NHS
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Percutaneous Coronary Intervention (PCI) for coronary artery chronic total occlusion (CTO)

This leaflet explains what happens during PCI treatment for coronary artery chronic total occlusion (CTO).

What is CTO?

CTO is a type of heart disease where an artery becomes completely blocked for at least three months. This blockage prevents blood from getting to the part of the heart supplied by that artery. Without enough blood flow, the heart does not receive the oxygen and nutrients it needs to function properly. This may result in angina or significant shortness of breath during exertion; both common symptoms of CTO. Many patients with a CTO will develop an alternative circulation to the heart, which we refer to as collateral circulation. However, these collaterals may still not provide sufficient flow to the myocardium (heart muscle). CTOs are very common – occurring in as many as 3 out of every 10 patients with coronary artery disease.

What are the treatment options?

Any patient with stable coronary artery disease, secondary prevention medication is vital, as well as medication to control the symptoms of angina. In the past, patients with a CTO who were experiencing symptoms of angina (chest pain; shortness of breath; tiredness), required open heart surgery – Coronary Artery Bypass Graft (CABG), despite maximum medical therapy or were managed conservatively (with patients tolerating ongoing symptoms). However, it is now possible to treat CTO through a less invasive technique called Percutaneous Coronary Intervention (PCI). This procedure involves opening the artery using balloons and stents, and occasionally other specialist equipment.

CTOs are often heavily calcified (hardened) and/or extremely fibrotic (scarred), therefore the treatment of these areas is considered highly challenging, with a success rate of 80-92%.

Patients having PCI often require additional treatments, such as intravascular lithotripsy (sonic wave treatment of calcified tissue) or rotational atherectomy (breaking up of calcified areas using a rotating device). Your doctor will explain these additional therapies in more detail to you at the time of your procedure. It can often take two or more procedures to open the artery, so do not be disappointed if it does not work first time. Often the first procedure creates tearing in the artery wall, which creates a new passage for the next attempt.

What are the benefits of PCI for CTOs?

The main benefit is an improvement in symptoms often resulting in the ability to also reduce the number of medications required. The pump function of the heart (left ventricular function) may also improve (providing the myocardium is viable). Furthermore, as this is less invasive than open heart surgery, the recovery from the procedure is shorter and indeed is most commonly performed as a day-case procedure.

What to expect

On the day of the procedure you will be admitted to our day ward within the Cardiology Department, where the nurse caring for you will undertake some pre-procedure checks, including blood pressure, ECG and insertion of a small tube (cannula) into the vein in your arm. This is used during the procedure for sedation and medication. PCI can be a lengthy procedure taking anything from one hour to three hours.

How is the PCI performed?

The procedure is similar to an angiogram or cardiac catheterisation. You will lie on a narrow table in the catheterisation room. An X-ray camera is used to take pictures. CTO Procedures are often carried out using two entry sites (wrist and groin, either groins or both wrists). This allows the doctor to position two catheters up to your heart so that the vessel can be visualised before and after the occlusion. A simultaneous injection of contrast (dye) into both the left and right coronary arteries is needed to show progress of the procedure. The blockage can then be targeted from the front and back (antegrade and retrograde). Firstly, the doctor will use a very fine wire in the coronary artery to create a passage through the blockage. Once this has taken place then he can use balloon inflations and stent/s to widen the artery.

At the end of the procedure the leg artery is closed using an Angioseal (a dissolvable plug). If we cannot use an Angioseal, then pressure will be used by a nurse or a special pressure belt called a Femostop. If the wrist artery is used, a pressure band is placed around your wrist and will be kept on for one to two hours. You will then return to our ward area where the nurses will do regular checks on your blood pressure and wound site.

If the procedure has been relatively short and uncomplicated then you will be able to go home between four and six hours after the procedure, providing that you have someone to remain with you overnight. If the procedure is lengthy or there have been complications, then you will be admitted to a cardiology ward for observation overnight.

What are the risks of the procedure?

- Bleeding – from the artery used for access (groin or wrist). This will be monitored closely by the nursing staff and treated by applying pressure.
- Transient kidney damage – as a result of large volumes of contrast. The kidney function returns to normal within 7-14 days. Less than 1 in every 100 patients will require dialysis.
- Heart attack can occur in less than 1 in 1000 cases.
- Stroke can occur in less than 1 in 1000 cases.

- Perforation – this is usually caused by the guidewire exiting the vessel. This can then lead to a tamponade (a collection of blood around the heart), which can be treated by inserting a drain in through the centre of your chest. This happens in 2 in every 100 CTO cases.
- Radiation exposure – CTO procedures are often lengthy procedures resulting in radiation exposure that could lead to skin injury. This may not be apparent until weeks after the procedure and should be reported back to the cardiologist. You will be advised what to look out for if you have a high dose of radiation during your procedure.
- Occasionally, scar tissue forms inside the stent/s, which causes narrowing and causes your angina symptoms to return; this is call 'restenosis'. This is rare and can be treated. There is a small risk of a blood clot forming which could block the stent/s. To avoid this please continue taking your anti-platelet medication (Clopidogrel/Ticagrelor/Prasugrel) for 12 months after the procedure, unless told otherwise by the cardiologist.

What about after the procedure?

- You must have someone at home for the first 24 hours following the procedure if you are discharged the same day.
- You will be expected to refrain from any physical activity for the first week.
- You must not drive for one week following the procedure. This is the DVLA rule.
- Your doctor will advise when you can return to work.
- Arrangements will be made for you to be followed up by the cardiac rehab nurses four weeks after the procedure.

Useful contact information

Cardiac Rhythm Management (CRM)/ Devices Clinic: 0118 322 6636 (Mon - Fri, 8am -6pm)
Jim Shahi Unit (JSU): 0118 322 6502 (Mon - Fri, 8am -6pm)
Cardiac Care Unit: 0118 322 6684 (Mon - Sun, 6pm - 8am)
Clinical Admin Team (CAT 11) (bookings): 0118 322 6676 (Mon - Fri, 8am - 5pm)
British Heart Foundation: www.bhf.org.uk
DVLA www.gov.uk/guidance/cardiovascular-disorders-assessing-fitness-to-drive#implantable-cardioverter-defibrillator-icd

This leaflet is printed privately for the Cardiac Fund. It was set up in 1976 for the purpose of providing cardiac services that would otherwise not be available through National Health resources. Our Cardiac Laboratory was largely equipped through the fund and many other areas in the Department have also benefited from equipment and staff training.

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