

First Percutaneous Balloon Pericardiectomy in Severe Malignant Pericardial Effusion due to Neoplastic Disease, Carried Out in Cuba

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Abstract

Pericardial effusion in neoplastic disease presents a recurrence rate of up to 70% after pericardiocentesis. Percutaneous balloon pericardiectomy in malignant pericardial effusions of large size and recurrent tamponade is a very effective and safe treatment, producing a direct pleuropericardial communication that allows the fluid to drain into the pleural space. The present work intends to make a brief review of the topic and present the first case carried out in Cuba. In a 69-year-old woman with a history of ovarian neoplasia, pulmonary metastasis underwent percutaneous balloon pericardiectomy in the course of cardiac tamponade due to severe pericardial effusion. The patient evolved during 4 months without recurrences, when she died due to progression of her oncological disease. The authors propose that percutaneous balloon pericardiectomy is a technique that can be generalized in this group of patients to avoid approaches with higher morbidity and mortality.

Keywords: *Percutaneous Balloon Pericardiectomy; Severe Malignant Pericardial Effusion; Cardiac Tamponade*

Introduction

Pericardial effusion in oncoproliferative disease is common either in primary pericardial tumors [1,2], as in secondary ones being more frequent in lung cancer and breast cancer, malignant melanoma, lymphomas and leukemias. Malignant pericardial effusions may be small, medium or large, with impending tamponade (frequent recurrences) or constriction [3]. In two thirds of patients with documented malignancy, pericardial effusion is caused by non-malignant diseases, such as radiation pericarditis, other treatments, or opportunistic infections [2]. The appearance of pericardial tumor effusion (PTE) in the evolution of the oncological disease is a complication that significantly worsens its prognosis [4,5] and can be potentially fatal [6]. The average survival of these patients does not exceed 5 months [4-9]. Percutaneous balloon pericardiectomy is a class indication (IIa) in the current European guide on diagnosis and treatment of pericardial diseases [9]. PTE presents a high rate of recurrences (40 - 70%) [10-13], presenting a 5 times greater probability of requiring new pericardiocentesis than patients with non-tumoral effusion [5,6]. Some authors, such as Yehuda Adler, et al. suggest that percutaneous balloon pericardiectomy (PPB) produces a direct pleuropericardial communication allowing the fluid to drain into the pleural space: in large malignant pericardial effusions and recurrent tamponade, it is a very effective treatment (90 - 97%) and insurance [9]. It is common that patients with metastatic pericardial effusion are in poor general condition to tolerate anesthesia of the surgical approach, which is not exempt from morbidity. In 1991, Professor Palacios IF and collaborators developed PPB with results similar to those of the surgical pleuropericardial window and without the disadvantages of surgery [14], showing its efficacy and safety in the last 20 years [15]. This paper presents a clinical case of a 69-year-old woman with a personal pathological history of: Ovarian cancer with pulmonary metastasis who

underwent percutaneous balloon pericardiomy in the course of cardiac tamponade due to severe pericardial effusion of tumoral etiology. In the Department of Interventional and Hemodynamic Cardiology at the Institute of Cardiology and Cardiovascular Surgery (ICCS).

Developing

PTE is usually large and can decompensate to tamponade due to intrapericardial hemorrhage. It can also become purulent, suggesting an infectious pericarditis, especially in immunocompromised patients because of their treatment or because of AIDS; the causative microorganisms can be habitual or opportunistic, particularly the atypical mycobacteria and fungi [16]. PPB is very effective in patients with limited survival expectations [17], this avoids the discomfort and risk of surgery. The experience obtained by Professor Igor Palacio and collaborators in the first PPB were supported by the good results of the multicentre registry of Professor Ziskind and collaborators that recruited 130 patients from 16 centers [18]. Over time this technique had different later modifications, such as dilatations in two adjacent sites of the pericardium, the use of an Inoue balloon [18] and the double balloon technique [19]. If the approach is made from the left side of the xiphoid appendix, other authors such as Maisch B., *et al.* argue that the rupture of the parietal pericardium creates a communication between the pericardium and the left pleura [20]. If the approach is subxiphoid, the opening can be done in both pleural spaces (right and left) and also to the peritoneal space [21]. These three serosa are adjacent to the subxiphoid area and therefore drainage can be performed without difficulty in any of these places [22]. Other authors report that there may be fusion of the parietal and visceral pericardium due to inflammatory reaction after pericardiomy [23]. The complications of the technique are similar to those of pericardiocentesis in general. Pericardial puncture in these patients is usually simple and the risk of low cardiac perforation, since they are patients with large pericardial effusions [23]. The degree of pleural effusion is probably related to the greater or lesser capacity of pleural drainage in these patients, depending on whether or not they have received radiotherapy in the thorax or if they have tumor affection of the pleura with compromise of the lymphatic drainage.

Clinical Case and Method

69-year-old woman with a personal pathological history of ovarian cancer, with pulmonary metastasis and systolic hypertension Grade-1, 20 years ago, treated with Amlodipine 10 milligrams daily and Enalapril 20 milligrams every 12 hours. It is attended in our emergency service, referring to "Thoracic pain and weakness". At physical examination, jugular vein, heart rate (HR): 120 beats per minute, blood pressure (BP): 90/50 mmHg. Respiratory frequency: 20 breaths per minute and Spo₂: 80%. Electrocardiogram sinus tachycardia, without alterations in the PR, QRS, ST, or the T wave. X-ray of the anterior thorax simple anterior: Tumor image in right hemithorax middle third. Silhouette cardiopericardial enlargement. Echocardiogram TT zone ecolucida anterior to the right ventricle (RV) of 18 mm, posterior to the left ventricle (LV) of 28 mm Lateral to VD 19 mm and lateral to IV of 25 mm Diastolic right atrial collapse and left. Variation of transmitral flow with respiratory movements > 20%. Conclusions: Severe pericardial effusion with hemodynamic repercussion. Given these Elements is taken to the haemodynamics room. Midazolam 1 mg is given in the room intravenous (e.v), morphine 2.5 mg (e.v) and cefazolin 1 gram (e.v). Later under control by fluoroscopy (Figure 1A), pericardial effusion is accessed through subxiphoid percutaneous approach (conventional technique of pericardiocentesis). Then Tefloned J-guide 0.035 "was advanced into the pericardial space (Figure 1B), Arterial introducer 8Fr (Figure 1C) was placed.

Then sample was taken to study (Bacteriological, Immunohistochemical, Cytological), 10 ml contrast was injected Iodine through the arterial introducer to better delimit the pericardial space (Figure 1D). Immediately 0.035 "tefloned J-guide was advanced and 20 mm × 4 cm Z-MED II™ dilatation balloon (NuMED, Inc., Hopkinton, New York, United States) (Figure 1E) was placed through the parietal pericardium, performed 3 manual inflation until the total disappearance of the notch created by the pericardium in the balloon (Figure 1F). The dilatation balloon is then removed through the exchange guide, Pigtail-145° catheter (IHT, Barcelona, Spain) 6Fr. Manually draining 450 ml of pericardial serohematic fluid, using fluoroscopy images, the Pigtail catheter was directed to the areas of remaining effusion. Finally, before leaving the haemodynamic room, we performed transthoracic echocardiography to confirm the absence of complications

and reduction of the pericardial effusion. At 48 hours the drainage was withdrawn (total evacuated 850 ml), at 72 hours radiological and echocardiographic control was performed to rule out the appearance of significant pleural effusion and recurrence of the pericardial effusion. In the evolutionary echocardiogram, improvement of the pericardial effusion was observed, without complications, in subcostal view anterior to the RV: 10mm and posterior to the LV: 7 mm. During the hospitalization that followed the PPB, fever or other infection data attributable to the procedure were not documented.

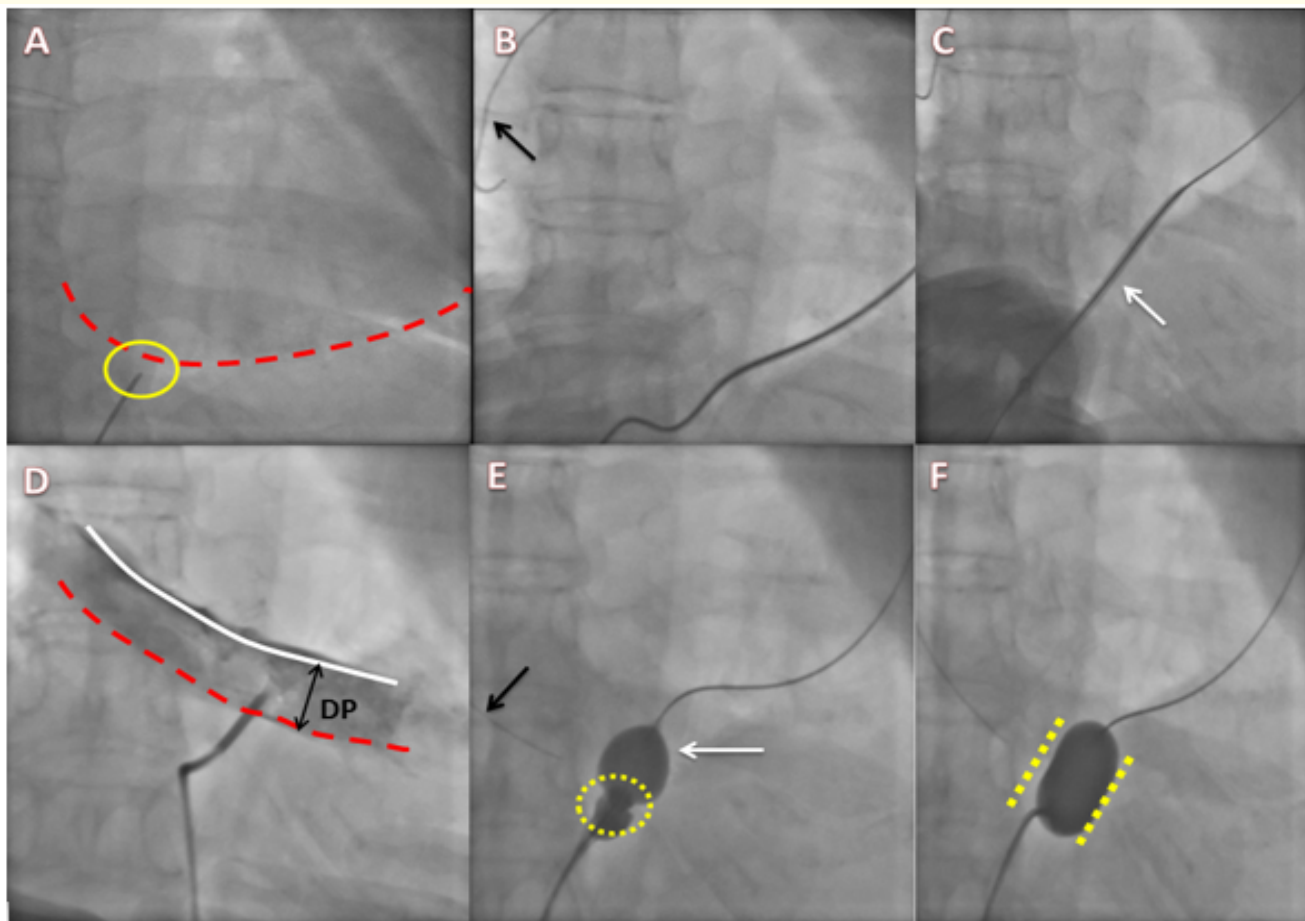


Figure 1: Percutaneous balloon pericardiotomy. Figure 1A: Subxiphoid percutaneous access to the pericardial space. (dashed lines in red) pericardium, (yellow circle) trocar puncture before entering the pericardium. Figure 1B: 0.035 “Tefloned J-guide (black arrow). Figure 1C: Arterial introducer 8Fr (white arrow). Figure 1D: Injection of 10 ml of iodinated contrast, visualization of the pericardial effusion (PD), cardiac silhouette (white continuous line) and parietal pericardium (red dotted line). Figure 1E: (black arrow) 0.035 “Tefloned J-guide (white arrow) Z-MED II™ 20 mm × 4 cm balloon (NuMED, Inc., Hopkinton, New York, United States), (yellow circle with lines discontinuous) notch created by the pericardium in the balloon. Figure 1F: Total disappearance of the notch created by the pericardium in the balloon, pericardial window (dashed yellow lines).

Discussion

Lung cancer along with breast cancer continue to be the main cause of most PTE [4,6,8,9,15]. Pericardiocentesis is the classic procedure, but in this group of patients it presents a high rate of recurrence and the need for reinterventions [4-6,24]. The creation of a

pericardial window by left minithoracotomy for the surgical treatment (PCQ) of malignant cardiac tamponade could be considered with class of recommendation IIb and level of evidence B [9]. This significantly increases hospitalization and the risk of infection [6,13], is a more complex procedure, associated with significant morbidity and mortality related to anesthesia, surgery and postoperative [6,8,13]. It presents a recurrence of up to 10% in the first month [6].

Palacios, *et al.* reported on the effectiveness of the PBP [14] and in the multicenter study of 50 patients by Ziskind, *et al.* [18] the success rate of the PBP was 95%. The recurrence rate after pericardiocentesis can be as high as 62% [24]. Recurrence suggests the need for repeated hospitalization, with its associated cost, morbidity and mortality. Recently, Swanson, *et al.* showed that the PBP as initial treatment in the PTE allows to be a definitive procedure at the time of presentation and that the reaccumulation rates between the pericardiectomy with balloon and the pericardiocentesis (7.4% versus 14.3%) and the rates of complications (7.4% versus 7.1%) were not statistically different [15].

In the Irazusta, *et al.* study, of the 35 patients, all patients had a severe circumferential effusion and the majority presented evidence of hemodynamic compromise in TTE. In all cases, the procedure was successful, there were no acute complications and it was well tolerated in the first attempt. There were no infectious complications during follow-up. Eighty percent of patients died during follow-up (57 days through the PBP) with respect to their oncological disease. The authors conclude that PBP is a simple and safe technique that can be effective in preventing recurrence in many patients with severe malignant pericardial effusion. The characteristics of this procedure make it particularly useful in this group of patients to avoid more aggressive and poorly tolerated approaches, since they have a very bad prognosis with respect to their oncological disease [25].

We consider that PBP is a well-tolerated procedure that allows the etiological diagnosis of the effusion, treats cardiac tamponade, reduces reinterventions on the pericardium, short hospital stay, decreases morbidity and mortality.

For the first time, PBP is reported in Cuba, in this case with the use of a single Z-MED II™ balloon (aortic and pulmonary valvuloplasty balloon catheters). The technique is relatively simple, safe and can be performed under local anesthesia and with minimal discomfort even in critically ill patients.

Conclusion

It is a simple and well tolerated technique, not free of complications or recurrence, but it can be extended in this group of patients as initial treatment of PTE.

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