

Percutaneous balloon pericardiotomy

Published on 01.09.2008

DOI: 10.1594/EURORAD/CASE.2585

ISSN: 1563-4086

Section: Interventional radiology

Imaging Technique: Digital radiography

Imaging Technique: Digital radiography

Imaging Technique: Digital radiography

Imaging Technique: CT

Case Type: Clinical Cases

Authors: Marcy PY, Bondiau PY, Benezery K, Peyrade F

Patient: 16 years, male

Clinical History:

A 16-year-old patient presented with malignant tamponade. A successful percutaneous drainage was performed under fluoroscopy and US guidance.

Imaging Findings:

The patient presented with malignant cardiac tamponade. An ultrasound examination done showed massive pericardial effusion, evidence of paradoxical interventricular septal motion, dilated inferior vena cava and jugular veins without significant respiratory variations. Pericardiocentesis utilizing the apical approach revealed an epithelioid sarcoma. Two thousand milliliters of blood-stained fluid was drained off slowly. Three weeks later, the patient was admitted because of the recurrence of severe dyspnea caused by recurrent pericardial effusion. Percutaneous balloon pericardiotomy was performed under combined ultrasound and fluoroscopy guidance in the interventional suite. The patient was placed supine on the fluoroscopy table, in a 45° head-up position. A large-bore intravenous catheter line was established, with continuous electrocardiographic and blood pressure monitoring. The apical area was infiltrated with 20 mL of 1% Lidocaine (xylocaine). The entry in to the pericardial cavity was made using a 22G needle under US guidance and a 0.018 inch guide wire with an angled tip was advanced under fluoroscopy guidance. The needle was removed, leaving the guide wire in the pericardial cavity. An exchanger was then passed to allow placement of a 0.038-inch J wire (Fig.1). The skin and the underlying tissue were dilated with a 14F dilator. A 18 mm x 40 mm high pressure balloon was advanced over the guide wire and placed in the pericardial cavity under fluoroscopy guidance (Fig.2). Care was taken to advance the proximal tip of the balloon beyond the skin and the subcutaneous tissue. The distal portion was inflated first, and the catheter was pulled back gently until resistance was felt when the distal balloon anchored itself at the parietal pericardium. The balloon catheter was then rapidly inflated manually to its fullest extent (Figs.3a,b). Three inflations were performed to ensure that there was an adequate opening of the parietal pericardium (Fig.3c). The balloon catheter was later removed, leaving the guide wire in the pericardial cavity. A 5F pigtail catheter was advanced over the guide wire and was left in place for subsequent drainage. An injection of 5 mL of contrast material failed to depict any pleural opacification. Three days later, after 900 mL of blood stained fluid was drained, a pigtail catheter was clamped. After 48 hours, the thoracic CT scanner showed the disappearance of the pericardial effusion, and the catheter was removed. The patient remained free of cardiac tamponade but died four months later under poor conditions.

Discussion:

Pericardial metastases occur frequently in patients having an advanced stage of a disease, in 5%–10% of all patients with cancer, at a time when the overall lifespan is already short. Primary tumors include melanomas (30%–65%), bronchogenic carcinomas (21%–37%), lymphomas (13%–35%), breast cancer (25%–33%), and sarcomas (25%) (1). Cardiac tamponade is caused by an accumulation of the pericardial fluid under pressure. Its diagnosis is suspected when an elevation of systemic venous pressure, a decline in systemic arterial pressure and a clinical context of recent acute pericarditis or neoplasia are associated. The effect is mainly due to the nature of effusion (blood clots), the poor right ventricular reserve, and the rapidity to develop effusion. Numerous surgical approaches have been described for the drainage of the pericardial sac. Initially described by Larrey in 1829, the epigastric surgical inferior approach allows the best access to the pericardial sac. More recently, US-guided percutaneous epigastric pericardiocentesis as an alternative to surgery has been used for immediate alleviation of symptoms and for therapy (2). A complete evacuation by an intrapericardial suction catheter permits complete apposition of the visceral and parietal pericardium, symphysis of the two layers, thus preventing a further fluid accumulation in more than 50% of the cases. Park et al. compared surgical pericardial windowing and pericardiectomy and concluded that creation of a pericardial window was recommended in cancer patients because of a far lower morbidity (10% vs 67%, respectively) (3). Percutaneous balloon pericardiotomy (4) as well as pericardial instillation of sclerosing agents are mandatory in patients who continue to get more than 100 mL/24 h three days after doing a standard US-guided catheter drainage, or in the case of recurrence of pericardial effusion. Single- or double-balloon inflation (4,5) results in the localized tearing of the parietal pericardium leading to a communication of the pericardial space with the peritoneal and/or pleural cavity, and appears to be less invasive than the surgical technique. The reported recurrence rate is 4% (4). Complications include fever (12%), left pleural effusion and/or asymptomatic pneumothorax (8%), bleeding (from a pericardial vessel) requiring surgery (2%), and persistent catheter drainage requiring surgery (2%) (4). Percutaneous balloon pericardiotomy has limitations when performed in obese patients, patients with Morgagni hernia, or in those who have had a prior thoracic surgery, patients presenting with bowel obstruction or severe ascites. Advantages of the percutaneous procedure include minimal discomfort, a low morbidity rate and an efficiency similar to that of surgical pericardiotomy without sedation.

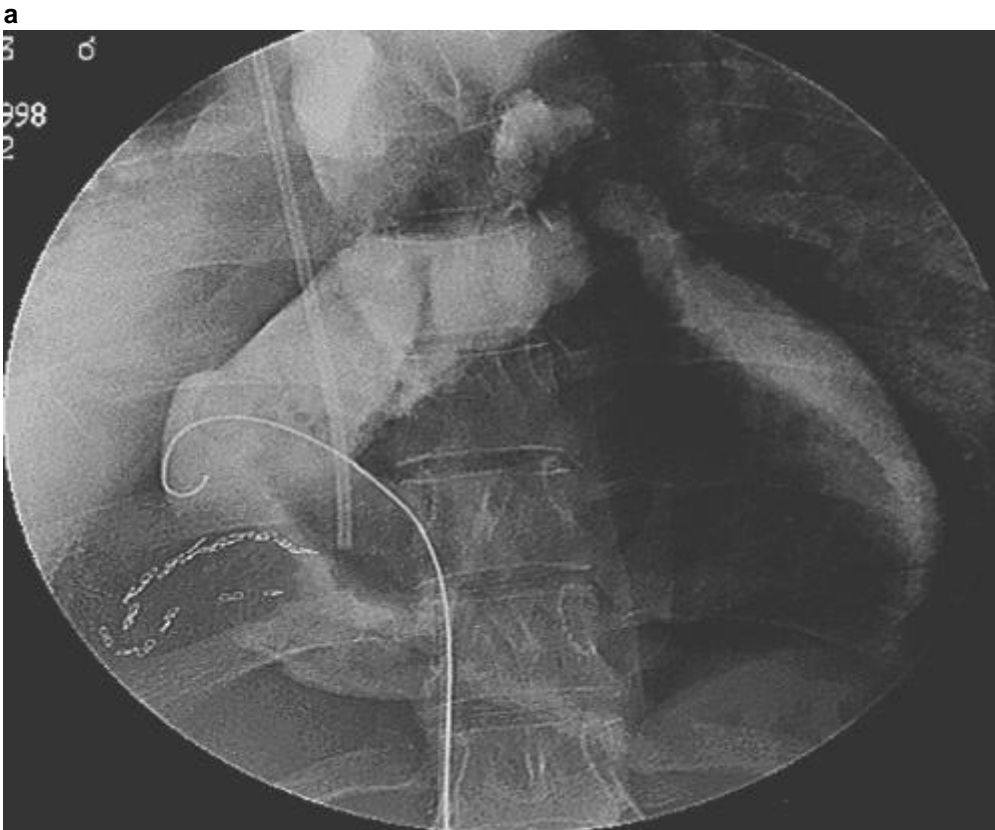
Differential Diagnosis List: Successful percutaneous balloon pericardiotomy in a patient with recurrent malignant tamponade.

Final Diagnosis: Successful percutaneous balloon pericardiotomy in a patient with recurrent malignant tamponade.

References:

- Hallahan DE, Vogelzang NJ, Bostwick DG, Simon MA. Cardiac metastases from soft- tissue sarcomas. *J Clin Oncol* 1986, 4 (11): 1662-9. (PMID: [3772419](#))
- Gatenby RA, WH Hartz, HB Kessler. Percutaneous catheter drainage for malignant pericardial effusion. *JVIR* 1991; 2: 151-55. (PMID: [1799745](#))
- Park JS, Rentschler R, Wilbur D. Surgical management of pericardial effusion in patients with malignancies. *Cancer* 1991; 67: 76-80. (PMID: [1702345](#))
- Ziskind AA, Pearce AC, Lemon CC, Burstein S, Gimble LW, Herrmann HC, Mc Kay R, Block PC, Waldman H, Palacios IF. Percutaneous balloon pericardiotomy for the treatment of cardiac tamponade and large pericardial effusions: description of technique and report of the first 50 cases. *J Am Coll Cardiol* 1993; 21 (1): 1-5. (PMID: [8417048](#))
- Wang H-J, Hsu K-L, Chiang F-T, Tseng C-D, Tseng Y-Z, Liao C-S. Technical and prognostic outcomes of double-balloon pericardiotomy for large malignancy- related pericardial effusions. *Chest* 2002; 122 (3): 893- 9. (PMID: [12226029](#))

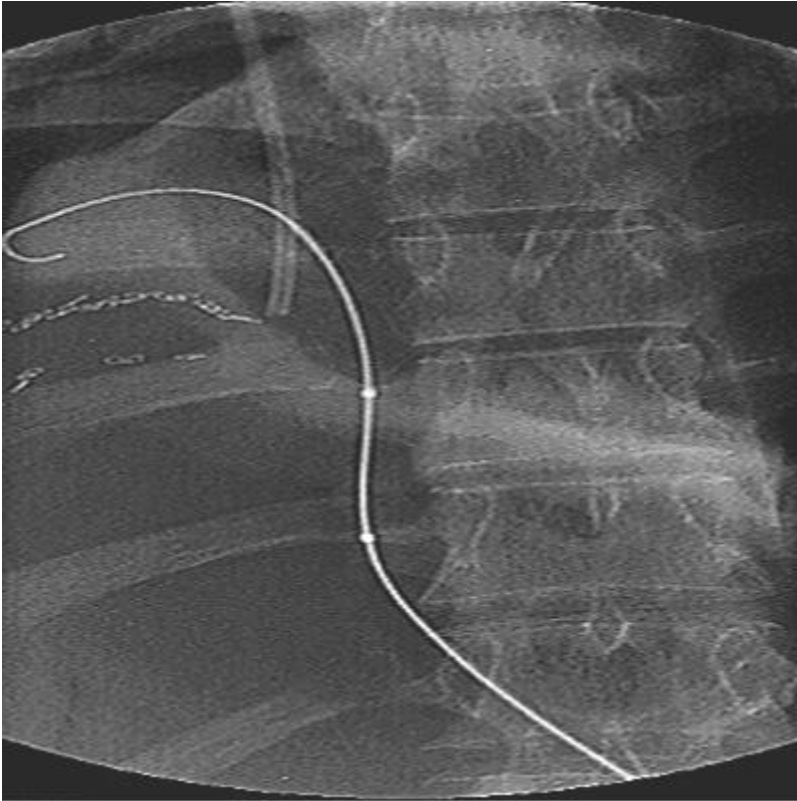
Figure 1



Description: A 6-French pigtail catheter is advanced over the 0.038 inch guide wire and is left for subsequent drainage of the pericardial cavity. Note the previous intrapericardial injection of a contrast medium via the 22G needle. **Origin:**

Figure 2

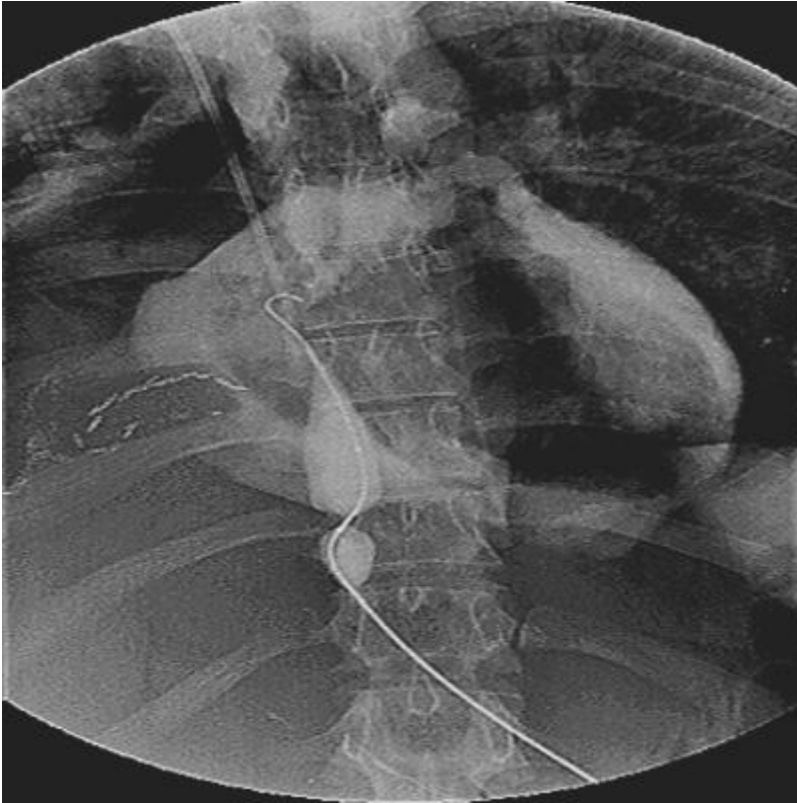
a



Description: An 18 x 40 mm high pressure balloon is gently advanced over a 0.0038 inch guide wire into the pericardial cavity under fluoroscopy guidance and cardiac monitoring. The guide wire tip is located in the most posterior recess of the pericardial sac. **Origin:**

Figure 3

a



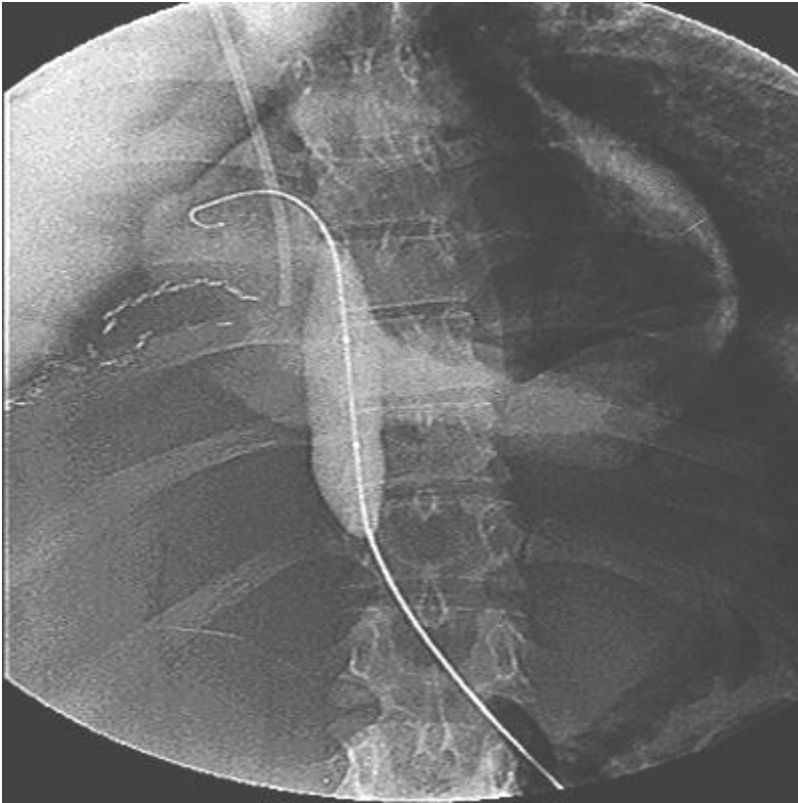
Description: Figs. 3a, b. Anteroposterior (a) and lateral (b) chest radiographs showing the partially inflated 18x40mm balloon. Manual inflation of the percutaneous epigastric balloon. The balloon waist corresponds to the parietal pericardium, ligaments and phrenic peritoneum. **Origin:**

b



Description: Figs. 3a, b. Anteroposterior (a) and lateral (b) chest radiograms showing the partially inflated 18x40mm balloon. Manual inflation of the percutaneous epigastric balloon. The balloon waist corresponds to the parietal pericardium, ligaments and phrenic peritoneum. **Origin:**

c



Description: Fig. 3c. An anteroposterior chest radiograph showing the fully inflated balloon across the parietal pericardium. The balloon stricture disappeared. Thus, pericardiotomy was performed. **Origin:**

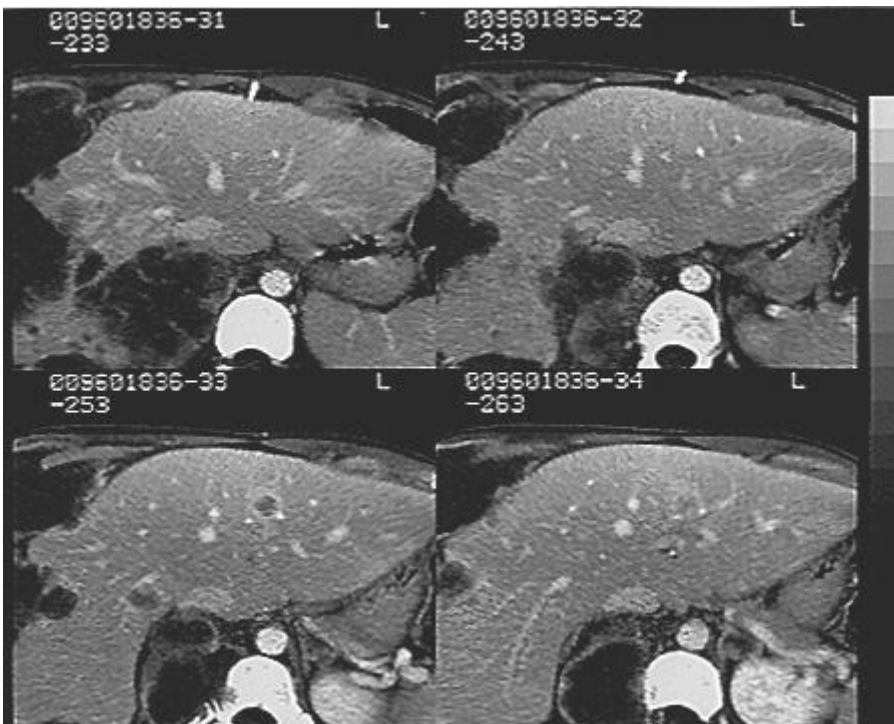
Figure 4

a



Description: Figs. 4a,b. Axial craniocaudal CT scans of the percutaneous pericardiotomy pathway. Contiguous scans above (4a) and below (4b) the level of the xiphoid process showing the pencil -line thin pericardium (after completion of drainage), the catheter crossing through the parietal pericardium, the inferior sternopericardial and phrenicopericardial ligaments, the epicardial fat, the anterior insertions of the diaphragm muscle, the phrenic and parietal peritoneum, and finally the abdominal wall in the subxiphoid area. Liver metastases are shown. Note the entry point at the skin, one centimeter below the xyphoid process. **Origin:**

b



Description: Figs. 4a,b. Axial craniocaudal CT scans of the percutaneous pericardiotomy pathway. Contiguous scans above (4a) and below (4b) the level of the xiphoid process showing the pencil -line thin pericardium (after completion of the drainage), the catheter crossing through the parietal pericardium, the inferior sternopericardial and phrenicopericardial ligaments, the epicardial fat, the anterior insertions of the diaphragm muscle, the phrenic and parietal peritoneum, and finally the abdominal wall in the subxiphoid area. Liver metastases are shown. Note the entry point at the skin, one centimeter below the xyphoid process. **Origin:**