THE BAIRD INSTITUTE
Applied heart & lung surgical research

WE NEED your help

Aortic Arch Replacement Surgery

Understanding your Aorta

The aorta is the main artery that carries oxygen-rich blood from the heart to the rest of the body. It initially travels upward from the heart, then curves backward to form the aortic arch, before continuing downward to supply blood to the lower body. The branches arising from the aortic arch deliver blood to the brain, head, and arms.

Various conditions can weaken the aorta, causing it to widen (dilate), tear (dissect), or rupture. These conditions are often life-threatening and may require urgent surgical repair. Causes include atherosclerosis (a build-up of fat and calcium in the arteries), hypertension (high blood pressure), inherited genetic conditions such as Marfan syndrome, connective tissue disorders including Ehlers-Danlos syndrome and scleroderma, as well as direct injury or trauma.

Symptoms of Aortic Arch Aneurysm or Dissection

Most people with an aortic arch aneurysm have no symptoms at all, and problems with the aorta are discovered incidentally during investigations for other health conditions or during routine health check-ups.

In certain situations, if the aorta dissects, people report a sudden tearing sensation in the upper chest or upper back. This pain can range from mild to very severe and is treated as a medical emergency. When this occurs, surgery is usually arranged urgently.

People who have a known connective tissue disorder are monitored regularly with imaging such as CT scans to assess the size of the aorta. If the aorta becomes enlarged and is considered at risk of rupture, surgery will be recommended in accordance with established aortic guidelines.

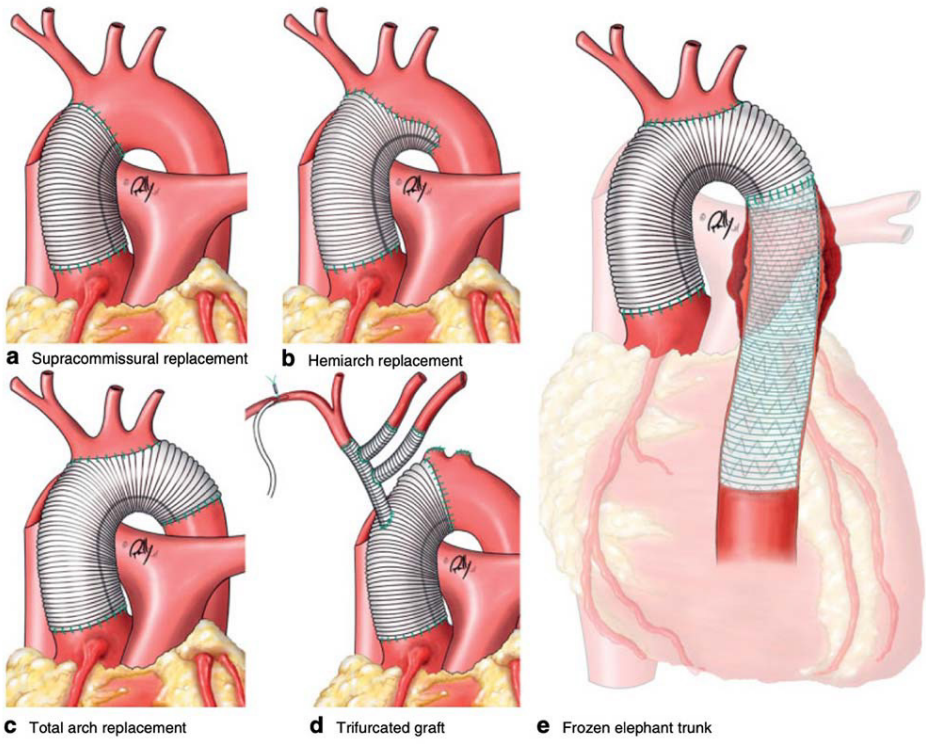
The Surgery

To gain access to the heart, the surgeon makes an incision through the breastbone, also known as the sternum. This allows the heart to be seen clearly. During the operation, a heart–lung machine is used to supply oxygen to the body and brain while the heart is temporarily stopped so the affected section of aorta can be safely removed and replaced with a synthetic dacron graft. The blood vessels that branch from the arch are reconnected to ensure proper blood flow to the brain and upper body. As circulation is paused during this part of the operation, several protective measures are used to reduce the risk of brain injury. The patient's body is cooled to between 18–28 °C, which slows brain and body cell activity and allows the tissues to safely tolerate the short period without blood flow.

Some people have very complicated aneurysms in the aortic arch that continue down into the next section of the aorta in the chest. In these cases, a more extensive operation may be needed, called a frozen elephant trunk (FET) repair.

This procedure combines traditional open surgery with a minimally invasive technique in a single operation, allowing surgeons to treat two sections of the aorta at the same time.

A specially designed graft is used. The “frozen” part refers to a metal-supported tube (called a stent graft) attached to the lower end of the synthetic graft. This stent is placed inside the lower part of the aorta in the chest, past the arch, where it opens up and supports the weakened area. By doing this, it strengthens the aorta and stops blood from flowing into the damaged section, helping to prevent further problems.



Once the surgery is complete, the heart–lung machine is removed and the heart is restarted.

At the end of the operation, drains are placed around the heart to remove any excess fluid and air. Pacing wires are attached to the outer surface of the heart, with the ends brought through the skin and connected to a pacing box. These wires allow the medical team to correct your heart rhythm if it becomes irregular after surgery.

The sternum is closed using surgical wires, and the skin is closed with dissolvable sutures. A thin dressing is applied and is usually left in place for up to six weeks.

After the Surgery

After your surgery, you will be cared for in the Intensive Care Unit (ICU) for approximately 48 to 72 hours. During this time, you will be closely monitored to ensure your heart, brain, and kidneys are functioning well.

When you first return from the operating theatre, you will be asleep and have a breathing tube in your mouth connected to a ventilator. This usually remains in place for around 6 to 12 hours. As your condition stabilises, the sedation medications will be gradually reduced, and the breathing tube will be removed.

Chest drains are typically removed two to three days after surgery. You will be helped to sit up in bed and encouraged to take deep breaths and cough to clear your lungs. When coughing, you will be shown how to support your chest using a small cushion to protect your breastbone.

Once your heart rate and rhythm are stable, the pacing wires will be removed. When you are medically ready, you will be transferred from the Intensive Care Unit to the ward.

During this period, you will receive regular pain relief to help you move comfortably and cough effectively to clear any mucus from your chest. Your physiotherapist and nurse will guide you on how to move safely in bed and how to get in and out of beds and chairs. They will also explain current recommendations for sternal, or breastbone, precautions. Your exercise program after surgery will include early mobilisation such as walking, sitting out of bed, and regular deep breathing and coughing exercises. These activities are an important part of your recovery and help reduce the risk of complications that could delay healing or prolong your hospital stay.

Recovery

Most people take around three to six months to fully recover from aortic surgery. If your job is not physically demanding, it may be possible to return to work within six to twelve weeks. Your breastbone takes approximately six weeks to heal, and during this time it is important to protect your chest when sitting up in bed or getting out of a chair. You should avoid lifting heavy objects, and you will likely need some assistance at home with daily chores. After six weeks, you can gradually begin lifting light items, resuming household activities, and driving, as advised by your healthcare team.

Some people worry about becoming dependent on pain-relieving medications. Taking pain relief as prescribed is important, as it allows you to breathe deeply, cough effectively, and

perform gentle exercises and daily activities. Strong pain relief medications, such as opioids, can cause constipation. Drinking plenty of fluids, particularly water, and eating a high-fibre diet can help prevent or relieve this. As your recovery progresses at home, you will usually need less strong pain relief and may be able to manage your pain with paracetamol (Panadol) alone.

It is common to feel very tired or low in mood after surgery. You may also notice difficulty concentrating, sleeping, or completing everyday tasks. Be kind to yourself and remember that recovery from major surgery takes time. Most people gradually return to their usual level of activity over several months.

Continue to perform your prescribed exercises and slowly increase the amount of walking you do each day. After discharge from hospital, contact your local public hospital to arrange attendance at a Cardiac Rehabilitation program, which provides supervised exercise, education, and support during your recovery.