



Medicine for Managers

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Anticoagulants

Anticoagulants are a group of drugs that reduce the ability of the blood to clot. They have widespread uses for a variety of reasons. They work by allowing the body to break down existing clots or by preventing new clots being formed. They have life-saving potential and can prevent or treat clot-based diseases like stroke, heart attack and pulmonary embolus. Although extremely helpful, they do increase the risk of unwanted bleeding.

Blood clotting is vital for us all. In the event of an injury, the blood clotting mechanism enables bleeding vessels to be sealed to minimise blood loss, and forms an infrastructure which assists healing.

However, if blood clots form spontaneously in the blood, or if they become dislodged from wound sites and travel round in the circulation they can be extremely dangerous and indeed even fatal.

Blood clots moving round the vascular tree may become lodged in blood vessels and the resulting obstruction of blood flow can result in acute **ischaemia** (lack of oxygen) resulting in damage of an organ which, depending on the severity, may result in severe consequences and even death.

Commonly circulating blood clots may result in vascular blockage which can lead to:

- **Stroke** – where clots lodge in a brain artery, causing part of the brain to die with the consequent loss of function

- **Pulmonary Embolus** where a clot blocks an artery in lung resulting in partial or even complete lung failure
- **Heart attack** where the clot lodges in one of the **coronary arteries** resulting in heart damage and death of part of the muscle

In patients suffering any of these events, the result may be disability or, if sufficiently severe, fatality.

Anticoagulant drugs may be used to help prevent the formation of blood clots *within* the blood vessels and *may* even help with the dispersal of clots that have already formed.

There are a range of medical conditions which increase the risk of clot development and for which anticoagulants are commonly used:

- **Atrial fibrillation** where an irregular heart rhythm results in disturbed blood flow through the heart resulting in pooling and clotting. Such clots can easily be carried to the brain

- **Heart Valve Surgery** increases clot risk associated with new valves
- **Deep vein thrombosis** is the result of a clot forming in some leg veins through immobility or sometimes knee or hip replacement. DVT can cause pulmonary embolism if a fragment of clot breaks from the leg clot and circulates.
- **Blood clotting disorders** may disturb the clotting mechanism

The anticoagulants are also used in medical equipment such as blood test tubes, blood transfusion bags and renal dialysis equipment.

The History of Anticoagulants

The first anticoagulant to be discovered, heparin, was identified by chance by a medical student at Johns Hopkins University in America.

He was investigating dog livers, hence the name **heparin**. It was purified in sufficient quantities for medical use in the 1930s.

Warfarin was first discovered in 1939 by researchers at Wisconsin University, based on a substance found in mouldy sweet clover, a chemical which killed many cattle in Canada from a bleeding disorder in the 1920s.

Since the 1970s a range of new agents have been identified by scientists and are now in use to provide controlled and safe anticoagulation and are commonly prescribed.

They are easily taken by mouth. For years, warfarin was the only oral drug available and dosage required regular monitoring by blood tests to ensure the dosage was correct. In the past 15 years a number of new anticoagulants, also taken by mouth, but for which monitoring is unnecessary, have come into use.

An American study has shown that approximately one third of all patients admitted to hospital require some sort of anticoagulation.

What does an anticoagulant do?

It obviously reduces clotting. In fact the blood has complex mechanisms which regulate clotting, because too little clotting ability will result in bleeding both within and from the body.

If blood clots too much, the consequences may be the disorders described above. The body also forms blood clots to seal wounds, keeps infection out of the wound and acts as a framework for rebuilding the skin.

What anticoagulants are there?

The drugs can essentially be divided into two groups

1. **Intravenous anticoagulants**
Heparin is a medication which inhibits clotting by activating the body's anti-clotting processes. Within the blood is a protein called **antithrombin** and heparin works by activating it.

Heparin is commonly used for short-term anticoagulation, often before starting a longer term form of anticoagulant and to protect a patient temporarily, for example, during surgery.

Regular heparin injections are administered and the drug is safe, simple and effective. They may be used when an oral anticoagulant is used but before it has become fully effective.

There are also low molecular weight heparins which are more rapidly acting and with a longer duration than heparin.

There is also a newer synthetic alternative called **fondaparinux**. It binds with anti-thrombin and is commonly used to prevent venous thrombo-embolism in patients who have undergone lower limb surgery, who are at risk of DVT and pulmonary embolism and sometimes in the management of unstable angina. It is most often used to prevent clotting rather than to treat clotting that has already occurred.

2. **Oral Medications**

3.

a. Warfarin. First approved as an anticoagulant in the 1950s, it blocks the use of vitamin K, a key element in the clotting process. It is still in common use but it does have the drawback that the drug needs careful dosing and regular monitoring to avoid complications. An incorrect dose can lead to severe bleeding. It remains the principal anticoagulant for valvular heart disease and end-stage kidney disease.

b. Other oral anticoagulants are newer and can be taken regularly without the need for laboratory monitoring. Although patients who are well controlled on warfarin may not be changed to the newer drugs, for some their convenience may make them the drug of choice.

The advantages and disadvantages of anticoagulants.

As stated, the drugs are extremely effective in the prevention of life-threatening diseases and disorders such as stroke, heart attack, deep vein thrombosis and pulmonary embolus.

The disadvantage of such a drug is, of course, the risk of bleeding. However, in general with monitoring where required and in correct dosage, side effects are very uncommon and may cause skin changes.

Because of the bleeding risk, there are a number of circumstances where anticoagulants are contra-indicated:

- Recent surgery
- High blood pressure uncontrolled by treatment
- Disorders causing gastro-intestinal bleeding such as ulcers
- Use with other drugs which may also affect bleeding tendency

Anyone experiencing bleeding that is difficult to stop, from any wound or from the nose or gums, bruising easily and repeatedly or experiencing dizziness should notify their doctor.

Duration of treatment

Anticoagulants are often used for prescribed periods in specific disorders. However, many patients with particular medical problems associated with an increased risk of clotting can take them for prolonged periods and even indefinitely without any problems. These drugs have saved many lives over the last seventy years by reducing the risk of clotting and have had a key impact on the risk of developing heart attack and stroke.

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