

Pericardiocentesis

Indications: cardiac tamponade (emergency); diagnosis of cause of pericardial effusion; drainage for palliative or prophylactic reasons

Contraindications: aortic dissection

Relative contraindications: coagulopathy (INR >1.4, platelets <50, oral anticoagulant <24 hours, clopidogrel <7days)

Surgical drainage preferred if: traumatic haemopericardium; purulent pericarditis; recurrent malignant effusion; loculated posterior effusion; pericardial biopsy required

Guidance: ultrasound guidance is preferred; however, if the patient is critically unwell and ultrasound is unavailable, electrocardiographic monitoring may be used (or procedure may be performed blind in cardiac arrest)

Introduction

Skip this section if being performed in critically unwell patient

- **W**ash hands, **I**ntroduce self, **P**atients name & DOB & wrist band, **E**xplain procedure and get written consent
 - Risks: pain; bleeding; infection; organ puncture & damage (lung, heart, spleen, liver, stomach); pneumothorax; coronary artery injury; internal thoracic artery injury; diaphragmatic injury; cardiac arrhythmias; death
- ****Check patients clotting screen, platelet count and if they have been on an oral anticoagulant/clopidogrel****
- Perform pre-procedure observations and ensure patient has IV access
- Ensure assistant is available and clinical and non-clinical bins are close by to dispose of waste
- Confirm pericardial effusion using echocardiography, review images from possible insertion points (see below) and measure the distance of the pericardium from the skin



Preparation part

- Wash hands and apply surgical hat and mask
 - Clean a large trolley
 - Gather equipment onto bottom of trolley (think through what you need in order)
 - 2x Cleansing snap-sponges (iodine or alcohol/chlorhexidine)
 - Sterile drape with hole in centre (or 2-3 drapes without holes in)
 - 10ml syringe and 3 needles (1 orange 25G, 2 green 21G) for local anaesthetic
 - 10ml syringe for aspiration during introducer needle insertion
 - 2x 10ml syringes and 1 green 21G needle for agitated saline flush
 - 50ml syringe for aspirating
 - Pericardial drain kit
 - Scalpel and blade
 - Introducer needle with syringe
 - Guidewire
 - Dilators
 - Pericardial drain tube
 - 3-way tap
 - Drainage bag with connection tubing
 - Alligator clip electrocardiographic monitoring cable
- NOTE: if not placing a catheter, you can use a pink 18G spinal needle with large syringe and 3-way tap for multiple aspirations*
- Cotton gauze swabs (used whenever needed throughout procedure to dry/clean sterile area)
 - 2-0 silk suture (large hand-held needle) *if planning to leave drain in place*
 - Sterile dressing
 - Sterile ultrasound probe cover and sterile ultrasound gel
 - Equipment to be kept outside of the sterile field
 - Chlorhexidine hand scrub solution
 - Sterile theatre gown
 - Sterile surgical gloves
 - Ultrasound scanner with cardiac probe
 - 20ml 1% lidocaine (maximum 3mg/kg – note 1ml 1% lidocaine = 10mg)
 - 10ml normal saline
 - *If using electrocardiographic monitoring, cardiac monitor*
 - Walk to patient
 - Wash hands
 - Open the pericardial drain kit to form a large sterile field on the top of the trolley
 - Open packets (without touching the instruments themselves) and drop sterile instruments neatly into the sterile field

Patient part

Positioning and exposure

- Fully expose the anterior patient's chest
- Position patient lying supine on the bed at 30-45° with arms rested by side
- Identify insertion point, options:
 - Sub-xiphoid approach: just below xiphoid, slightly to the patient's left, at 30° from horizontal plane, aiming towards left shoulder
 - Apical approach: 5th intercostal space, mid-clavicular line, aiming towards right shoulder
 - Para-sternal approach: 5th intercostal space, immediately lateral to left sternal edge with needle perpendicular to skin

Preparation

- Wash hands using Chlorhexidine solution, then apply sterile gown and gloves using the [surgical scrub technique](#)
- Sterilize area
 - Work from middle outwards in one spiral motion using cleansing snap-sponge (sterilise the entire anterior chest)
 - Repeat this with 2nd cleansing snap-sponge
 - *Discard used snap-sponges as they are no longer sterile, but note all equipment used after this (including all needles) can be returned to the sterile field after use*
 - Apply the sterile drape over the patient's body so that the hole is in the correct place to allow access to the insertion site (or apply 2-3 drapes centred around exposed insertion site if no holes)
- With the help of the assistant, apply the sterile ultrasound cover and the sterile ultrasound gel and then hold the probe adjacent to the insertion point whenever a needle is being infiltrated to allow real-time ultrasound guidance
- Anaesthetise area
 - Ask assistant to snap open lidocaine bottle and hold open upside-down
 - Draw up lidocaine using 1st green needle on 10 ml syringe and expel any air
 - Change to the orange needle and insert at an acute angle to form a single subcutaneous bleb around insertion site in order to anaesthetise the skin
 - Change to the 2nd green needle and anaesthetise the insertion tract
 - This is done by instilling lidocaine in small increments of increasing depth
 - Always aspirate when advancing the needle (so you know if you get to the pericardial cavity) and aspirate before injecting lidocaine (to check you are not in a vessel)
 - Wait 1 minute to work

Insertion procedure

- Make a 5mm skin incision (with the scalpel perpendicular to the skin, press the scalpel blade straight in and out)
 - Introducer needle insertion
 - *If using electrocardiographic monitoring*, attach the alligator clip of the electrocardiographic monitoring cable to the distal needle and ask the assistant to attach the other end to a cardiac monitor lead
 - Insert introducer needle
 - *Sub-xiphoid approach*: just below xiphoid, slightly to the patient's left, at 30° from horizontal plane, aiming towards left shoulder
 - *Apical approach*: 5th intercostal space, mid-clavicular line, aiming towards right shoulder
 - *Para-sternal approach*: 5th intercostal space, immediately lateral to left sternal edge with needle perpendicular to skin

NOTE: the needle should be inserted lateral to the ultrasound probe, in the probe's horizontal plane so the needle can be visualised the entire time

 - Once the introducer needle has punctured the skin, remove the stylet (if present) and attach a 10ml syringe
 - Slowly advance the needle through the insertion tract while:
 - Aspirating during infiltration
 - Watching the ultrasound monitor to guide needle
 - *If using electrocardiographic monitoring*, watch the cardiac monitor for ST elevation as the needle makes contact with the right ventricle
 - When pericardial fluid is aspirated, stop and remove the syringe from the needle
- Position confirmation with agitated saline (*if using ultrasound guidance in non-emergency setting*)
 - Attach a 3-way tap to the end of the needle, with the needle's port closed (off switch pointing to that port)
 - Ask assistant to snap open 10ml normal saline bottle and hold open upside-down
 - Draw up 5ml of the saline using a green needle on 10 ml syringe and expel any air and place in sterile field
 - Attach an empty 10ml syringe to a free port of the 3-way tap and move the off switch to close the empty port
 - Aspirate 5ml of pericardial fluid
 - Now attach the saline filled syringe to the other empty port and move the 3-way tap off switch to close the pericardial needle's port
 - Holding the two syringes, expel each in turn repetitively to mix and agitate the saline with the pericardial fluid between the two syringes
 - When it makes a foamy colour, draw all of the fluid up in one of the syringes



- Close the empty syringe's 3-way tap port and inject the 10ml of agitated saline/pericardial fluid back in to the pericardium
- Observe the ultrasound monitor to confirm the air bubbles are contained within the pericardial fluid
- Remove the 3-way tap
- **Guidewire insertion**
 - Insert the guidewire through needle so half the wire is in the chest
 - From now on, keep hold of the guidewire at all times with one hand, as close to the skin as possible – you can hold it in a loop to make things easier
 - Withdraw the needle and thread it right the way off the end of the guidewire, ensuring the guidewire remains in place
- **Tract dilation**
 - Thread the smallest dilator over the guidewire and insert into the chest with a rotational movement
 - Withdraw the dilator and thread it right the way off the end of the guidewire, ensuring the guidewire remains in place
 - Repeat this with all of the dilators, working your way up the sizes
- **Drain insertion**
 - Thread the drain over the guidewire until the tip is near the skin
 - Now retract the guidewire slowly until the end comes out of the drain
 - Holding the end of the guidewire, insert the drain into the chest
 - When the drain is in place, remove guidewire
 - Attach the 3-way tap with the drain's port closed (hold finger over end of drain to stop spillage until this is attached)
- **Complete circuit**
 - Attach drainage bag tubing to the end port of 3-way tap
 - Move the 3-way tap's off switch to close the empty middle port to allow free drainage of pericardial fluid into the drainage bag

Drainage options

1. **Free drainage (leaving drain in situ):**
 - Suture the drain in place
 - Apply sterile dressing
 - Allow free drainage for ~30minutes prior to drain removal, or leave in place if likely to re-accumulate
2. **Multiple aspirations (then immediate removal):**
 - Attach 50ml syringe to middle port of 3-way tap and close the drainage bag's 3-way tap port
 - Aspirate 50ml of pericardial fluid
 - Close the pericardial drain's 3-way tap port and expel the syringe contents, which will then be diverted into the drainage bag
 - Move the 3-way tap's off switch back to close the drainage bag's 3-way tap port and repeat the process
 - Keep repeating the aspiration process above until there is no more fluid to aspirate then remove drain

Removal

- Cut and remove the suture if present
- Remove the drain
 - Close the pericardial drain's 3-way tap port
 - Place a gauze over the drain site and slowly retract the drain
- Apply a sterile dressing

To complete

- Collect and send samples if required
- Thank patient and cover them
- Bin waste and gloves, dispose of sharps safely in sharps bin, clean trolley and wash hands
- Fully document procedure in patients notes
- Ensure patient is monitored for a few hours and review patient later