deep vein thrombosis,” and the medical term for a blood clot that breaks off and travels to the lung is a “pulmonary embolism.” About 1 in 20 people will have vein clots or lung clots in his/her lifetime.
- ◆ Most vein clots occur in the legs, but some can form in other places, such as the arms or abdomen.
- ◆ Blood clots that occur in the surface veins (not the deep veins) are less serious and are referred to as “superficial thrombosis” or “phlebitis.” Such blood clots do not break off and cannot travel to the lungs to cause a “pulmonary embolism.”
- ◆ Approximately one-half of all blood clots occur in people who have other illnesses, such as cancer, or who are recovering from surgery or a serious accident. The other blood clots can occur “out of the blue,” without any provoking factors. Most vein clots are not dangerous, but some clots can be serious and even cause death. Fortunately, using relatively simple preventive measures in people who are at risk (eg, those requiring surgery), or by recognizing less serious earlier signs of leg clots or lung clots and promptly treating them, these serious outcomes can usually be prevented.

## How is a blood clot treated?

- ◆ A blood clot is treated with a blood thinner (anticoagulant therapy) for at least 3 months but sometimes for a longer period. For very severe blood clots, more powerful “clot-busting drugs” (thrombolytic therapy) can be given.
- ◆ Treatment for blood clots consists of two parts: (1) immediate treatment; and (2) long-term treatment. The goals of immediate treatment are to prevent such clots from becoming larger, to prevent clots from breaking off and causing a lung embolism, to prevent death from lung embolism, and, of course, to relieve symptoms. The goals of long-term treatment are to prevent recurrent vein clots and lung embolism and to lessen symptoms, such as leg pain and swelling that occur from damaged veins. Such vein damage and its consequences are referred to as the postthrombotic syndrome.
- ◆ Treatment for “superficial thrombosis” or “phlebitis” may or may not require giving a blood thinner, because these are less serious. Giving an anti-inflammatory drug may be sufficient.

**The following questions and answers will provide you with specific information on how blood clots develop, how they can be prevented, and how they are treated.**

## How does blood circulate through the body?

- ◆ The heart pumps blood through blood vessels in the body.
- ◆ Blood is pumped into large veins that deliver oxygen-containing blood to the heart and then to the lungs.
- ◆ After blood is oxygenated in lungs, it is returned to the heart where it is pumped into the aorta, the largest blood vessel in the body.

- ◆ The aorta branches into smaller arteries and distributes this oxygen-containing blood, along with nutrients, to all tissues and organs of the body.
- ◆ The arteries taper down to narrower capillaries where oxygen and other nutrients can be given off to various tissues. Once this has happened, the capillaries join to form a network of veins that transport the blood back to the right side of the heart.
- ◆ The oxygen-containing blood then reenters the left side of the heart through the pulmonary veins for another cycle through the body.

### **What is a normal (or helpful) blood clot?**

- ◆ If a blood vessel is cut, blood flows out of the vessel where it comes into contact with powerful substances that stimulate blood clotting, and the leak is sealed.
- ◆ The plug forms a scab, during which time the blood vessel is repaired.

### **What is an abnormal (or harmful) blood clot?**

- ◆ Blood clotting is harmful when it occurs inside blood vessels and causes a blockage of the blood flow.
- ◆ Blood clotting can occur in veins, leading to venous thrombosis or pulmonary emboli, or it can occur in arteries, leading to a heart attack or stroke.

### **What are the major risk factors for vein clots (“venous thrombosis”)?**

- ◆ Major surgery
- ◆ Major trauma to legs and/or pelvis
- ◆ Prolonged bed rest and immobility
- ◆ Cancer
- ◆ Advanced age
- ◆ Hereditary predisposition
- ◆ Previous venous thrombosis

### **What are other risk factors for venous thrombosis?**

- ◆ Estrogens (oral contraceptives or hormone replacement therapy)
- ◆ Pregnancy and postpregnancy period
- ◆ Chronic illness
- ◆ Varicose veins or phlebitis
- ◆ Severe obesity

### **What about airplane travel?**

- ◆ Airplane travel is a very minor risk factor for venous thrombosis, because many people travel by air but very few of them (less than 1 in 5,000) develop blood clots. The risk of developing vein clots occurs almost always in travelers who have other risk factors for venous thrombosis or on flights that are 6 hours or longer.

- ◆ There is evidence that the following factors may increase the risk of blood clots:
  - previous blood clot
  - hereditary conditions that predispose to blood clots (thrombophilia)
  - cancer, recent surgery, or trauma
  - advanced age
  - estrogen use (oral contraceptives)
  - pregnancy
  - obesity

### How can venous clots be prevented during air travel?

- ◆ Everyone should exercise the legs with calf-muscle stretches and frequent walking around during the flight.
- ◆ High-risk patients should wear elastic stockings.

### What are the common symptoms of deep vein clots (“venous thrombosis”)?

- ◆ Pain, tenderness, and/or swelling of the calf or thigh
- ◆ Red or bluish discoloration of the calf or thigh
- ◆ Symptoms of pulmonary embolism (lung clot) (See the following text for the common symptoms of lung embolism.)
- ◆ Long-term swelling and leg discomfort

### What is a lung embolism?

- ◆ A venous clot that breaks off and follows the path of the blood into a lung artery. If the embolus is large, it can block blood flow into lung arteries.
- ◆ This can cause severe breathing difficulties and can even be fatal.
- ◆ With time, emboli usually break up and disappear.

### What are the most common symptoms of lung embolism?

- ◆ Difficulty breathing
- ◆ Sharp chest pain that worsens after taking deep breaths
- ◆ Coughing up blood
- ◆ For very large emboli, light-headedness, fainting, and unconsciousness

### What tests are commonly used to diagnose lung embolism?

- ◆ Lung scan (also known as ventilation-perfusion lung scan)
- ◆ CT scan (also known as computed tomography pulmonary angiography)
- ◆ D-dimer blood test
- ◆ Compression ultrasound of the leg veins

### What are the long-term complications of venous clots?

- ◆ Most patients do not develop long-term complications and recover completely if they receive proper blood thinning treatment. However, some can develop the following complications in the future:
  - Persistent pain and swelling in the leg
  - Further episodes of clotting in veins or lung arteries

### Can clots form in any part of the body?

- ◆ Yes, but they usually occur in leg veins.
- ◆ Less commonly, they can form in arm veins, veins draining the intestines, veins within the brain, and other veins.

### What measures can be used to prevent venous clots?

- ◆ Blood thinners (anticoagulants) to slow down clotting
- ◆ Physical methods consisting of elastic compression stockings, which reduce swelling and pain that are caused by obstruction of blood flow from a blood clot

### What are elastic compression stockings and how are they used?

- ◆ These stockings are obtained by prescription and are customized to fit each person; most types are knee-length or thigh-length.
- ◆ They provide graduated compression, meaning there is more pressure around the ankles and feet, less pressure in the calves, and less pressure around the knees and thighs. This helps to return blood to the veins and prevents leg swelling.
- ◆ Elastic stockings, if prescribed, should be put on after waking up in the morning and worn throughout the day, to be removed for bathing and at nighttime.

### Does everyone with a leg blood clot require treatment with elastic stockings?

- ◆ Elastic stockings appear to be most helpful in people with larger blood clots (extending into the thigh) and people with more pronounced leg swelling.

### When should treatment be given to prevent venous thrombosis?

- ◆ Preventive treatment consists of blood thinners or mechanical devices worn on the legs (elastic stockings or compression devices should be given to people considered at high-risk for developing blood clots).

The benefits of such measures for patients at low-risk for venous thrombosis are questionable, especially as such treatments carry risks; for example, there is a small increased bleeding risk with blood thinners.

### In which situations should preventive measures be used?

- ◆ Major surgery
- ◆ Major trauma to the chest, legs, and/or pelvis
- ◆ Prolonged immobility
- ◆ Major illness requiring hospitalization

### What are the different kinds of blood thinners?

- ◆ Heparin
- ◆ Low-molecular-weight heparin
- ◆ Fondaparinux
- ◆ Warfarin (Coumadin)
- ◆ Dabigatran (Pradaxa)
- ◆ Rivaroxaban (Xarelto)
- ◆ Apixaban (Eliquis)

### What are the main features of these blood thinners?

- ◆ Heparin and warfarin have been used for more than 50 years, but patients who take either of these drugs require blood testing to measure the drugs' blood thinning effects and to adjust (increase or decrease) the dose to achieve the desired blood thinning effect.
- ◆ Heparin is given by injection; therefore, it is confined mostly to patients in the hospital.
- ◆ Warfarin is taken orally; therefore, it is used most commonly when treatment is given outside the hospital.
- ◆ Low-molecular-weight heparins are derived from heparin and have been used in the last 15 years. They are given by injection, once-daily or twice-daily and can be easily given without blood testing.
- ◆ Fondaparinux is similar to low-molecular-weight heparin in its manner of action but is a synthetic compound and is given as a once-daily injection.
- ◆ Dabigatran is a new oral blood thinner taken as a pill that can be taken instead of warfarin and, unlike warfarin, does not require regular blood testing. This drug is FDA-approved to prevent stroke in patients with an irregular heart beat (atrial fibrillation).
- ◆ Rivaroxaban and apixaban are new blood thinners, also taken as pills, that are similar in their blood thinning action and, like dabigatran, do not require regular blood testing.

### If necessary, how can I decide which of these blood thinners to take?

- ◆ You and your doctor should discuss which one is best for you to use.

### What are side effects of treatment with blood thinners?

- ◆ The only common side effect that occurs with all blood thinners is bleeding. Most of the time, bleeding is not serious, such as bruising or a nose-bleed that stops with local pressure. About 1% to 2% of people taking blood thinners will develop more serious bleeding that may require a blood transfusion and interruption of blood thinning treatment.
- ◆ Less common complications, occurring in less than 1% of people, include a type of allergic reaction (heparin-induced thrombocytopenia) and thinning of bones (osteoporosis). Both of these occur mainly in people taking heparin.
- ◆ Skin rashes are very uncommon with blood thinners, although people can develop small bruising at the site where heparin injections are given.
- ◆ Other problems, which are common to many drugs, such as headache, nausea, or stomach upset, are very uncommon with blood thinners and, if they occur, should prompt you to seek medical attention to look for another cause.

### How can vein clots be diagnosed?

- ◆ The most widely used test to diagnose a venous thrombosis is a compression ultrasonography, a painless test that is done by running a probe down the length of the leg, pressing slightly on the skin.
- ◆ A D-dimer test can be done in people with a possible clot. If the test result is negative (normal), this means it is less likely that the person has a blood clot. A positive (abnormal) test result does not always mean a blood clot is present and usually means that additional testing, such as an ultrasound, is needed.

### How are vein clots and lung emboli treated?

- ◆ Immediate treatment: to prevent growth of vein clots, to prevent lung emboli, and to relieve symptoms. Usually treated with a blood thinner (anticoagulant) and, in extreme circumstances (very large venous thrombosis or pulmonary embolism), with "clot-busting drugs" (fibrinolytics).
- ◆ Continuing treatment: to prevent recurrent venous clots and lung emboli and to relieve symptoms from venous thrombosis (leg swelling or pain) and pulmonary emboli (difficulty breathing, chest pain). Usually treated with an oral blood thinner (typically warfarin), but some of the newer drugs mentioned above may soon be available as alternatives to warfarin.

### Additional Information

Antithrombotic Therapy and Prevention of Thrombosis, 9th ed: American College of Chest Physicians Evidence-Based Clinical Practice Guidelines. *Chest*. 2012;141(2)(suppl)  
[www.chestpubs.chestjournal.org](http://www.chestpubs.chestjournal.org)



### American College of Chest Physicians

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