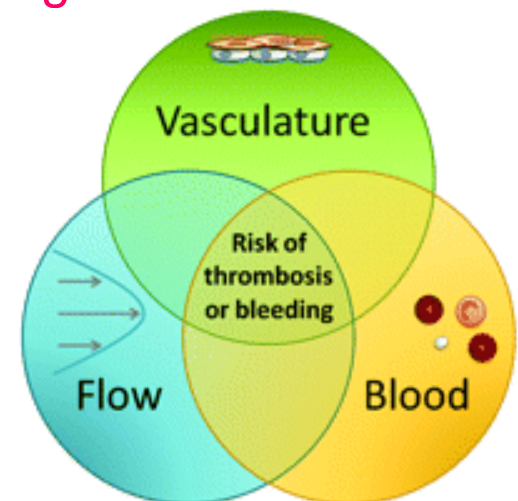
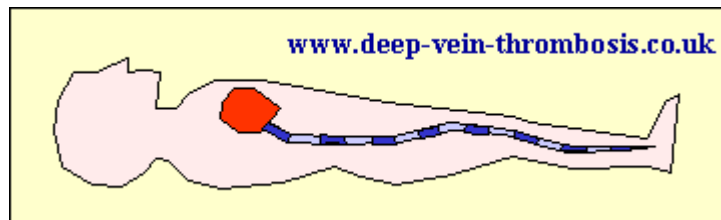


# Prevention of DVT-

How blood flows back to the heart thru veins and lymphatic vessels

From heart to tissues and lungs by heart pumping;

From tissues to heart: thru muscle pumping



# Data and statistics

- DVT affects about 300,000~600,000 Americans a year.
- Failure to correctly diagnose blood clot formation causes up to 100,000 deaths a year. [Clinical Advisor, June 2004, page 53]
- From <http://www.cdc.gov/ncbddd/dvt/data.html>

# Symptoms and diagnosis of DVT

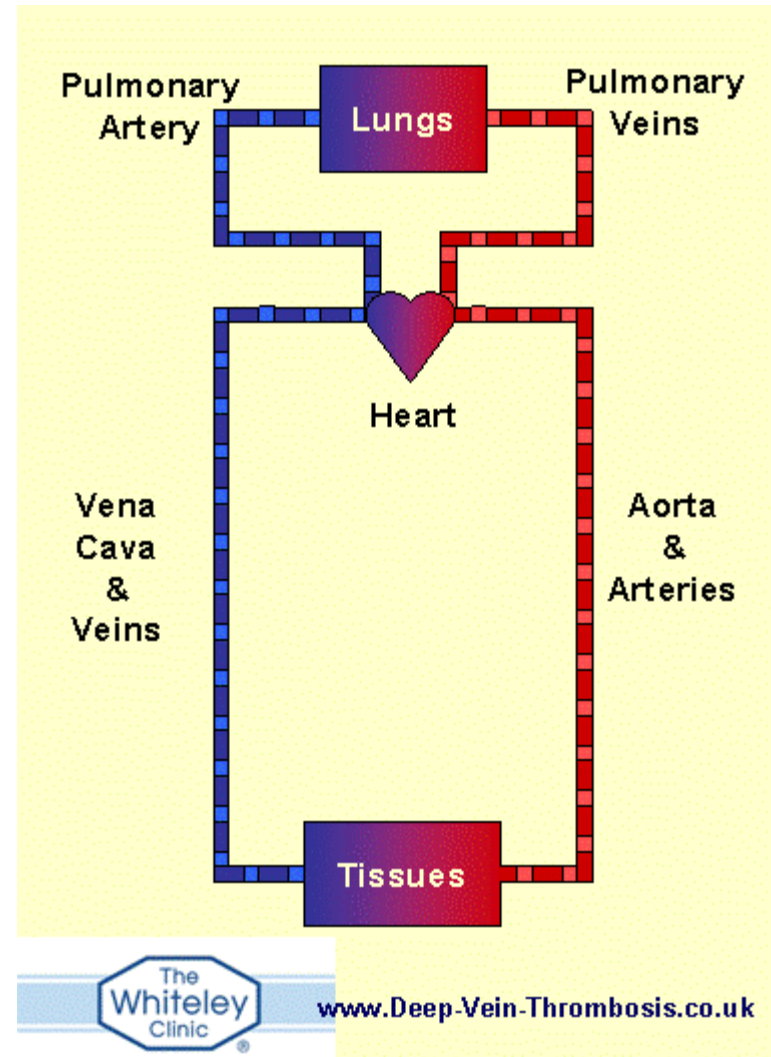
- Leg Symptoms: pain, swelling, cramp
- chest symptoms(PE): shortness of breath, sharp chest pains, rapid pulse, sweating, cough with bloody sputum, a feeling of apprehension, or fainting
- Diagnosis: by ultrasonic scan

# Normal blood flows

- From heart to tissues and lungs by heart pumping  
from tissues to heart:  
thru muscle pumping

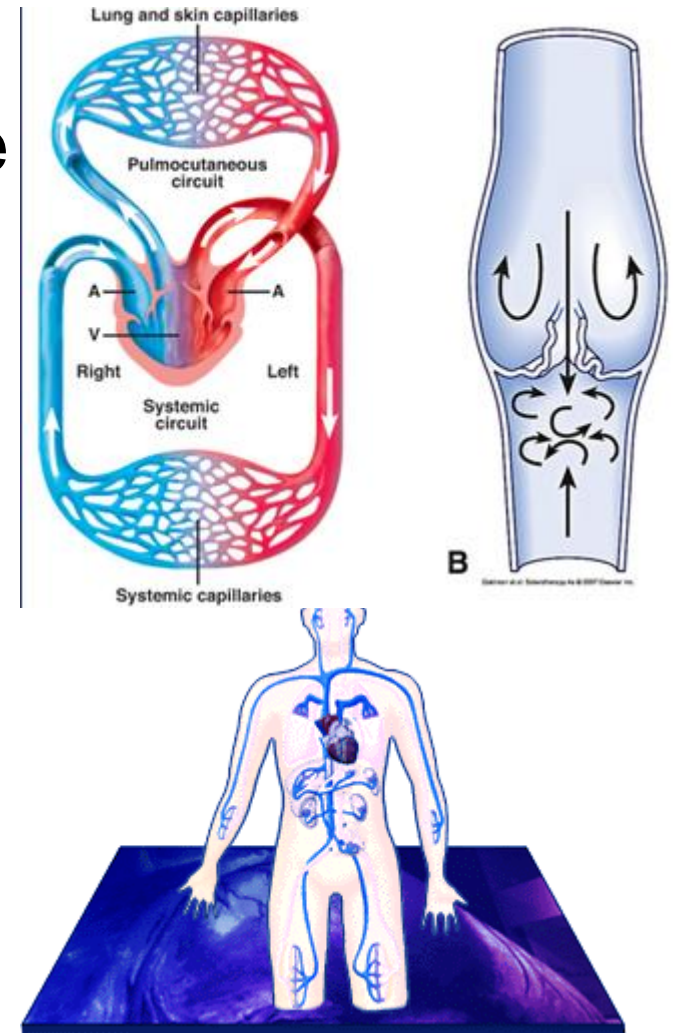
**Animation link:**

<http://deep-vein-thrombosis.co.uk/normal-blood-flow-circulation-in-a-human.htm>



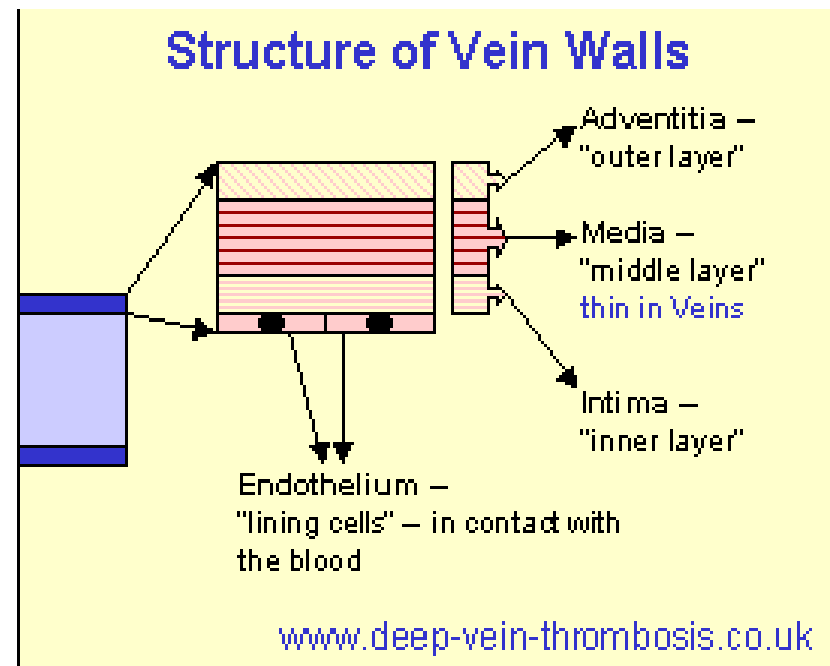
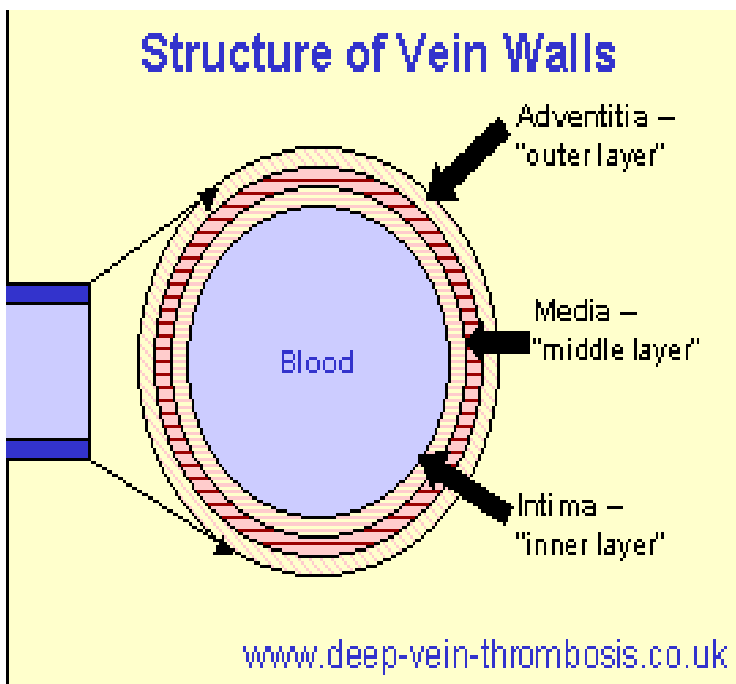
# Muscle pump is the driving force of the blood back to the heart

- Because unlike arteries, veins have built in valves that keep the blood flow going in **one direction**...the heart!! Blood pressure is the driving force of the blood, but that pressure is lower in the veins, the valves keep the blood from pooling in your ankles and make sure things only move forward driven by muscle movement.



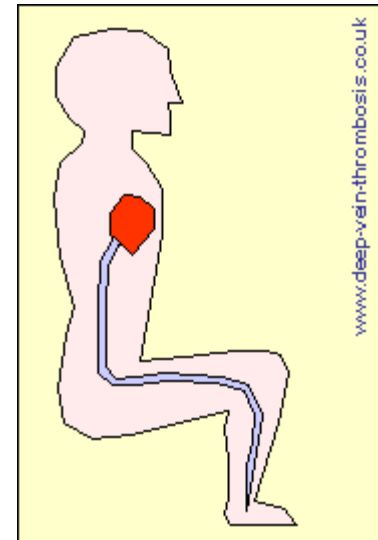
# Structure of the veins

- The vein wall has the same layers as the arterial wall, but it is much thinner. It is thinner as the flow is smoother and the vein wall does not have to withstand the pressure of the heart pumping.



# Blood Flow in Leg Veins when Sitting & Standing

- As the vein system is a Low Pressure system, whenever the heart is above the ankles, blood cannot flow smoothly back. In fact, it cannot flow up the veins at all by itself as there is nothing pushing it upwards against gravity.
- Most people do not get swelling of the ankles when they sit still for long periods of time. The way they get around this problem by **using their ankles to pump blood back to the heart**. By continually moving every few minutes or so, they use the muscles of the legs to pump the blood back up to the heart.
- **Animation link:** [http://deep-vein-thrombosis.co.uk/blood\\_flow\\_veins\\_sitting.htm](http://deep-vein-thrombosis.co.uk/blood_flow_veins_sitting.htm)



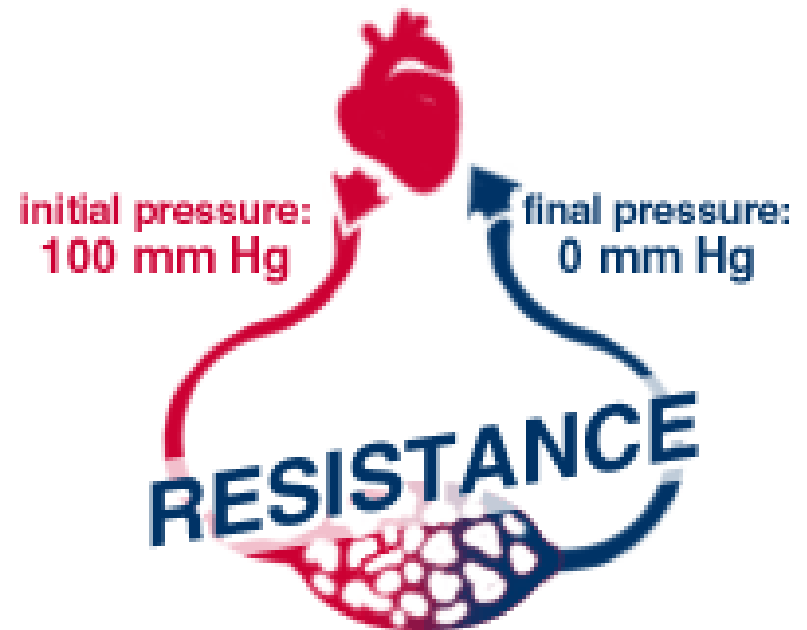
# Muscle is the second heart to pump the blood and lymph back to the heart

- "Unlike the arteries, the veins and lymphatic vessels have no muscle tissue. Veins use the muscles in our feet and legs to return blood, against gravity, to the heart. To help this process, the veins and lymphatic vessels have a series of valves in them that prevent blood from flowing backward."



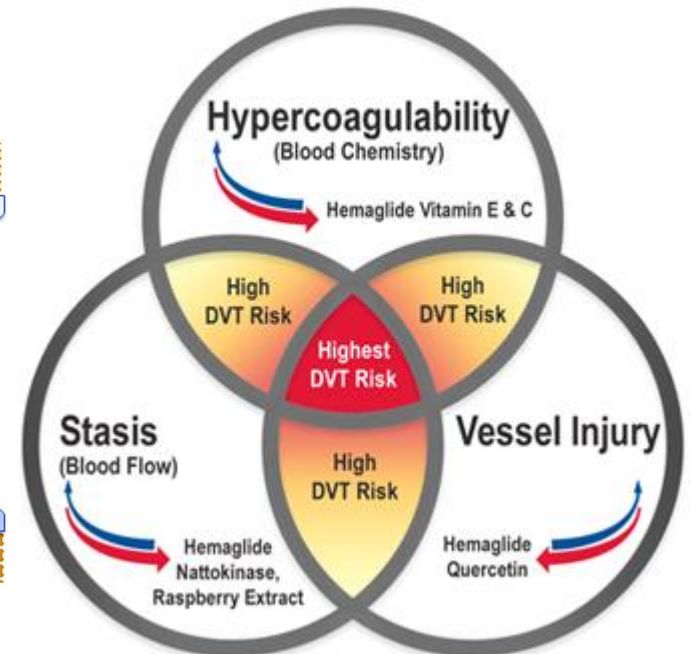
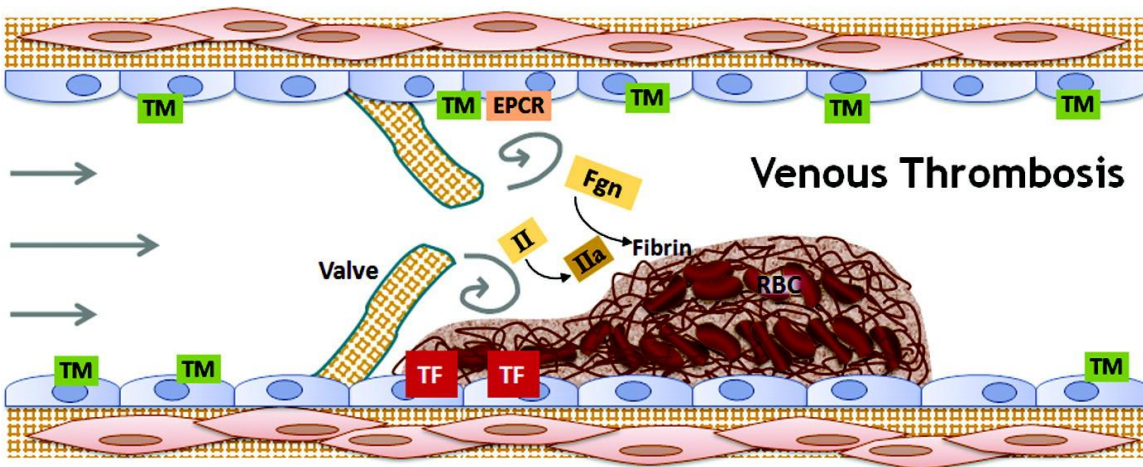
Heart beating and breathing in create negative pressure help to draw the blood back to the heart

There is always a pressure gradient such that the lowest pressure is normally in the right atrium (central venous pressure). This acts like water flowing downhill such that the water will flow without the need for any pumping; it's the same thing with our veins.



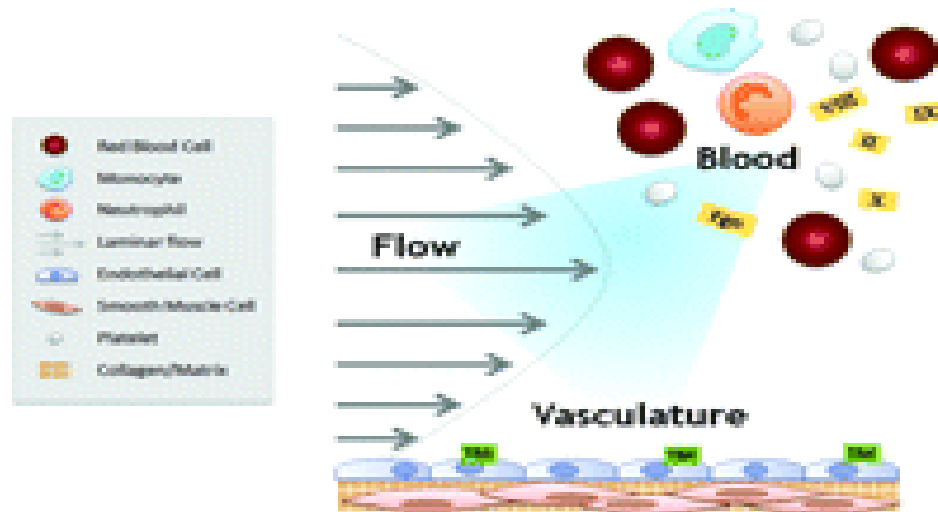
# How blood clots (thrombosis) develop?

- Virchow's Triad - Causes of Thrombosis
  - 1) Changes in the blood vessel wall
  - 2) Changes in blood flow
  - 3) Changes in blood composition



# Changes in the blood vessels

- Blood vessels are lined by a special sort of cell called an **endothelial cell** that prevents normal blood clotting on it. Anything that damages the endothelial cell, can cause blood to clot on to it or to clot to the lining of the blood vessel underneath the endothelial cell.



- Things that damage the endothelial cell include smoking-caused over-oxidation or low oxygen concentrations...

# Changes in the blood flow

- Immobility is a risk factor.
- Sedentary routine of young officegoers may be doubling their risk of suffering from a dangerous blood clot, according to a new survey.



# Changes in blood composition

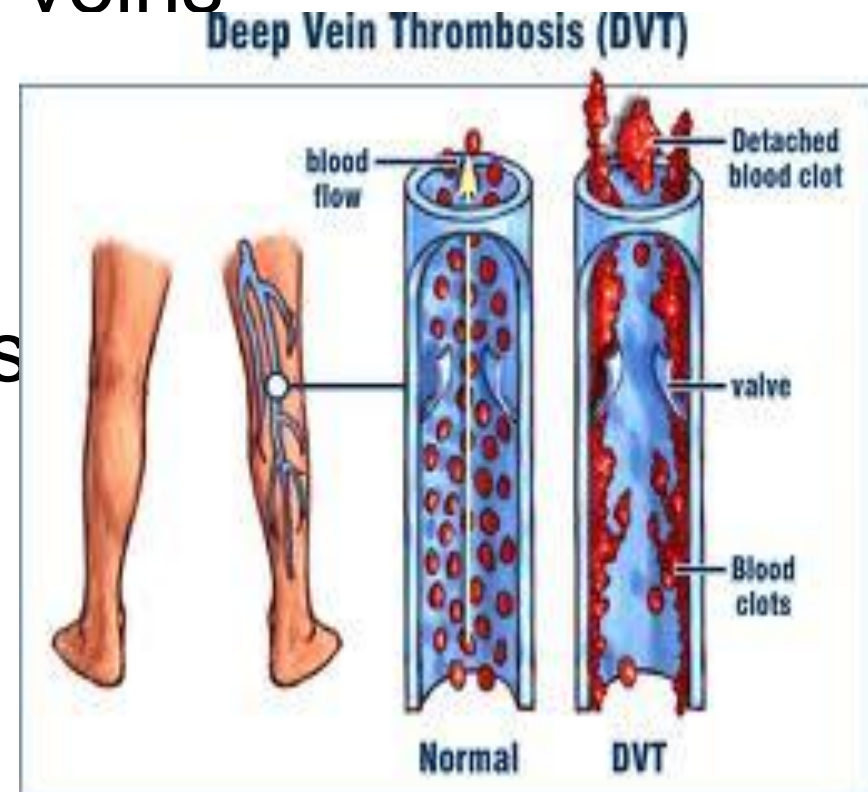
- Commonest: dehydration
- Taking medicines: like estrogen...
- High blood fats/sugar...
  
- Notice: alcohol and caffeine act as diuretics

# Dehydration is a risk factor

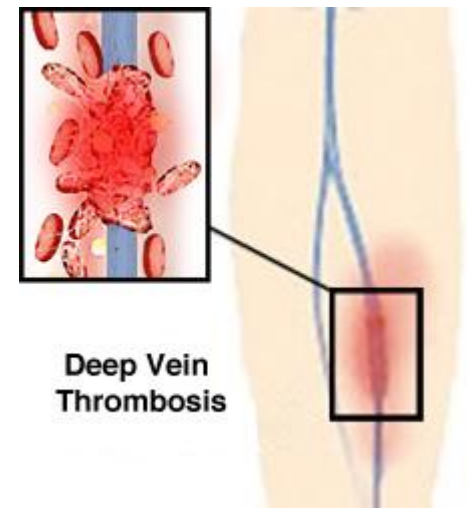
- dehydration level is a factor in DVT. As dehydration occurs, the blood thickens. Thick blood moves slower through the veins.
- Dehydration often occurs among endurance athletes, like marathoners and bike riders.

## Different Clots - Superficial Thrombophlebitis and Deep Vein Thrombosis (DVT)

- Both the deep and the superficial veins can get clots within them.
- A clot in the superficial veins is called "Superficial Thrombophlebitis".
- A clot in the deep veins is called a "Deep Vein Thrombosis" or DVT.



# Prevention of DVT



- **keep mobile**
- **avoid long periods of inactivity**
- **Stay hydrated**, making sure that drinks with caffeine or alcohol in them are balanced with water or juices (as caffeine and alcohol dehydrate you) , electrolytic drinks are better than water especially for endurance athletes.
  
- **stop smoking**
- weigh up the pros and cons of oral contraceptive pill or HRT with your doctor - this is particularly important if you're a smoker
- **Prevention of vessel wall injury**  
by antioxidants and stress-reducing measures



# Deep Vein Thrombosis



### Inhibition and frequency of movement

Long-haul flights are a common cause of DVT. Blood clots can form in the legs during a flight, especially if you are sitting for long periods of time. The risk is higher if you are also taking certain medications.

### Complication through pulmonary embolism

A blood clot that has formed in the leg can travel through the bloodstream to the lungs, where it can block a blood vessel. This is a medical emergency and can be fatal.

### Prolonged sitting while travelling

When you sit for long periods of time, the muscles in your legs do not contract and relax normally. This slows down the flow of blood through the veins. The longer you sit, the more blood can pool in your legs, increasing the risk of a blood clot.

### Risk factors

There are several factors that increase the risk of DVT, including:

- Age
- Family history
- Obesity
- Smoking
- Alcohol consumption
- Dehydration
- Recent surgery
- Recent trauma
- Recent hospitalization
- Recent long-distance travel
- Recent childbirth
- Use of birth control pills
- Use of hormone therapy
- Use of certain medications

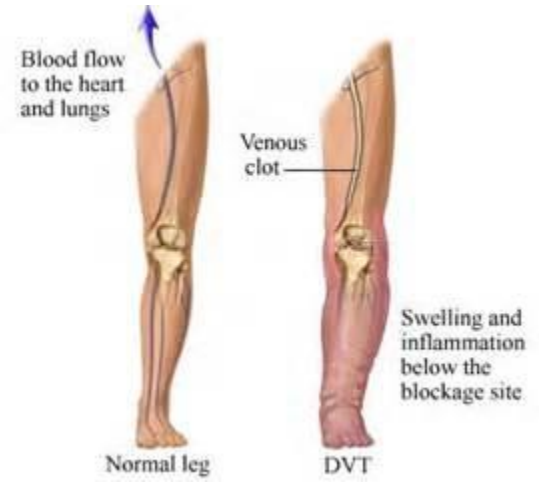
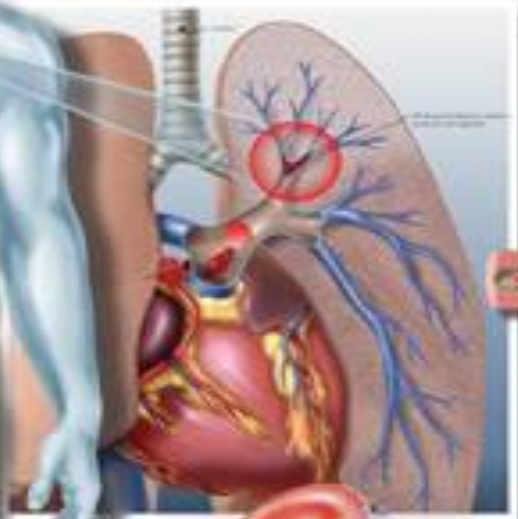
### Function of the muscle pump

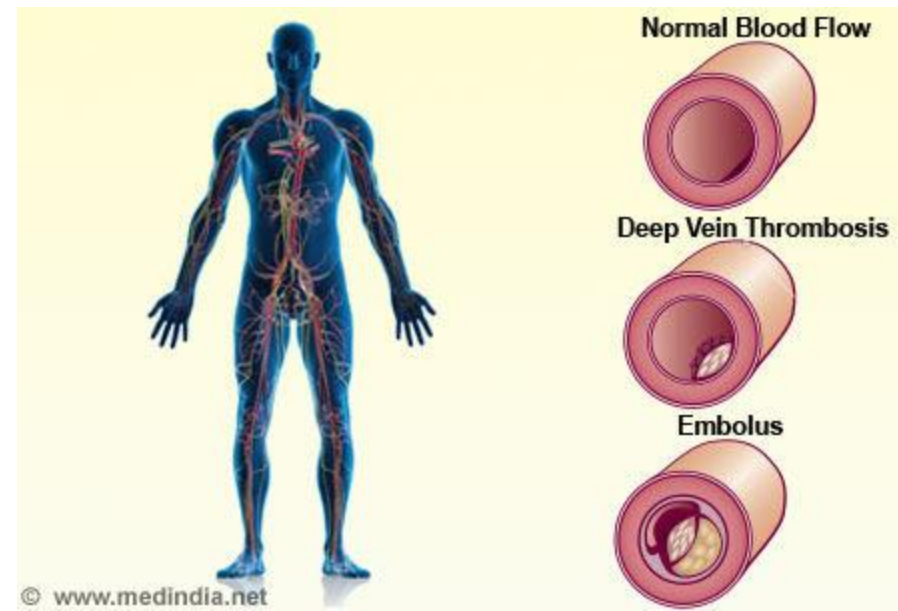
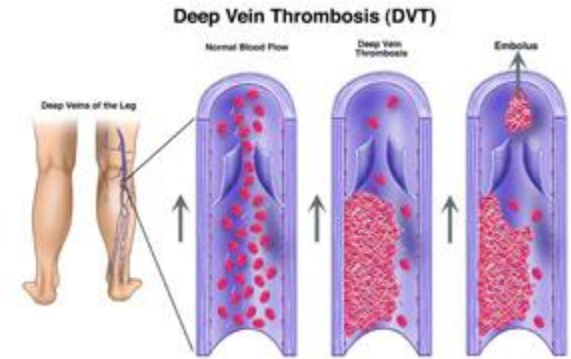


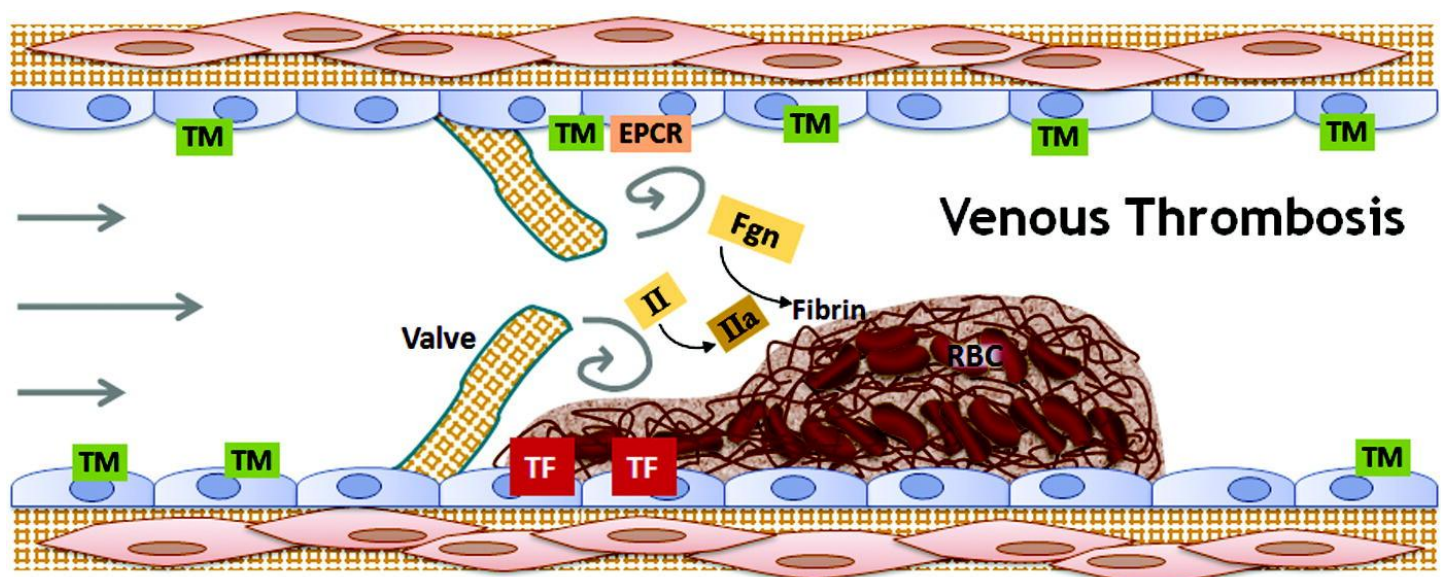
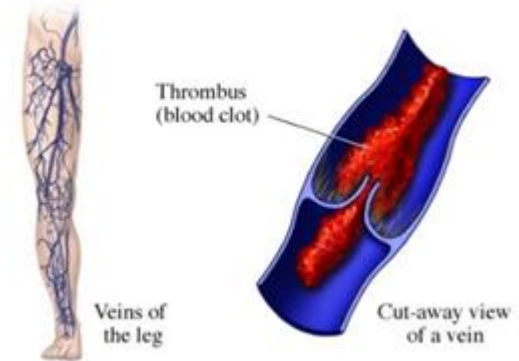
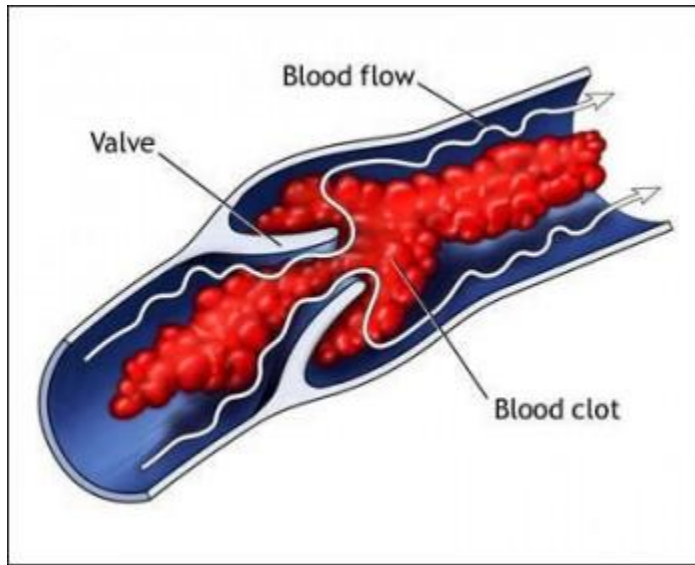
### How to prevent deep vein thrombosis

There are several ways to reduce your risk of DVT, including:

- Staying hydrated
- Getting up and moving around regularly
- Wearing compression stockings
- Avoiding long flights if possible
- Discussing your risk with your doctor

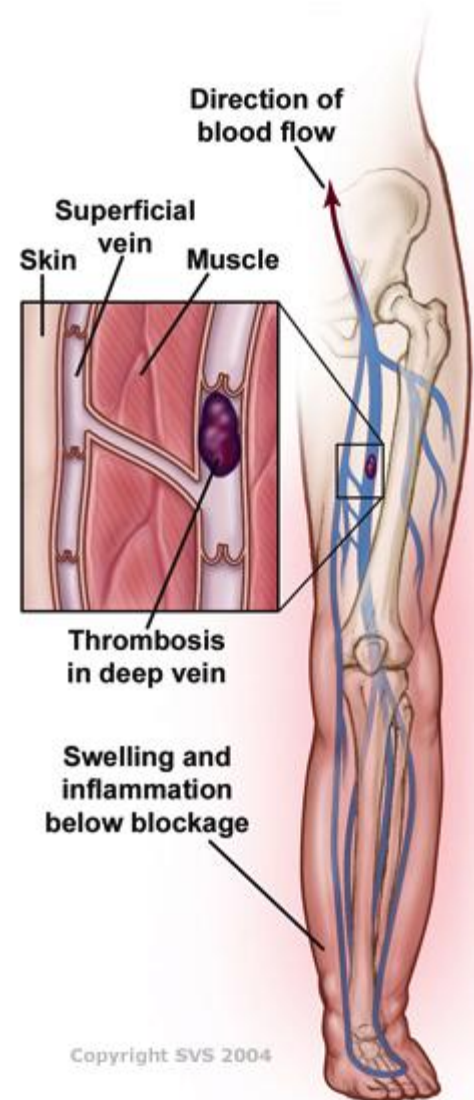






# Smoking is the leading risk factor causing DVT

- **Smoking** remains the leading risk factor for the development of problems with the arterial circulation of the legs, reports the National Heart Lung and Blood Institute. **Overweight, obesity and lack of physical activity** increase the risk for the development of deep vein thrombosis.



# Stop smoking today!

