

Cardiac catheterisation

Cardiac catheterisation is an invasive diagnostic procedure that provides information about the structure and function of the heart, using a technique called coronary angiography or arteriography. Cardiac catheterisation with a venous or arterial long-line catheter allows:

- Injection of radio-opaque dye for angiography.
- Measurement of intracardiac pressures and oxygen saturations.
- Passage of electrophysiological instruments.
- Passage of angioplasty and valvuloplasty balloons.

The catheter is manipulated under fluoroscopic guidance. The patient is usually awake and on a cardiac monitor throughout. Most diagnostic studies are conducted as day cases.

Left heart catheterisation^[1] ^[2]

This is performed via the arterial route:

- On the basis of improved clinical efficacy and safety endpoints, transradial access has become the preferred approach for percutaneous coronary procedures. Functional hand dysfunction is very rare after transradial access, and non-specific sensory symptoms or muscle weakness typically resolve over time.^[3]
- The femoral artery is also used as an access point.
- The brachial artery may be used. This is usually done percutaneously rather than with surgical exposure of the artery.

Diagnostic uses^[1]

Cardiac catheterisation allows for diagnostic confirmation and more detailed information after non-invasive studies. It can be used in assessment of the following:

- Left ventricular function.
- Severity of mitral and aortic valve disease.
- Outflow tract obstruction.
- The extent and severity of coronary artery disease (coronary angiography is the most common diagnostic study).
- Left ventricular biopsies may be taken (for example, in cardiomyopathies).
- Electrophysiological provocation studies can be performed (for example, for ventricular tachycardia).

The National Institute for Health and Care Excellence (NICE) recommends that angiography should be performed as soon as possible for patients who are clinically unstable or at high ischaemic risk. ^[2]

Therapeutic interventions

Detailed analysis of the merits of such interventions is beyond the scope of this article. Such interventions have a role following [acute coronary syndrome](#) and [acute myocardial infarction](#), as well as balloon valvuloplasty, and septal infarction by alcohol injection for [hypertrophic obstructive cardiomyopathy \(HOCM\)](#).

See also the article on [Percutaneous Coronary Intervention](#).

Right heart catheterisation

This is performed by the venous route, via the femoral, internal jugular, subclavian or forearm veins. ^[4]

Diagnostic uses

Right heart catheterisation allows:

- Measurement of cardiac output, left ventricular filling pressure and pulmonary artery wedge pressure.
- Measurement of right heart oxygen saturations (for example, for septal defects).
- Assessment of pulmonary hypertension (for example, prior to cardiac transplantation).

- Electrophysiological provocation studies.

Therapeutic interventions

These include:

- Right-sided valvuloplasties.
- Radiofrequency ablation of, for example, the accessory pathway in Wolff-Parkinson-White syndrome.
- Direct thrombolysis into the pulmonary artery for massive pulmonary embolism.
- Insertion of electrodes for cardiac pacemaker devices.

In the critically ill patient, right heart catheterisation with a Swan-Ganz catheter may be used for acute monitoring of left and right ventricular function, to guide treatment and to monitor the effects of intervention. It has no direct therapeutic function. The catheter is usually inserted via the internal jugular or subclavian vein. Potential indications include:

- Shock (cardiogenic versus noncardiogenic).
- Respiratory distress (cardiogenic versus noncardiogenic).
- Complicated myocardial infarction.
- Monitoring effects of drugs (for example, cardiac inotropes).
- Assessing fluid requirements in patients with, for example, multi-organ failure.

Preparation for cardiac catheterisation

This will include:

- Investigations: day-case angiography does not usually require any routine pre-procedure investigations other than:
 - ECG.
 - Blood tests: FBC, U&E, clotting studies and group and save.

- Full explanation of the procedure with informed consent: it is not usually painful, although the injection of dye causes a warm flushing sensation.
- **Premedication:** anxious patients may require premedication.

Contra-indications

Once consent has been given, there are no absolute contra-indications to cardiac catheterisation. The outcome of the procedure should have potential benefit greater than the risk associated with the procedure. However, a widespread risk-averse strategy to angiography may be preventing higher-risk patients from having revascularisation procedures. [5]

- Relative contra-indications include:
 - Severe hypertension.
 - In shocked patients (for example, in acute gastrointestinal haemorrhage).
 - Severe anaemia.
 - Acute kidney injury.
 - Severe congestive cardiac failure.
 - Allergy to the contrast medium.
 - Active infection or unexplained fever.
- Caution is required in higher-risk patients - for example, in:
 - Extremes of age (under 1 year and over the age of 60 years). [6]
 - Severe coronary artery disease affecting the left main stem.
 - New York Heart Association Classification class IV.
 - Left ventricular ejection fraction <30%.
 - Recent cerebrovascular disease.
 - Chronic obstructive pulmonary disease.

Complications^[7]

Cardiac catheterisation and coronary angiography are usually very safe, with only minor complications such as bleeding at the catheter insertion site and bruising. There is a very small risk of more serious complications, such as:

- False aneurysm (a firm, pulsatile swelling) – confirm with ultrasound.
- Dye reaction – skin reactions, nausea and vomiting, transient cortical disturbance; usually settle within 24 hours. Early fever is usually a dye reaction.
- Infection (relatively low rate).
- Loss of distal pulse(s).
- Angina and myocardial infarction.
- Arrhythmias.
- Pericardial tamponade.
- Stroke.
- Renal dysfunction.

Further reading

- [O'Gallagher K, Dancy L, Pearce L, et al](#); Interpretation of cardiac catheterisation reports: a guide for primary care. Br J Gen Pract. 2017 Oct;67(663):481-482. doi: 10.3399/bjgp17X693053.

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Originally Published: 20/11/2023	Next review date: 20/09/2023	Document ID: doc_1907

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