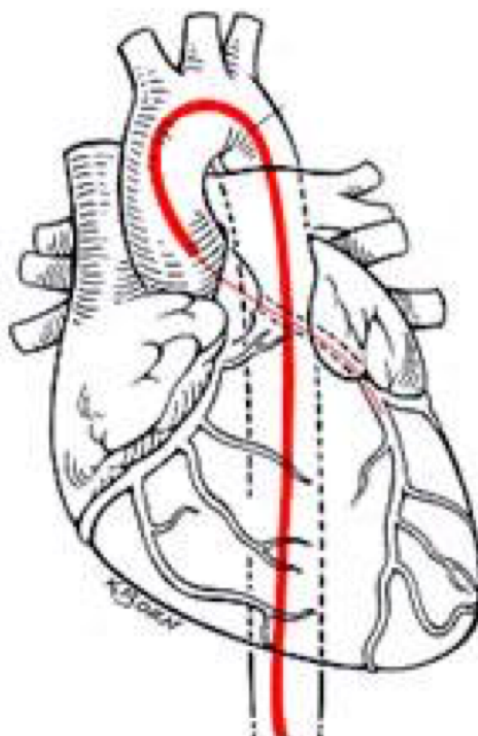


Cardiac Cath Labs

Student Nurse Introduction & Welcome Pack



Student	
Allocated Mentor	
Placement Date	

Tina Prestwood, Manager Cardiac Catheter Laboratories

Version: V1.0

Review Due: 1 Feb 2015

CONTENTS

1	Introduction
2	Radiation Protection
3	What is a Cardiac Cath Lab/A Short History
4	The Multi-disciplinary Team
5	Daily Routine
6	Diagnostic Angiogram/Indications & Contraindications
7/8	Radiographic Views
9	Routes of Access
10	Percutaneous Coronary Intervention
11	Stents
12	Cardiac Pacing
13	Pacing diagram
14	Potential Complications & Emergencies
15	Quiz
	Appendices
16	Further Reading
17	Cardiac Cath Lab Abbreviations
18	Commonly-used drugs
19	Student Feedback

INTRODUCTION

Welcome to the Cardiac Cath Labs located on the 1st Floor, Trelawney Wing. The Cardiac Cath Labs are part of the Medical Division, working in conjunction with the Cardiac Investigation Unit, Coronary Care Unit and Roskear wards, providing an elective and acute service for cardiac patients in Cornwall and the Isles of Scilly. Our busy multi-disciplinary team staff two Cardiac Catheter Labs Monday to Friday as well as an on-call out of hours emergency service.

The Cath Lab manager is Tina Prestwood. Our daily working pattern is 08.00 – 18.00. Please contact your mentor for duty allocation. We will always aim to maximise your time spent with your mentors.

We are a friendly team, who take pride in providing a high standard of care to our patients and also to furthering the education of the team and others. We have an experienced multidisciplinary team who are keen to share their knowledge, skills and experiences with you, but ultimately you must remember it is your placement and is your responsibility to learn and meet all your learning needs, ie:

To gain an understanding of cath lab procedures; cardiac anatomy; ECG recognition; indicators for treatment; the role of cath lab nurse and multi-disciplinary team members; patient pathway; emergency treatment for myocardial infarction etc.

Your first shift

On the day of your first shift please report to the nurse in charge on your arrival. He/she will walk you through some housekeeping and orientate you to the environment prior to your start in the lab.

Radiation Protection

Both of our Cath Labs have viewing areas that are protected from radiation by a large lead-lined glass shield. It is not necessary to wear lead protection in this area. Lead protection can either be a separate skirt and top, or a one-piece apron. You must also wear a lead thyroid shield.

Once inside the operating area, you should always ensure you have lead protection during cases until the Radiographer states that the X-Rays have been switched off.

Sickness

You are required to telephone the Cath Lab on 01872 254625/01872 252227 and speak to the nurse in charge if you are not able to attend your shift. Please note this is in addition to contacting the university.

If you have a problem whilst on placement with us, your mentor should be your first point of contact. If you are not working with your mentor then the nurse in charge should be able to provide you with assistance.

What is a Cardiac Catheter Lab?

A Cardiac Catheterisation Laboratory or Cath Lab is an examination room in a hospital with diagnostic imaging equipment used to visualise the arteries of the heart and the chambers of the heart and treat any stenosis or abnormality found.

An overview of procedures performed in our Cath Labs:

Diagnostic angiography

Angioplasty

Pacing

Electrophysiology

A short history of cardiac catheterisation

1929: Werner Forssmann performed a right heart catheterisation study on himself, by using a modified urinary catheter. It was inserted into the internal jugular vein and through the right atrium by using fluoroscopic control and a mirror.

1941: Cournand catheterised the right ventricle obtaining further information.

1947: Zimmerman performed the first simultaneous left and right heart catheterisation.

1953: Seldinger developed his eponymous technique for percutaneous vascular access.

1977: Gruntzig performed the first coronary angioplasty on a 38 year old male.

1986: The first coronary artery stents were implanted.

Cardiac Catheterisation is the generic term used to describe the introduction of a thin flexible hollow tube (catheter) to the left or right side of the heart. It is a minimally invasive procedure carried out in a sterile environment under fluoroscopy (X-Ray). The procedure is used to identify coronary artery disease, identify abnormalities of the heart muscle and valves, and also obtain information on congenital heart abnormalities.

Cath Lab Multi-Disciplinary Team

The minimum staffing required to safely run a Lab list is:

- Cardiologist
- Scrub Nurse
- Circulating Nurse – one nurse for Diagnostic Angio/Pacing/Electrophysiology procedures, two if case list includes PCI
- Cardiac Technician
- Radiographer

As part of your placement with us you will have the opportunity to shadow each discipline to gain understanding of their role and responsibilities as part of the cath lab team. We will also aim to give you the chance to observe as many different procedures as possible to get the most from your placement with us.

Our Nursing team covers the Labs from 8am – 6pm Monday to Friday. We have capacity to run between 18-20 procedure lists each week over the two Labs. **In general, Lab 1 is the 'Cold lab' (mostly elective with some in-patients) and Lab 2 is the 'Hot lab' (mix of elective/in-patients, and any critically unstable cases/PPCI that may arise).** Depending on the type of procedure our patients undergo we can often see between 8-12 cases in both Labs each day.

Nursing Responsibilities

- Monitoring patient vital signs
- Advocate for patient
- Pre/post procedure checks
- Maintain sterility throughout procedure
- Preparation of equipment
- Second Operator to consultant
- Administering medication
- Liaising with other departments and multi-disciplinary team
- Ensure smooth running of the list
- Stock ordering
- Hand over to recovery nurse
- Documentation of procedure

Daily Routine

Prior to the lists starting each day, we ensure that the Labs are a safe environment by completing the following:

• Damp dust surfaces
• Check crash trolley and wall suction/O₂
• Check suction, O₂ and monitor on anaesthetics machine
• Perform quality control testing on Hemochron ACT anti-coagulation monitor and Nova Statstrip Blood Glucometer
• Check controlled drugs
• Check Baxter and Alaris infusion pumps
• Check drugs fridge temperature
• Re-stock the Lab as necessary

The first patient should arrive with our Cath Lab Porter for 08.45am. The morning list should aim to finish by 12.45pm and restart at 13.30pm, but this can be negotiable. Generally, our lists are finished by 17.30pm. We then ensure the Lab is re-stocked and ready for the next day.

Diagnostic Angiogram

Coronary Angiogram is the 'Gold Standard' diagnostic investigation for those patients with suspected or known coronary artery disease.

Indications

A diagnostic angiogram will be performed to assess:

- Extent of coronary artery disease - will subsequently determine treatment (medical therapy, PCI or CABG)
- Suspected myocardial infarction
- Patency of cardiac bypass grafts
- Patients presenting with symptoms relating to suspected restenosis of a previously implanted coronary stent
- Patients prior to cardiac surgery (e.g. heart valve repair/replacement)
- Left ventricular function and pressures (left ventriculography)
- Suitability and fitness for non-cardiac surgery
- Patients prior to transplant (e.g. renal)

Relative Contraindications

- Severe peripheral vascular disease
- Aortic aneurysm
- Renal failure
- Unstable cardiac failure/arrhythmias
- Haemodynamic instability
- Severe reaction to contrast agents

Pregnancy is an absolute contraindication

A routine angiogram takes approximately 15-20 minutes, following which the cardiologist will be able to advise the patient on the best treatment option available.

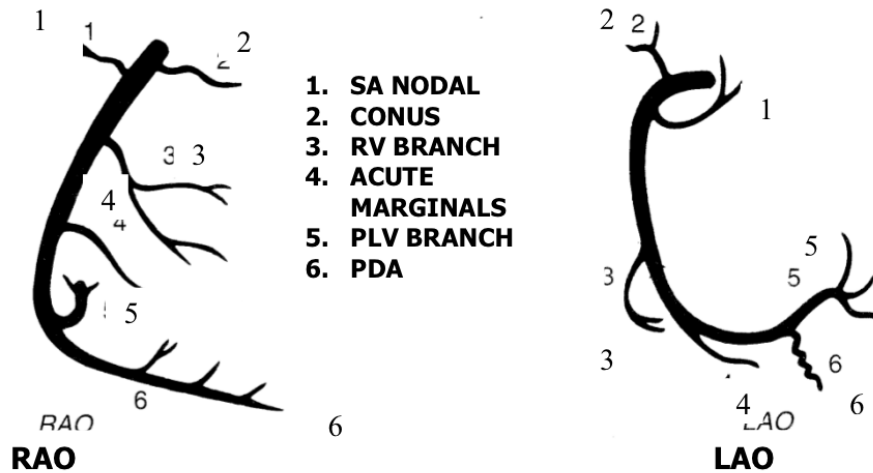
The heart has three main coronary arteries that will be visualised during an angiogram:

- LAD (left anterior descending)
- Cx (circumflex)
- RCA (right coronary artery)

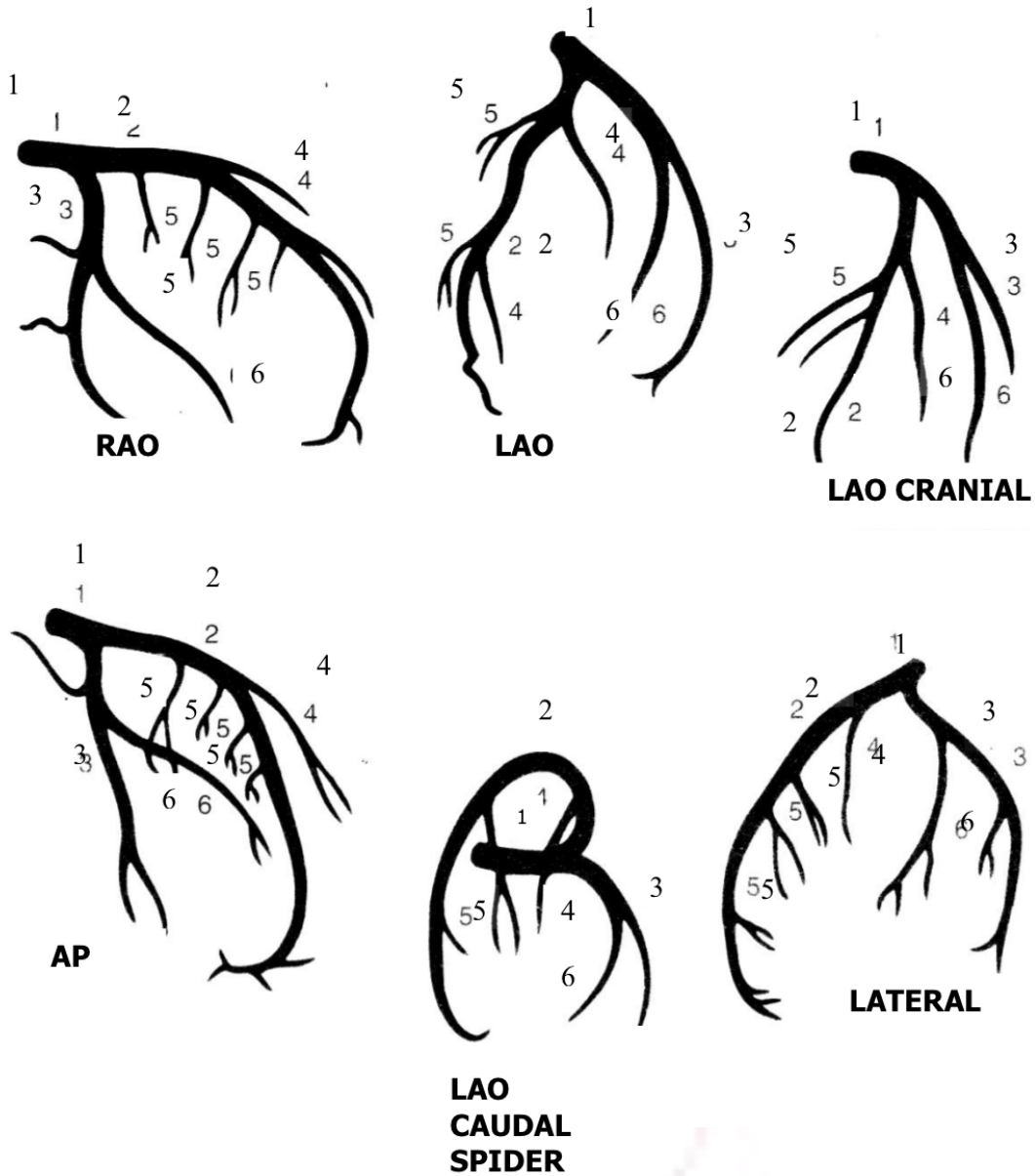
The left main stem (LMS) splits into the LAD and Cx.

Radiographic views of the coronary arteries

Right Coronary Artery



Left Coronary Artery



1. LEFT MAIN
2. L.A.D.
3. CIRCUMFLEX
4. DIAGONALS
5. SEPTALS
6. OBTUSE MARGINALS

Routes of vascular access

Pre-procedure, the cardiologist will select the preferred access site - both right and left radial and femoral vessels can be used.

Following local anaesthesia, the site is punctured with a hollow needle (Seldinger technique). Once arterial flow is observed, a fine wire is advanced through the needle to the vessel and the needle removed over the wire. A sheath and dilator is then introduced. Finally, the wire and dilator is removed, allowing catheter and guidewire advancement through the sheath via a haemostatic valve without blood loss.

Radial Artery	
Advantages	Easy to access in most patients
	Easy to control bleeding at site - haemostasis achieved with TR Band compression
	No prolonged bed rest post-procedure
Disadvantages	Has tendency to spasm especially if small, resulting in patient discomfort (vasodilators may ease this - if severe revert to femoral)

The Allen's Test

As part of the checklist, the Allen's test is performed on the radial artery to ascertain suitability for access:

- Attach pulse oximetry to patient's hand, observe waveform
- Occlude both radial and ulnar artery until waveform is flat
- Release ulnar artery, observe for return of satisfactory waveform
- Occlude both again, release radial artery, observing for the same

Femoral Artery	
Advantages	Easy access - larger artery compared to radial
	No risk of spasm
	Haemostasis can be achieved with Angioseal collagen plug device in Lab if suitable, which enables patient to sit up in bed post procedure
Disadvantages	May be difficult to access/painful if peripheral vascular disease present
	If unsuitable for Angioseal post procedure, patient to lie flat as per protocol following sheath removal and digital compression on ward
	Digital compression time-consuming for ward nurse and potentially uncomfortable for patient

Percutaneous Coronary Intervention (PCI)

All patients considered for PCI should be pre-loaded with the appropriate dose of Aspirin and Clopidogrel (dual anti-platelet therapy) to prevent stent thrombosis post procedure.

In the event of PPCI, Prasugrel is given in place of Clopidogrel.

In general, a patient who has no blockages in the LMS or who has less than three diseased coronary arteries will be considered for PCI to aim to reduce anginal symptoms.

Angioplasty & Stenting

Once the target lesion has been identified, the diagnostic catheter will be exchanged for a guide catheter that will support the passing of wires, balloons and/or stents (a small wire mesh tube) to the artery.

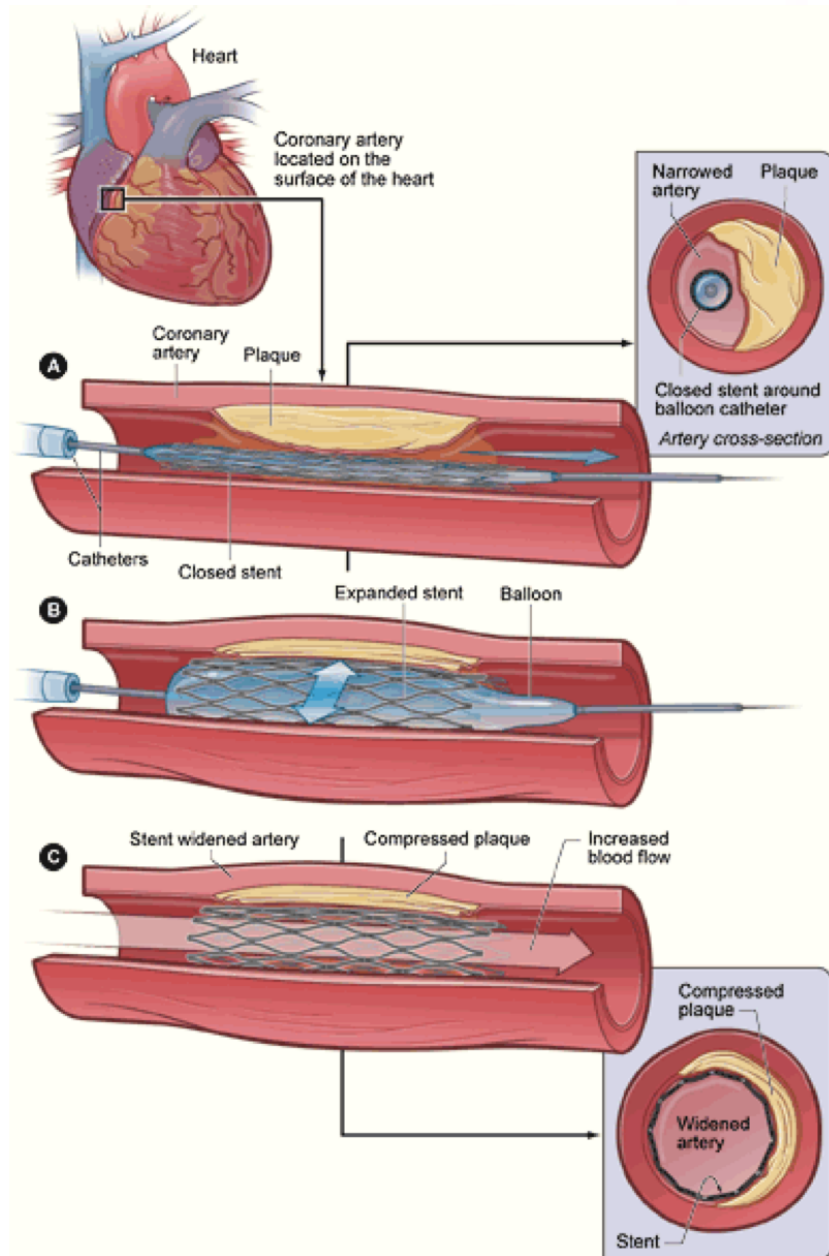
A fine angioplasty wire is advanced to the distal part of the artery. Once adequate wire position has been obtained, a pre-mounted monorail balloon can be advanced over the wire to the lesion and inflated at high pressure for a few seconds. The patient may experience anginal-like symptoms during this time, as the inflated balloon will temporarily occlude the vessel. Balloon angioplasty aims to press the atheroma against the artery wall and improve blood flow, paving the way for stent insertion.

Stents

There are two types of stent – **bare metal** and **drug eluting**.

Various factors will be taken into account as to the most appropriate stent choice for the patient such as:

- Size and shape of the narrowed part of the artery
- Presentation of the patient and symptoms
- Any planned surgery which may interfere with taking dual anti-platelet therapy post procedure



Cardiac Pacing – Overview

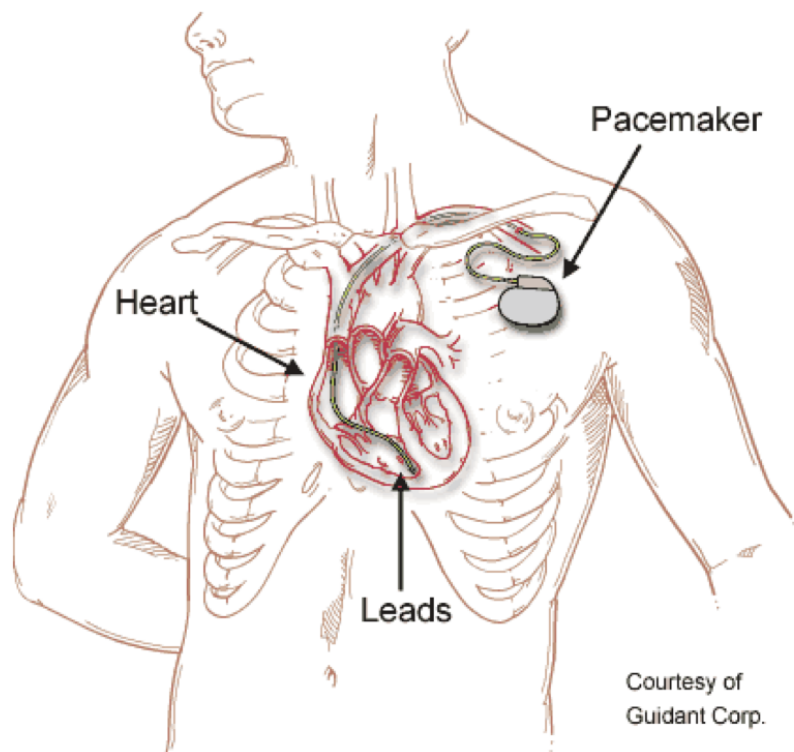
Cardiac cath lab 1 is our pacing lab, therefore the majority of our cardiac pacing procedures are carried out in this lab. Cardiac pacing is our most invasive procedure therefore sterility is of paramount importance.

We keep staffing to a minimum whilst carrying out these procedures and all members of the team are required to wear theatre hats, with the consultant and scrub nurse both wearing masks in addition to the hats and gowns.

Listed below is an overview of our cardiac pacing procedures.

Procedure	Description
PPM	• Indicated for bradyarrhythmias • Inserted under local anaesthetic using a subcutaneous cut-down procedure • Usual site is the left pre-pectoral region • A battery operated generator placed in a pocket controls the electrical stimulation of the heart via one or two electrodes • Access for electrodes is via the cephalic or subclavian vein, targeting the right atrium (RA) &/or right ventricle (RV)
ICD	• Indicated for monitoring of VT, VF and bradycardia • Principles of insertion as above, however the electrode placed in the RV will be capable of delivering defibrillation if indicated
CRT	• Indicated in severe heart failure • Electrodes inserted to RA, RV & coronary sinus • Can be Pacemaker or Defibrillator
Generator Change	• Pacemaker batteries last for approx. 8-12 years depending on frequency of use, after which they are replaced
Loop Recorder	• Indicated for unexplained syncope • Inserted subcutaneously in left pre-pectoral pocket • Device can be activated by person/carer when symptoms occur • Ability to monitor and store information preceding and following such events, which can be retrieved by Technician • Battery lasts approx 18-24 months
TPW	• Inserted when a patient is haemodynamically compromised by bradycardia

Single-chamber pacemaker implant



(single-chamber pacemaker ECG rhythm strip showing pacing spikes)

Cath Lab Complications and Emergencies

Unlike many other clinical areas, the patient in the Cath Lab is monitored in a very controlled environment, so we are able to detect and manage any deterioration in condition quickly.

Although these are relatively infrequent, it is essential to have an awareness of potential problems. The risks can increase with the patient's presentation, age and co-morbidities, and the complexity of the case:

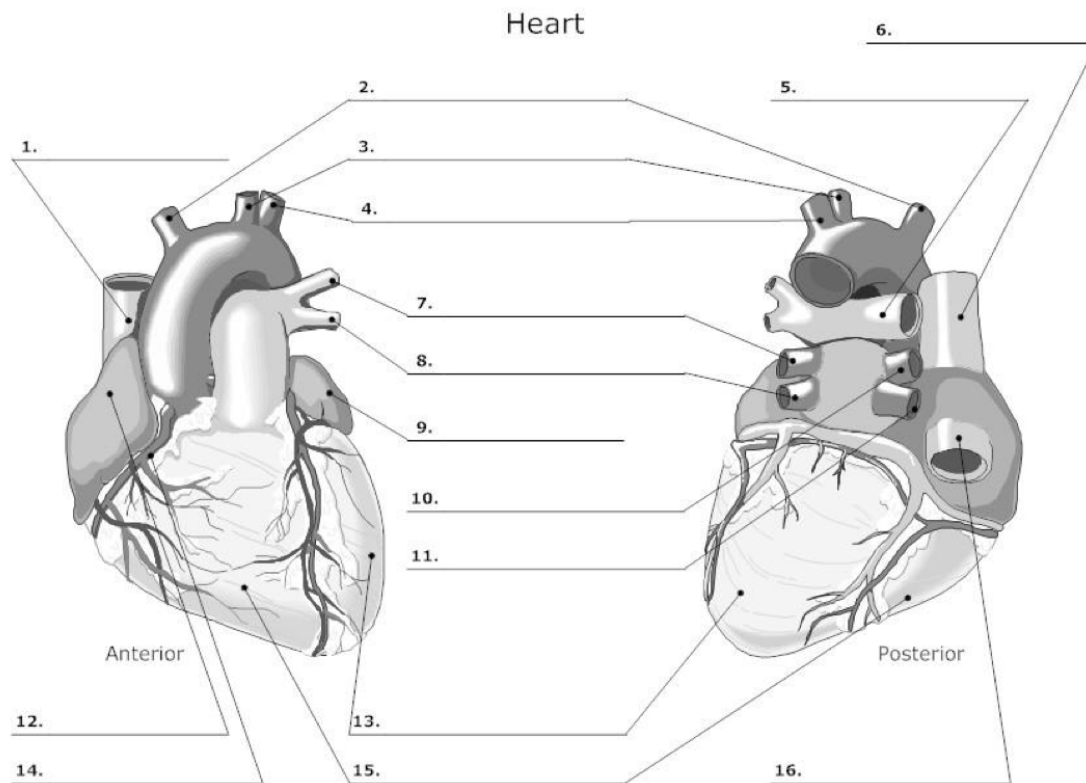
- **Haematoma formation/Vascular complications** at site of vascular access
- **Allergic reaction to contrast dye** (e.g. rash, pruritis, wheeze, angioedema)
- **Vasovagal reaction** (e.g. during arterial puncture or compression haemostasis)
- **Arrhythmia** (can be transient and benign, but can also result in VF/VT due to catheter placement)
- **Bradycardia** - can be common during contrast injection, especially of the RCA which covers the territory of the heart's natural pacemaker system: may result in emergency insertion of temporary pacing wire to externally pace if severe
- **Coronary dissection** (separation of the layers of the vessel wall, can be due to contrast injection, or, catheter, wire or balloon manipulation)
- **Cardiogenic shock/left ventricular failure** resulting in insertion of IABP

Rarely:

- **Myocardial infarction**
- **Need for emergency CABG** (transfer to Plymouth)
- **Stroke**
- **Death**

CATH LAB QUIZ

Please label the diagram below



LIFEART Collection Images Copyright: © 1989-2001 by Lippincott Williams & Wilkins, Baltimore, MD

Who carried out the first coronary angiogram?
What does PCI stand for?
What are the 2 routes of arterial access for angiography/PCI?
1.
2.
Who is responsible for continuous ECG recording during procedures?
Name 3 potential complications of a PCI
1.
2.
3.
What is nitrate used for, and why?

Further reading/information

Websites:

British Heart Foundation
(BHF Patient booklets on CIU can be helpful to new starters!)
www.bhf.org.uk

British Cardiovascular Intervention Society
www.bcis.org.uk

Cardiology HD (Coronary Heart Magazine)
www.cardiologyhd.com

European Society of Cardiology
www.escardio.org

Books:

O'Grady, E. (2007) *A Nurse's Guide to Caring for Cardiac Intervention Patients* (Wiley) *Available at the Knowledge Spa Library*

Journal Articles:

Leahy, M. (2006) *Primary Angioplasty for acute ST-elevation myocardial infarction*; Nursing Standard. 21, 12, 48-56

Jackson, A. (2010) *An Overview of Permanent Cardiac Pacing*; Nursing Standard. 25, 12, 47-57

Abbreviations

LHC	Left Heart Catheterisation (Diagnostic Angiogram)
RHC	Right Heart Catheterisation (Diagnostic Study of Right Heart Pressures)
LHC ?Proceed	Diagnostic Angiogram ? Proceed to Angioplasty/Stenting
LHC & grafts (+/- PCI)	Diagnostic Angiogram of native coronary arteries and coronary artery bypass grafts (+/- PCI)
PCI	Percutaneous Coronary Intervention
PPCI	Primary PCI
PWS	Pressure Wire Study
IVUS	Intravascular Ultrasound
Rotablation	Rotational Atherectomy (burring of atheroma)
CTO	Attempt to re-open Chronic Total Occlusion of coronary artery
IABP	Intra-Aortic Balloon Pump
PPM	Permanent Pacemaker
ICD	Implantable Cardioverter Defibrillator (Carried out under General Anaesthetic/Conscious Sedation with Anaesthetist)
CRT-P	Cardiac Resynchronisation Therapy-Pacemaker
CRT-D	Cardiac Resynchronisation Therapy-Defibrillator (Carried out under General Anaesthetic/Conscious Sedation with Anaesthetist)
Generator Change	Pacing Device Box Change
Loop Recorder	Insertion or removal of 'Reveal' Device
TPW	Temporary Pacing Wire
EPS +/- RFA	Electrophysiology Study +/- Radiofrequency Ablation
AV Node Ablation + PPM	AV Node Ablation & insertion of Permanent Pacemaker
VT Stim	Attempt to induce the tachyarrhythmia VT

Commonly Used Drugs

Drug	Usage
Lidocaine 1%	Local anaesthetic to site of access
Lidocaine 1% with Adrenaline (Xylocaine)	Used by some cardiologists in pacing procedures - local anaesthetic with vasoconstrictor which reduces bleeding at site
Diazemuls (mg)	Light sedative to reduce anxiety and possibly radial artery spasm, dose usually starts at 2.5mg IV Monitor sats and respiratory effort throughout, oxygen if applicable - caution in elderly
Heparin (iu)	5,000iu administered IA for anti-coagulation by most cardiologists in diagnostic angio via radial Weight adjusted (70iu per kg) if PCI
Nitrate (mcg)	Vasodilator, used for reduction of arterial spasm Also used IC to dilate vessel Caution in hypotension, may cause headache
Verapamil (mg)	Used alongside Nitrate as a 'radial cocktail' to reduce spasm pre-catheter advancement
Morphine (mg)	Titrated for moderate to severe pain, especially in PCI, PPCI or difficult arterial access Dosage usually starts from 5mg IV, monitor sats and respiratory effort – caution in elderly
Metoclopramide (mg)	Anti-emetic, 10mg given IV in conjunction with Morphine to reduce nausea and vomiting
Adenosine (mg)	Used IV to obtain maximum hyperaemia (blood flow) during PWS
Integrilin (Eptifibatide)(mg)	IV Antiplatelet drug – weight adjusted double bolus 10 mins apart, then infusion
ReoPro (Abciximab)(mg)	IV Antiplatelet drug – weight adjusted single bolus then infusion (bolus on occasion IC)
Gentamicin (mg)	Antibiotic generally given SC post pacing device implant
Prasugrel (mg)	Antiplatelet drug, 60mg given orally pre PPCI

Student Feedback

We hope you have enjoyed your placement with us. To ensure we give students a positive learning experience in the Cath Lab we continually monitor our performance through your comments. This student orientation pack is new and we would be grateful for your feedback. All feedback will remain anonymous and will be treated confidentially.

Many thanks

(Please detach and return this sheet once completed to your Cath Lab mentor).

Have you found this pack useful for your placement in the Cath Lab?

Is there anything you would include that isn't included?

Has the placement met your learning goals?

What would improve your placement experience?