How to Manage Complications: Technical Aspects of Pericardiocentesis.

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Indications for Pericardiocentesis

- Pericardial Tamponade
- Pericardial effusions with impending cardiac tamponade
- Pericardial Effusions of infective or uncertain etiology where fluid analysis and/or culture are desirable
- Recurrent persistent pericardial effusions.
- To ameliorate symptoms related to pericardial effusions e.g. dypnea, esophageal compression.

Echocardiographic Findings of Pericardial Tamponade

- Presence of a pericardial effusion
- Right atrial collapse in late diastole
- Right ventricular free wall collapse in early diastole
- Increase in E-wave velocity across tricuspid valve during inspiration
- Decrease in E-wave velocity across mitral valve during inspiration
- Inspiratory decrease and expiratory increase in diastole pulmonary venous forward flow
- Dilated inferior vena cava without inspiratory collapse

Hemodynamic Findings of Pericardial Tamponade

- Elevated right atrial pressure
- Elevated intra-pericardial pressure (very similar to right atrial pressure)
- Elevation and equalisation of left-right ventricular filling pressure
- Loss of *y descent* of the right atrial pressure waveform
- Arterial *pulsus paradoxus* (i.e. an inspiratory decrease in excess of 10mmHg in systolic BP)

Situations warranting special consideration before performing pericardiocentesis

- Hemopericardium due to Type A Aortic Dissection
- Traumatic hemopericardium
- Hemopericardium secondary to post-myocardial infarct ventricular free wall rupture
- Bleeding diathesis (Use of anticoagulants, raised INR/APTT/PT, platelet count < 50,000)
- Recurrent pericardial effusions
- Purulent pericardial effusions
- Small pericardial effusions that warrant drainage
- Loculated pericardial effusions
- Posteriorly located pericardial effusions difficult to access percutaneously

Techniques for Confirming Needle/Catheter Placement in the Pericardial Space

- Monitor ECG signal from aspiration needle
  - ST segment elevation/PVCs suggest epicardial irritation or puncture; PR elevation/PACs suggest entry into RA
- Monitor pressure
  - Intrapericardial pressure tracing observed (RV pressure waveform suggests entry into RV)
- Inject agitated saline and observe for bubbles arriving in pericardial space with echocardiography
- Inject contrast under fluoroscopic screening
- Advance an 0.035-inch J wire and observe it wrapping around heart using fluoroscopy

Management Post Pericardiocentesis

- Close monitoring and observation
- Remain vigilant for development of complications
- Post-procedure CXR to exclude pneumothorax
- Analgesia as required for pericardial pain
- Catheter drainage: free drainage or intermittent aspiration
- Record volume draining at regular intervals
- Strict aseptic technique for catheter manipulations
- Flush with heparinised saline every 6-8 hours
- Minimise duration of catheter stay to reduce risk of infection

Management Strategies for Recurrent Symptomatic Pericardial Effusions

- Repeat closed pericardiocentesis
- Percutaneous balloon pericardiotomy
- Surgical pericardial window creation
- Intrapericardial injection of sclerosing agents
- Adjuvant local and/or systemic chemotherapy for malignant effusions
- Adjuvant radiation therapy (external or with intrapericardial radionuclides)
- Combination of above strategies

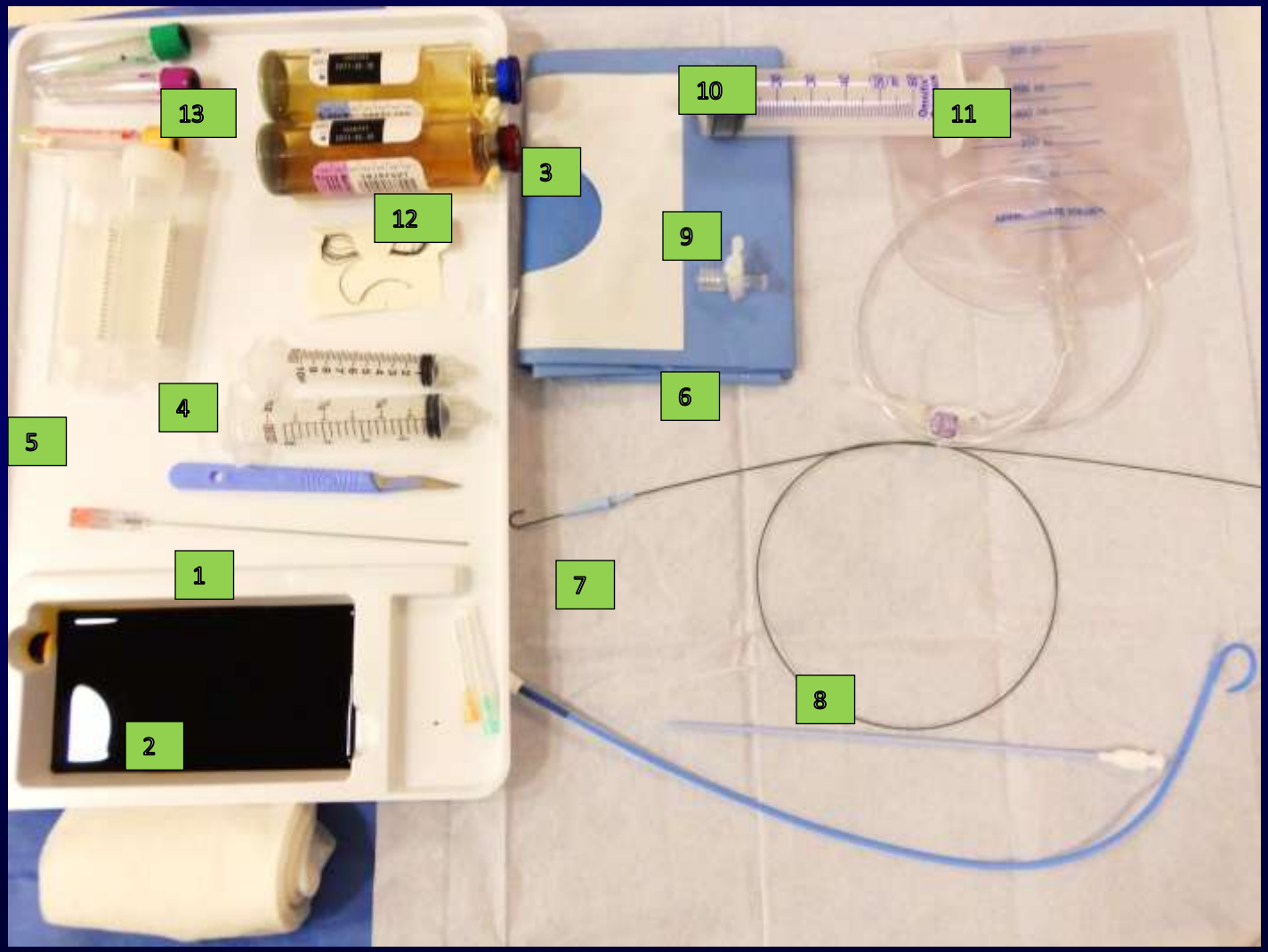
Novel Percutaneous Pericardial Interventions

- Percutaneous balloon pericardiotomy
- Percutaneous pericardial biopsy
- Pericardioscopy
- Percutaneous pericardial access for epicardial mapping and ablation of ventricular and supraventricular arrhythmias
- Pericardial access for Left Atrium Exclusion

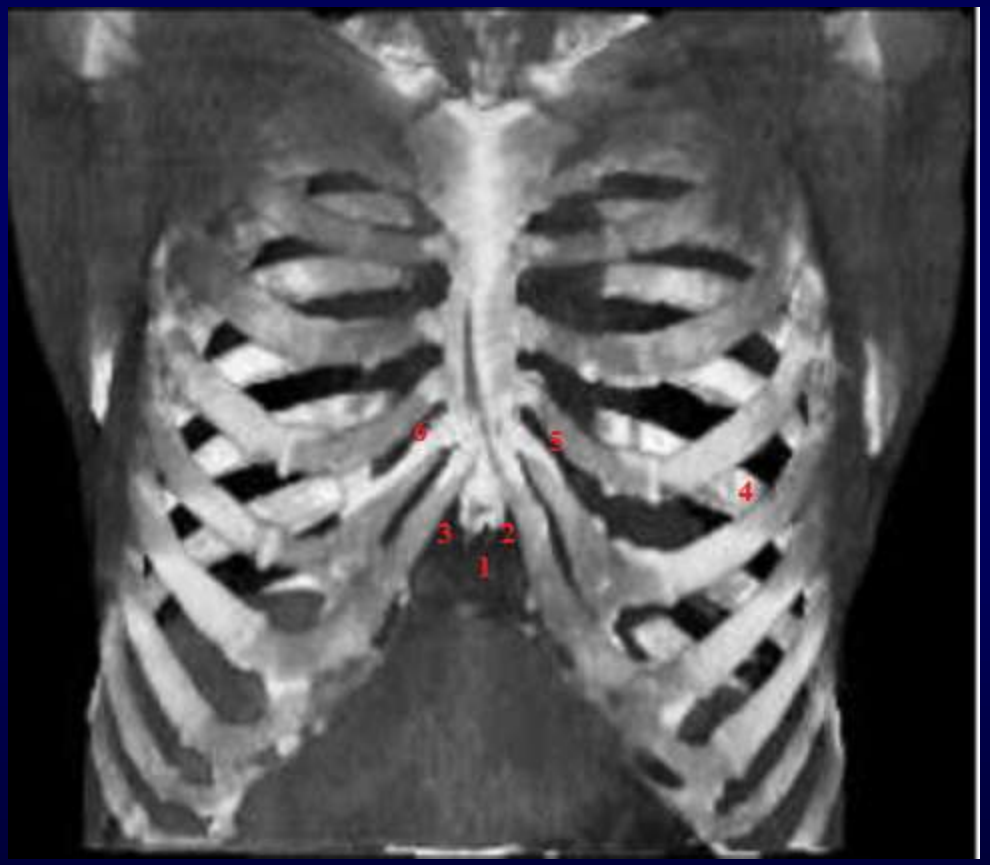
Management Post Pericardiocentesis

- Pull catheter as soon as appropriate or when volume draining is <25-50mls/24 hours
- Pull catheter in event of fever/sepsis
- TTE before pulling catheter
- Surveillance TTE at appropriate intervals following catheter removal
- Immediate TTE in event of deterioration in patient's hemodynamics

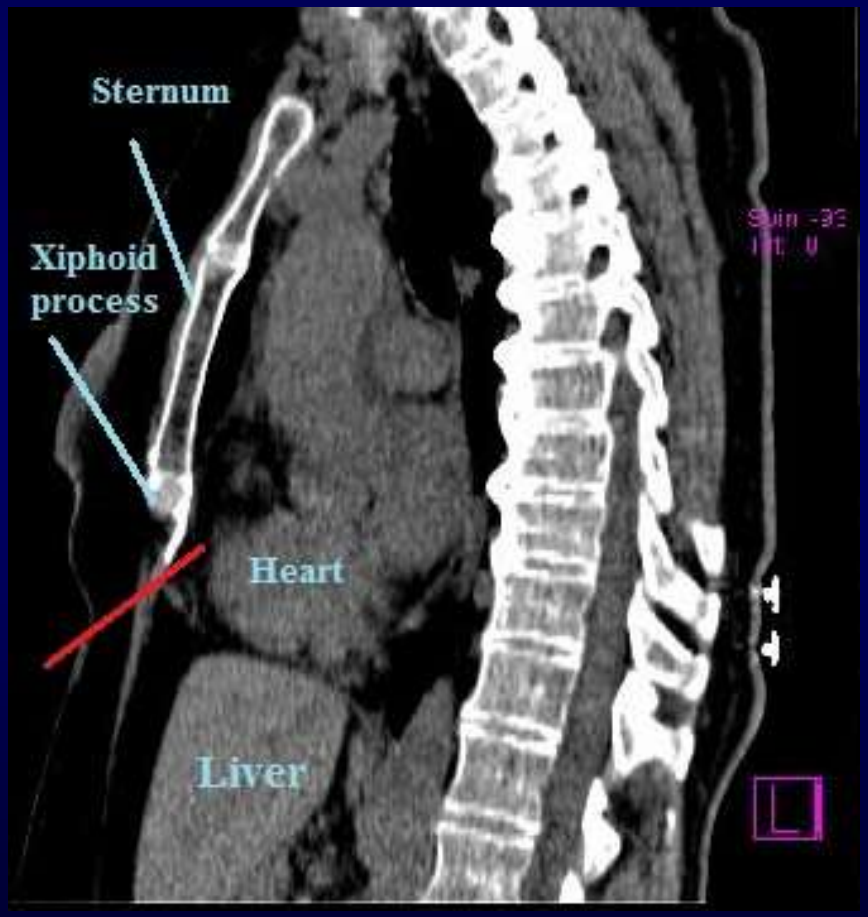
Materials required for needle Pericardiocentesis.



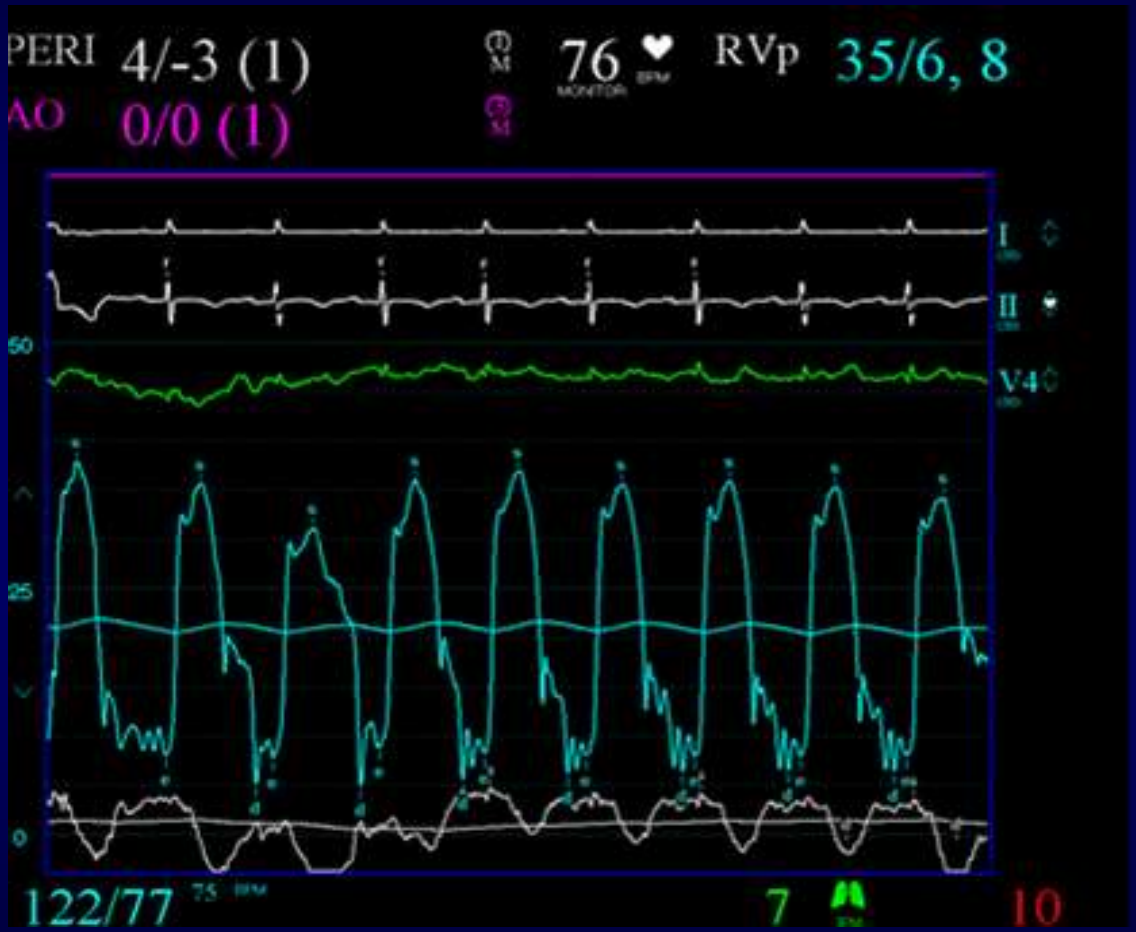
Various Aproaches for Pericardiocentesis



Subxiphoid Approach to Pericardiocentesis

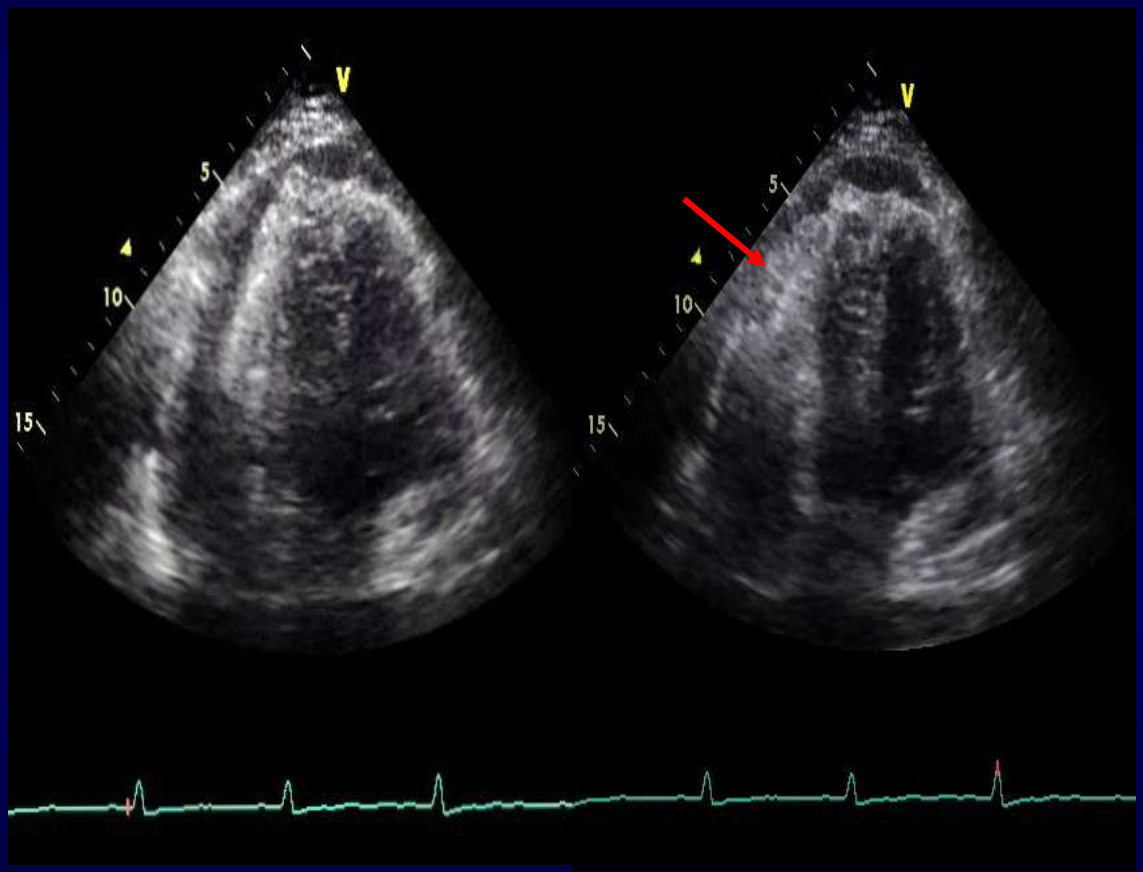


Hemodynamic During Pericardial Tap



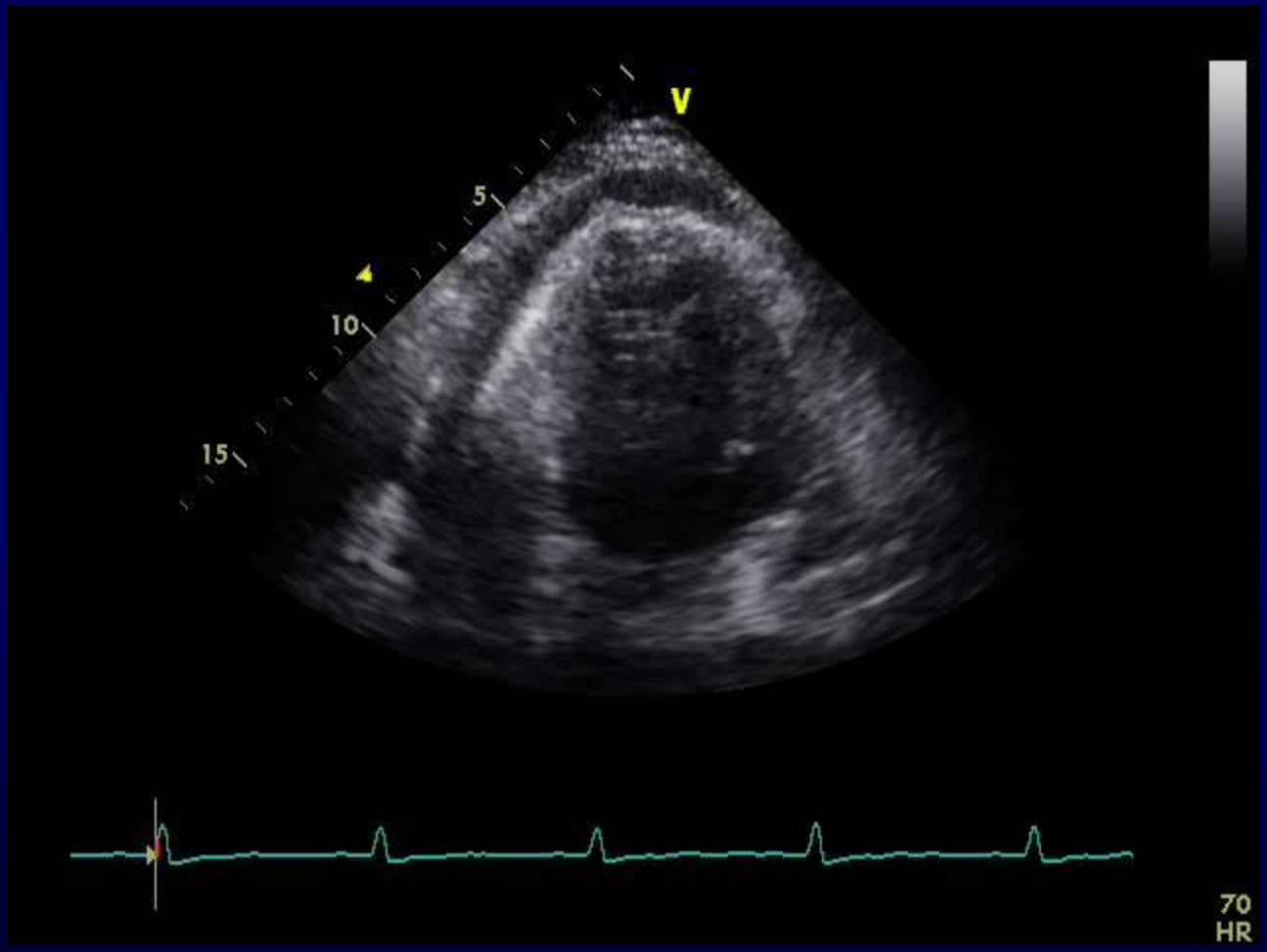
Right ventricular (RV) pressure waveform is shown in blue. The intrapericardial pressure wave form is shown in white below the RV waveform.

Circumferential Pericardial Effusion.

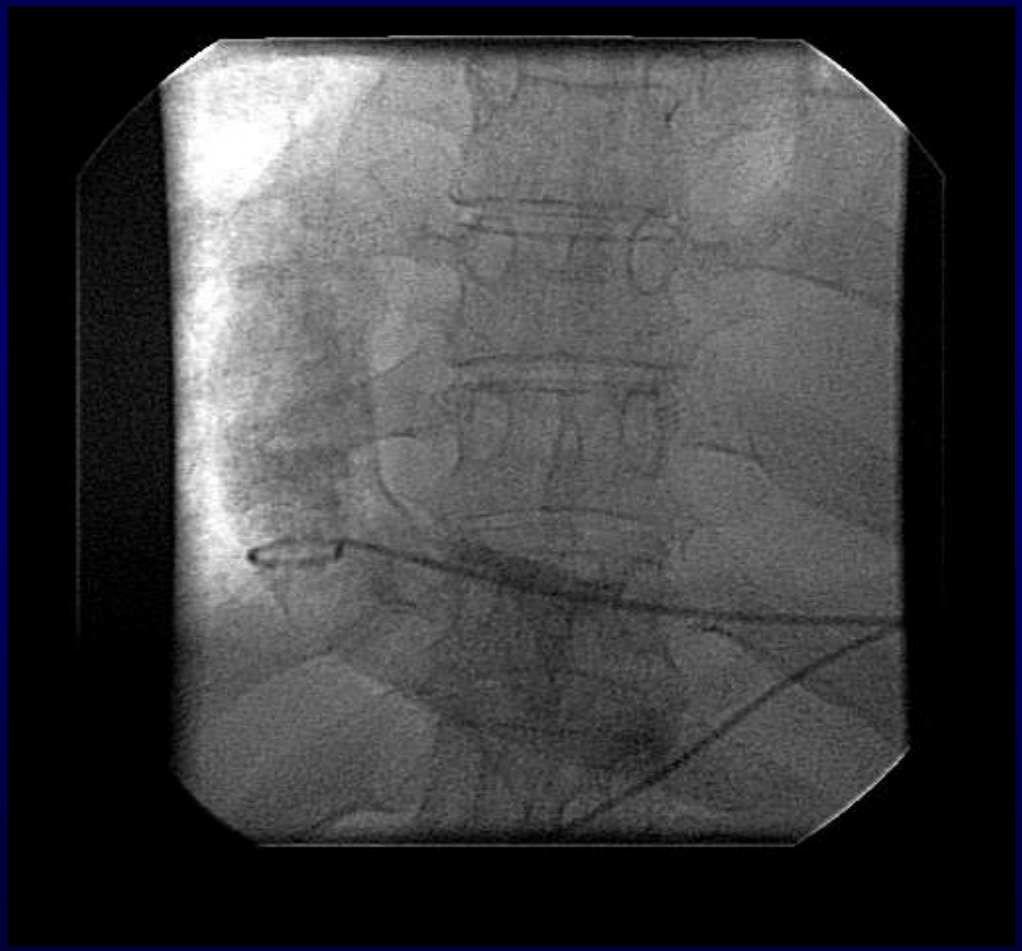


Images before and after injection of agitated saline through a needle positioned in the pericardial space. Red arrow points to microbubbles filling the pericardial space.

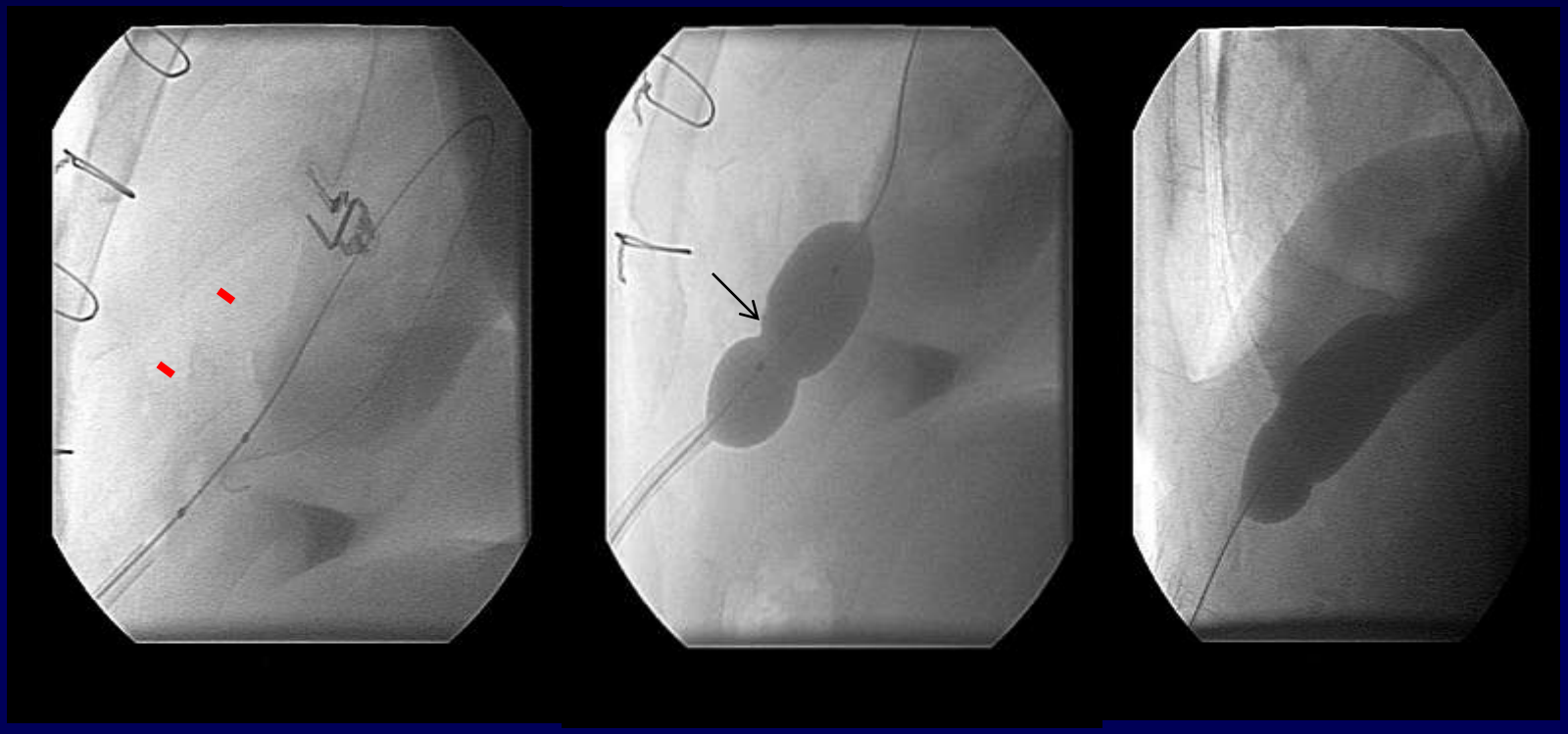
Bubble injection in the Pericardial Space during tap.



Radiographic contrast injected via a pigtail catheter in the pericardial space.



Percutaneous Balloon Pericardial Window



The panel on the left is a lateral projection showing the balloon (located between the two highlighted dots) being advanced over the intrapericardial guidewire into a position where it straddles the parietal pericardium. The panel in the middle shows the balloon inflated with an evident ‘waist’ from surrounding parietal pericardium indicated by the arrow. The panel on the right shows eventual release of the waist .

Complications of Pericardiocentesis (I)

- Viscus perforation
- Pneumothorax
- Haemothorax
- Bleeding
- Infection
- Coronary artery laceration
- Intercostal artery laceration
- RA/IVC puncture
- RV perforation

Complications of Pericardiocentesis (II)

- LV perforation (with or without complicating LV pseudoaneurysm)
- Arrhythmias
- Pleuropericardial fistula
- Hypotension
- Acute pulmonary edema
- Transient LV dysfunction +/- Cardiogenic shock
- Death (0.09%)

Percutaneous Pericardial Biopsy

A bioptome advanced through an introducer away from the cardiac shadow with snares open to biopsy the parietal pericardium of the lateral pericardial wall.