

## Cardiac Surgery – Coronary Artery Bypass Grafting (CABG) Surgery

### Introduction

Liverpool Heart and Chest Hospital is one of the busiest cardiac surgery units in the country. The unit sees the second highest number of adult cardiac cases, treating just under 2,000 patients per year including planned and emergency cases.

A total of 16 surgeons provide adult cardiac surgical services that are available 24 hours a day, 7 days a week and every day of the year.

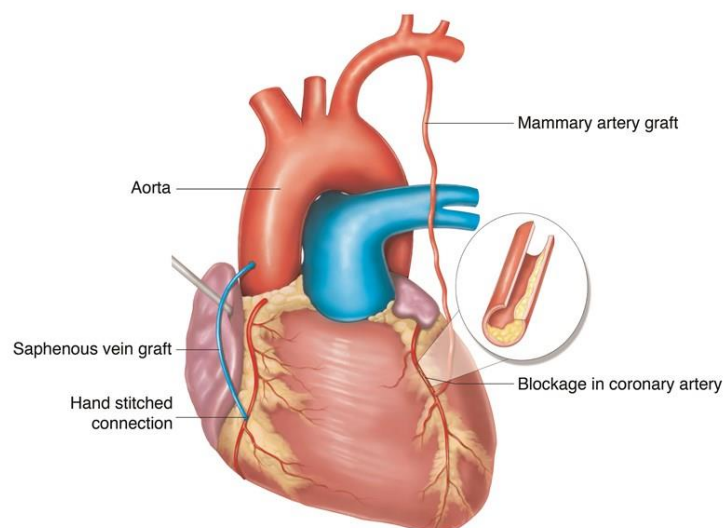
This guide is designed to provide an overview of **CABG Surgery**, however, you will find lots of helpful details about our surgical teams, cardiac disease, the types of surgery we provide, as well as useful patient information and resources concerning your stay in hospital, discharge home, frequently asked questions and much more on the Trust website, [www.lhch.nhs.uk/our-services](http://www.lhch.nhs.uk/our-services)

### Guidance for Patients

#### Procedure Information

Coronary artery bypass grafting (also known as bypass surgery or “CABG”) is a treatment for coronary artery disease (ischaemic heart disease or also known as atherosclerosis) and is the most common cardiac surgical procedure in the UK and at LHCH.

### Coronary Artery Bypass Grafting



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It is usually offered to patients who have coronary arteries that cannot be stented; who have all three main coronary arteries blocked; or those who have two coronary arteries blocked but other significant risk factors (such as diabetes or any reduction in the strength of the heart, called the left ventricular ejection fraction).

The decision to offer surgery is based on European Guidelines that have used the latest research to determine which treatments will be best for patients in the long term.

In a CABG procedure, blood vessels from elsewhere in the body are removed (or “harvested”) in order to reroute the blood around the heart. The blood vessels that are taken are chosen based on whether they can be removed without it causing major harm to the blood flow. The most common blood vessels harvested are the Left Internal Mammary Artery (LIMA) from the inside of the chest, the radial artery from the arm and the long saphenous vein from the inside of the leg.

The disease in the coronary arteries is not taken out, but rather the blood supply to the area of muscle beyond the blockage is “bypassed”, hence the name.

Because the disease is not removed (this has been tried previously and causes too much damage), it is important that the medications used to prevent further progression of atherosclerosis continue to be taken lifelong.

Surgery is needed for coronary artery disease if you have the following:

- \* three major coronary artery territories blocked
- \* two major coronary artery territories blocked AND diabetes or reduced heart function
- \* coronary artery disease in the first part of the left anterior descending coronary artery not amenable to stenting
- \* any coronary artery disease that cannot be stented and is causing crippling symptoms
- \* less severe coronary artery disease but another reason for cardiac surgery (e.g. valve disease)

Benefits of performing this surgery are:

- \* to improve symptoms (angina, shortness of breath or fatigue, where these were present before surgery)
- \* to prolong life (in patients who have evidence of disease that may shorten life expectancy)

### Off-pump and on-pump coronary artery bypass grafting

In order to connect the blood vessels that have been harvested for the bypass to the coronary arteries, which are usually around 1.5 - 2.0mm in diameter, the area being stitched to must be still and clear of bleeding without causing any damage to the heart.

There are two ways of achieving this:

- Coronary artery bypass grafting using a cardiopulmonary bypass machine to do the job of the heart and lungs, stopping the heart for the duration of the procedure. This is sometimes called on-pump surgery and is the most common way of performing this surgery worldwide.
- Beating heart surgery (aka off-pump surgery) where a 3cm square portion of the heart to be operated on is held steady with a suction device whilst the rest of the heart continues to beat underneath. This is not possible if the heart needs to be opened for another reason (such as a valve

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procedure being done at the same time). Off-pump CABG is safest when performed by surgeons who do this regularly and as their main technique.

For the vast majority of patients, these two techniques are no different. They are different means of achieving the same important goal: to get a better blood supply plumbed into the coronary arteries.

In some special circumstances, one technique might be preferred over the other, but research published from Liverpool Heart and Chest Hospital shows that in most cases, the two techniques are equivalent in the long and short term - as long as the surgeons who are doing the operations do their preferred technique the majority of the time. Our unit has one of the biggest and longest research studies that shows our worldwide expertise in both techniques.

If you fall into the rare group of patients who cannot have one or the other method for whatever reason (e.g. if your heart is too weak to beat by itself whilst being operated on; or if your blood vessels are too diseased to tolerate the pipes that are used for cardiopulmonary bypass) then you will be referred to a surgeon with the appropriate experience.

Surgeons with a predominantly off-pump (beating heart) practice at Liverpool Heart and Chest include:

- Mr Mark Pullan
- Mr Paul Modi
- Mr Andrew Muir
- Mr Bil Kirmani
- Mr Mohammed Zeinah

### Total arterial revascularisation

The choice of which blood vessels to use for coronary artery bypass grafting (called “conduits”) are practically limited to three main groups:

- \* The internal mammary arteries (from the inside of the chest)
- \* The long saphenous vein (from the inner leg)
- \* The radial arteries (from the forearm)

Other blood vessels can be used, but in the majority of patients these are the main options. Each has its advantages and disadvantages, and your surgeon will discuss with you the options available.

### Arterial vs venous grafts

There is some debate about what the best form of treatment for coronary artery disease is. Some people believe that arteries (rather than veins) should be used to replace the work of diseased arteries. There is some evidence to support the idea that arteries used to perform the bypass may last longer, but the evidence is not complete and doesn't answer all the questions. Veins have been used for a very long time and advances in medicines and the techniques of surgery have meant that they are approaching the long-term quality of arteries in many cases.

The internal mammary arteries Blood vessels that come off branches near the aorta sit behind and to the side of the breastbone. The left internal mammary is the most important bypass graft that can be offered - when it is plumbed into the main blood vessel on the front of the heart, the left anterior descending artery, it is the main reason that CABG prolongs life as it tends to work reliably for a very long time. It sits in a convenient position to reach the heart without having to detach it from its source.

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The contents of this information has been reviewed and approved by the Divisional Boards of Liverpool Heart and Chest Hospital.

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There is a right internal mammary artery, but it sits a little further away from the major arteries and therefore sometimes needs to be disconnected and plumbed in elsewhere to be long enough.

Using both of the mammary arteries may provide a small advantage to the long term outcome, but removing the blood supply from both sides of the breastbone can make it unstable and slow to heal. Although problems with this are rare, they can be devastating if they occur and this method is therefore especially avoided if there are risks of poor wound healing (such as smoking, COPD, diabetes, steroid use etc).

### Long saphenous vein

This is the most commonly used conduit for performing CABG worldwide. It comes from the inner leg, anywhere between the thigh and the ankle. Any areas with varicose veins, which are weak points in the vein wall, cannot be used. The main advantage of veins is that they are plentiful, can be taken with relatively little impact on the circulation in the leg as there are plenty of alternative routes for the blood to go, and have been used for a long time with good results.

### Radial artery

Each forearm has a dual circulation to the hand: the radial and the ulnar arteries. As long as the ulnar artery has enough flow to supply the hand (tested using a simple clinical manoeuvre called the Allen test), the radial artery can be used. It is shorter than the other conduits, but has a good patency (high rates of staying open after a long time) as long as the bypass graft itself has a good flow through it. It is a muscular vessel and can easily go into spasm, which would restrict its flow so cannot be used in all situations.

If arteries alone are being used, which are typically shorter than veins, the configuration of the grafts must be organised in such a way that they will all reach. This sometimes involves having one artery conduit supplying more than one coronary artery.

### Aortic non-touch grafting

If there is a lot of calcium deposits in the aorta or if blood vessels (conduits) to do the bypass grafts are scarce, it is sometimes possible or necessary to undertake surgery without touching the aorta. This involves mounting all the bypass grafts on the mammary artery for the inflow of blood, rather than attaching them to the larger, higher flowing aorta.

This technique may reduce the risks of stroke by minimising the amount of debris that is showered out of the aorta when it is clamped or cut, but it relies on a single vessel to supply the whole heart with blood.

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## What should I do if my health is deteriorating?

**If you have any change in your symptoms or other concerns whilst waiting for surgery, please contact one of the contacts below.**

### **Urgent Health Advice**

For urgent health advice about physical or mental health, when it's not an emergency, please call 111 from any landline or mobile phone. You can also visit [www.nhs.uk](http://www.nhs.uk). The NHS 111 service is available 24 hours a day, seven days a week.

### **Life Threatening Emergencies**

For something life threatening – severe bleeding, breathing difficulties or chest pains – please dial 999.

### **GP surgeries are still open**

GP practice staff are also helping patients to manage their conditions at home while they wait for hospital appointments.

GP surgeries are still open and are working differently to how they did before the COVID-19 pandemic and GP practices continue to make best use of telephone, online and video consultations. Face-to-face appointments are still being given to those who need it.

When you phone or use an online form to contact your GP surgery to make an appointment, you will be asked some questions which are designed to help staff guide you to the most appropriate clinical person to help you with your condition. This could be a nurse, clinical pharmacist, physician's associate, GP or paramedic.

## Contact Us

Please contact the Hospital switch board on 0151 600 1616 for Appointment team or the Medical Secretaries