

## Percutaneous Balloon Pericardiotomy

TOMÁS F. CIANCIULLI<sup>1</sup> MTSAC FACC, 1

The most effective treatment for cardiac tamponade is removal of the pericardial fluid. For decades, *blind pericardiocentesis* has been the standard procedure, but it presents complications that include pneumothorax, laceration and perforation of the myocardium and the coronary vessels, and death. *Two-dimensional echocardiographically guided pericardiocentesis* reports better outcomes and lower risks, since the optimal site of puncture can be located by determining the depth of the pericardial effusion and the distance from the puncture site to the effusion. The position of the needle can be confirmed with the administration of 3 ml of agitated saline, so that microbubbles can be detected in the pericardial space. (1) *Fluoroscopically guided pericardiocentesis*, which is performed in the cath lab with ECG monitoring, is also a safe technique, because it is possible to check the intrapericardial guidewire pathway before inserting a catheter, and the 10 cm<sup>3</sup> of iodinated contrast injected in the pericardial sac allows for accurate identification of the parietal pericardium.

The recurrence rate of pericardial effusion after a pericardiocentesis is high, especially in those of tumor etiology, varying between 13% and 50%. (2) Non-surgical techniques—such as repeated pericardiocentesis and intrapericardial administration of sclerosing agents like tetracycline, proposed for recurrence control—have been discarded. Today, intrapericardial instillation of chemotherapy agents is used, depending on the type of tumor: Cisplatin is the most effective agent in the treatment of pericardial effusion secondary to malignant lung cancer (3), and thiotepa instillation is more effective in pericardial malignancy secondary to breast cancer. (4)

The most effective treatment to prevent recurrences is the surgical pleuropericardial window. Patients with malignant pericardial effusion are usually in poor overall medical condition to tolerate anesthesia during the surgical procedure, which is not morbidity-free. This encouraged Palacios et al. to develop percutaneous balloon pericardiotomy (PBP) 18 years ago, whose outcomes are similar to those of the surgical pleuropericardial window but without the disadvantages of surgery. (5) His initial experience was supported by the positive outcomes of the multicenter PBP registry, which recruited 130 patients from 16 centers. (6)

Later on, this technique underwent modifications, including the dilation of two adjacent pericardial sites, the use of the Inoue balloon (7), and the double balloon technique. (8) This latter modification was the one used by Kevorkian et al. in their work *Percutaneous Pericardial Procedures: In-Hospital and One-Year Outcomes*, published in this issue of the *Revista*. (9)

The use of two valvuloplasty balloons to perform PBP ensures a safer position into the parietal pericardium and increased pericardial tension, than the use of only one balloon. Another advantage is that the separation between the two guidewires allows for better identification of the parietal pericardium without the need for contrast agent. The Inoue balloon allows for an accurate localization in the parietal pericardium because its shape resembles that of a weight, but once inflated, the proximal area of the balloon can lacerate the thoracic wall and the skin, with the risk of pneumothorax and subcutaneous emphysema.

The authors describe the efficacy of the PBP performed on 15 patients in the cath lab. It was a primary strategy for the 73% of the cases, and a secondary strategy due to a relapse of pericardial effusion for the remaining 27%. This study supports the outcomes from previous reports which prove that PBP can successfully reduce severe pericardial effusion, with a low recurrence rate (6.6%).

The reduced survival of patients with malignant effusion (less than 1 year), together with the low rate of effusion recurrence, supports the use of the conservative approach instead of the surgical approach. Through their experience, the authors renew the interest in this procedure, which has not been widely spread in our country despite its positive outcomes. The PBP is safe and well-tolerated, and presents a high rate of success for critical patients with cardiac tamponade or malignant or recurrent pericardial effusion. It is relatively contraindicated in cases of infectious pericardial effusions, due to its spreading to the pleura or the peritoneum.

The mechanism for pericardial fluid drainage after PBP is under discussion. If it is approached from the left side of the xiphoid appendix, rupture of the parietal pericardium creates a communication between the pericardium and the left pleura. This study proved that left pleural effusion was present in 13 patients

MTSAC Full Member of the Argentine Society of Cardiology

FACC Fellow of the American College of Cardiology

<sup>1</sup> Chief of Echocardiography at Hospital "Dr. Cosme Argerich", Buenos Aires, Argentina  
Director of the Annual Course on Echocardiography at the Argentine Medical Association  
Researcher at the Ministry of Health of the Government of the City of Buenos Aires

(86%) 48-72 hours after the procedure, with post re-absorption within 30 days. In subxiphoid approach, the opening can be performed in both (right and left) pleural spaces, and also in the peritoneal space. (10) These three serosas are adjacent to the subxiphoid area, therefore drainage can easily be performed in any of these places. The study was completed with a biopsy of the parietal pericardium on three patients, and the etiologic diagnosis was achieved in only one of them (33%). This finding is not surprising, since literature data report low performance of the fluoroscopically guided biopsy. (11) Because of the patchy distribution of lesions and the fact that these lesions are usually located in the visceral pericardium, (12) the sensitivity and specificity of the pericardial biopsy are higher if it is performed under surgical visualization or through the non-surgical approach guided by pericardioscopy. (13)

The effectiveness of PBP lies in that effusion recurrence is rare. The credit of the work by Kevorkian et al. is that its reading should encourage clinicians and cardiologists to choose this procedure instead of the surgical approach, for treating patients with severe recurrent or malignant pericardial effusion or cardiac tamponade. In cases of acute pericardial effusion, guided pericardiocentesis with echo or fluoroscopy is preferred because of its simplicity.

## BIBLIOGRAPHY

1. Tsang TS, Enriquez-Sarano M, Freeman WK, Barnes ME, Sinak LJ, Gersh BJ, et al. Consecutive 1127 therapeutic echocardiographically guided pericardiocenteses: clinical profile, practice patterns, and outcomes spanning 21 years. *Mayo Clin Proc* 2002; 77:429-36.
2. Flannery EP, Gregoratos G, Corder MP. Pericardial effusions in patients with malignant diseases. *Arch Intern Med* 1975; 135:976-7.
3. Bishiniotis TS, Antoniadou S, Katseas G, Mouratidou D, Litos AG, Balamoutsos N. Malignant cardiac tamponade in women with breast cancer treated by pericardiocentesis and intrapericardial administration of triethylenethiophosphoramide (thiotepa). *Am J Cardiol* 2000; 86:362-4.
4. Bishiniotis TS, Lafaras CT, Platogiannis DN, Moldovan L, Barbetakis NG, Katseas GP. Intrapericardial cisplatin administration after pericardiocentesis in patients with lung adenocarcinoma and malignant cardiac tamponade. *Hellenic J Cardiol* 2005; 46:324-9.
5. Palacios IF, Tuzcu EM, Ziskind AA, Younger J, Block PC. Percutaneous balloon pericardial window for patients with malignant pericardial effusion and tamponade. *Cathet Cardiovasc Diagn* 1991; 22:244-9.
6. Ziskind AA, Lemmon CC, Rodriguez S, Burnstein S, Johnson SA, Feldman T, et al. Final Report of the percutaneous balloon pericardiectomy registry for the treatment of effusive pericardial disease (abstract). *Circulation* 1994; 90:I-121
7. Chow WH, Chow TC, Cheung KL. Nonsurgical creation of a pericardial window using the Inoue balloon catheter. *Am Heart J* 1992; 124:1100-2.
8. Iaffaldano RA, Jones P, Lewis BE, Eleftheriades EG, Johnson SA, McKiernan TL. Percutaneous balloon pericardiectomy: a double-balloon technique. *Cathet Cardiovasc Diagn* 1995; 36:79-81.
9. Kevorkian R, Etcheverry C, Ruiz N, Olmedo P, Brandeburgo S, Strumminger M et al. Procedimientos pericárdicos percutáneos: resultados hospitalarios y en el primer año. *Rev Argent Cardiol* 2009; 77:280-5.
10. Bertrand O, Legrand V, Kulbertus H. Percutaneous balloon pericardiectomy: a case report and analysis of mechanism of action. *Cathet Cardiovasc Diagn* 1996; 38:180-2.
11. Fernandes F, Ianni BM, Arteaga E, Benvenuti L, Mady C. Value of pericardial biopsy in the etiologic diagnosis of pericardial diseases. *Arq Bras Cardiol* 1998; 70:393-5.
12. Maisch B, Pankuweit S, Brilla C, Funck RC, Simon BC, Grimm W, et al. Intrapericardial treatment of inflammatory and neoplastic pericarditis guided by pericardioscopy and epicardial biopsy—results from a pilot study. *Clin Cardiol* 1999; 22:117-22.
13. Seferović PM, Ristić AD, Maksimović R, Tatić V, Ostojić M, Kanjuh V. Diagnostic value of pericardial biopsy: improvement with extensive sampling enabled by pericardioscopy. *Circulation* 2003; 107:978-83.