Chapter 42
Pericardiocentesis

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42.1 Introduction

The pericardial space normally contains several ml of serous fluid. Due to diseases and external or iatrogenic trauma, the fluid volume may increase, either acutely or chronically. The increase of volume and intrapericardial pressure may compress cardiac chambers and restrict filling, which may lead to a decrease in cardiac output and cardiac tamponade. Rapid accumulation of pericardial fluid may produce tamponade at much smaller volumes than when accumulation occurs over a longer period of time.

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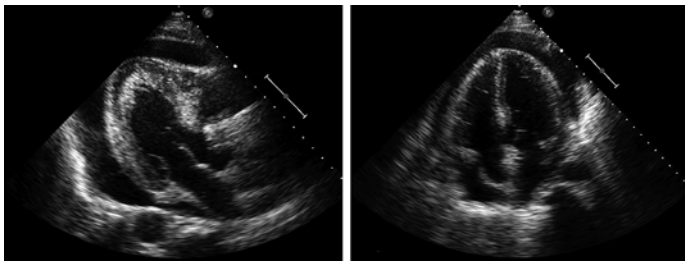

Fig. 42.1 Echocardiographic four-chamber and long-axis view showing moderate pericardial effusion

42.2 Diagnosis of Cardiac Tamponade

Pericardial effusion may present as an incidental finding on routine echocardiography or may be suspected because of a large heart contour on X-ray of a low-voltage ECG. The other extreme of the spectrum is the patient with acute low output due to cardiac tamponade where pericardial drainage is potentially lifesaving. Clinically low blood pressure, tachycardia and muffled heart sounds may raise suspicion. Echocardiography will reveal pericardial effusion (Fig. 42.1). Right atrial collapse in late diastole, increased tricuspid E-wave velocity during inspiration and decreased mitral E-wave velocity confirm the diagnosis of tamponade.

The urgency for drainage depends on the clinical picture, echo findings and patient history.

42.3 Indication for Pericardiocentesis

These are the indications for pericardiocentesis:

- Cardiac tamponade
- Impending cardiac tamponade

- Recurrent or persistent pericardial effusion
- Relief of symptoms due to pericardial effusion
- Need for diagnostic culture or fluid analysis

42.4 Complications

Potential complications of the pericardial puncture include visceral perforation, pneumothorax, haemothorax, coronary artery laceration and cardiac perforation (the inferior vena cava, right atrium, right or even left ventricle). Arrhythmias may occur, as well as transient hypotension and low cardiac output.

42.5 Contraindications for Pericardiocentesis

There is no absolute contraindication for pericardiocentesis in acute cardiac tamponade, but a variety of conditions may increase the risk of the procedure. Do realize that surgical drainage may be a superior alternative in some instances. Special caution should be taken in case of a traumatic bleed, bleeding diatheses and suspected purulent effusion. A small or posteriorly located effusion is difficult to reach, and if multiple septa are present, a simple puncture is likely to fail.

If in adults tamponade or haemopericardium is associated with aortic dissection, emergency surgery is the only reliable approach.

42.6 Preparation

In a nonurgent procedure, the patient and/or parents should be informed about the procedure and possible complications, and give consent.

Depending on local practice, the pericardiocentesis is performed either in the ICU or in the cath lab, with echo standby. Patient's ECG, heart rate, blood pressure and oxygen saturation are monitored continuously. The echo machine should be running and pericardiocentesis package prepared.

In children, general anaesthesia by a dedicated anaesthesiologist is helpful, as long as one realizes that induced changes in body position as well as vascular resistance may compromise the haemodynamic condition. Close collaboration between anaesthesiologist and cardiologist is essential, and the puncture should be performed directly after induction of anaesthesia.

Echocardiography is used for the confirmation of the appropriate puncture site for pericardial drainage and helps to assess at what depth the effusion is to be expected. Subsequently, it shows the position of the drain and relief of fluid volume.

42.7 Access and Drainage

A pericardial puncture set is prepared (Fig. 42.2).

Positioning the patient in a 30° head-up angle may help pooling the effusion at the inferior site of the heart. With the help of echocardiography, the location of the effusion is reconfirmed and the appropriate puncture site is marked. The patient is draped and cleansed with an aseptic solution. The skin and subcutaneous tissue are infiltrated with a local anaesthetic. The needle (appropriately long for patient size) is slowly advanced through the skin at an angle of 15–30° pointing at the left shoulder. Mild negative pressure with a 5–10 ml Luer-Lok syringe is applied. The patient monitor is continuously checked for arrhythmias. Passing the parietal pericardium into the pericardial space may be felt as a pop, and then it should be possible to gently aspirate fluid. When necessary, the access can be echocardiographically confirmed by injecting some agitated saline.

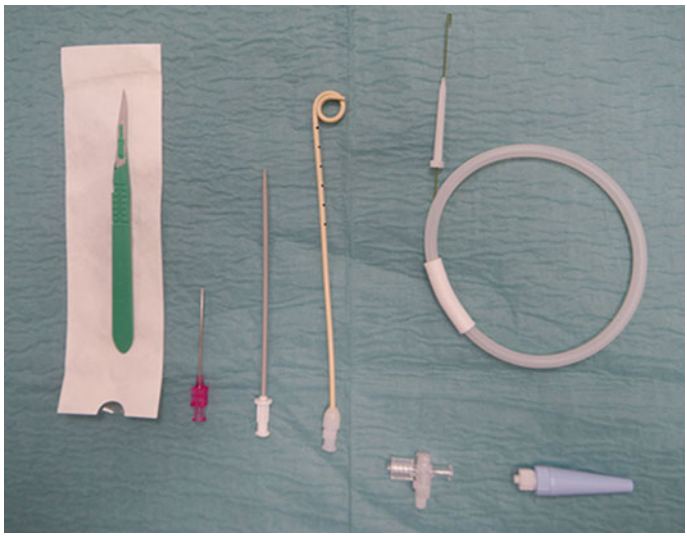

Fig. 42.2 Paediatric pericardial drainage set with scalpel (William Cook Europe, Bjaeverskov, Denmark)

(Alternative but nowadays less frequent used techniques include ECG monitoring from aspiration needle, pressure monitoring from aspiration needle, contrast injection and/or observation of wire curve once introduced during fluoroscopy).

Depending on the urgency and indication for pericardial drainage, some more fluid is aspirated and a J-wire is inserted. The wire advance should not be forced against resistance. The entry site is dilated with a 6–8 F dilator and a (pigtail) catheter with multiple side holes is advanced for continuing drainage. Fluid is collected for laboratory analysis and culture. A 3-way stopcock is connected with a 20–50 ml syringe and collection bag. The drain can be sutured if continued drainage is expected. In case of haemorrhagic fluid aspiration, a rapid comparison of the fluid and whole blood haematocrit may confirm the proper drainage site.

42.8 Monitoring After Drainage

Following the pericardiocentesis vital signs of the patient are closely monitored. An X-ray will confirm drain position and rule out pneumothorax. Drain volume is noted. Echocardiography should be repeated before drain removal and in case of suspicion of inappropriate fluid drainage.

Depending on the cause of the effusion, anti-inflammatory agents and antibiotics may be started. The management of chronic pericardial effusion is beyond the scope of this chapter.

Suggested Reading

1. Groarke JD, Maree AO, Palacios IF (2012) Pericardiocentesis. In: Eeckhout E et al (eds) Percutaneous interventional cardiovascular medicine. The PCR-EAPCI textbook, vol 1. Europa Edition, Toulouse, pp 183–198
2. Loukas M, Walters A, Boon JM, Welch TP, Meiring JH, Abrahams PH (2012) Pericardiocentesis: a clinical anatomy review. Clin Anat 25:872–881
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