A New Diagnostic and Therapeutic Approach to Pericardial Effusion*

Transbronchial Needle Aspiration

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Pericardiocentesis was introduced during the 19th century, and reached its current level of development with the introduction of two-dimensional echocardiography. Although there is general agreement that complications are rare with skilled operators, a diagnostic and therapeutic problem often occurs when there is a posterior pericardial effusion, as it is not easy to quantify by echocardiography, and difficult to drain through a percutaneous access; therefore, it is usually treated surgically. We describe a new approach to pericardial effusion by a transbronchial access through the left lower lobe bronchus (which allows both diagnosis and evacuation of abundant amounts of fluid), or through the distal trachea (for diagnostic purpose only, in the presence of pericardial effusions filling the aortic recess of the pericardium). The technique is rather easy for operators skilled in transbronchial needle aspiration, and is safe, economical, and well tolerated.

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Key words: aortic recess of the pericardium; pericardial effusion; transbronchial needle aspiration

Pericardiocentesis was introduced during the 19th century, and reached its current level of development with the introduction of two-dimensional echocardiography. Before this, the procedure was essentially blind, and serious complications were not uncommon; therefore, a surgical approach to pericardial effusion was usually preferred.

Two-dimensional echocardiography permits a direct visualization of the structure of the heart and of nearby organs; consequently, percutaneous pericardiocentesis can be performed with minimal risks. There is general agreement that complications are rare with skilled operators, even in pediatric series, so that the technique could be suggested to be used on outpatients as well. This technique can be used for diagnosis, with a high sensitivity for neoplastic effusions and low sensitivity for tuberculous ones, and for therapeutic purposes, for evacuating symptomatic effusions, and eventually for the introduction of cytolitic agents into the pericardial space.

The most common complications are as follows: pneumothorax, cardiac arrhythmias due to stimulation or accidental puncture of the myocardium, acute left or right ventricular failure, or severe circulatory collapse after pericardiocentesis for cardiac tamponade. Isolated cases of hemoperitoneum, chylopericardium, sinus node dysfunction, induced intrapericardial thrombosis, or tumor seeding in a patient with pulmonary adenocarcinoma have also been described.

Methods used less frequently for pericardial effusion drainage have been described in the literature. For example, in the case of myocardial perforation occurring during cardiac catheterization, internal transcardiac pericardiocentesis can be performed through the same catheter. Occasionally, in the presence of both left pleural and posterior pericardial effusion, echocardiographically guided pleuropericardial drainage can be carried out using the left axillary approach. Transatrial access to the pericardial space has been used safely on laboratory animals.

There is often a diagnostic and therapeutic problem when a posterior pericardial effusion occurs, as it is not easy to quantify by echocardiography, as well as being difficult to drain through a percutaneous access; therefore, it is usually treated by a direct surgical procedure. In these cases, when the size of the effusion is such that it widens the pleural fissure and brings the pericardium near or in contact with the left stem of the bronchial tree (usually with the left lower lobe bronchus; Fig 1), a direct transbronchial approach could be used (with or without endobronchial ultrasound). The same path can be used for access to minor pericardial effusions by passing through the anterior tracheal wall (first to third intercartilage space up from the carina), when they have caused a redundancy of the aortic recess of the pericardium, which can be recognized on CT as a small homogeneous, hypodense “half moon” suspended from the ascending aorta.

Technique

From May 1999 to January 2002, three transbronchial pericardiocenteses were performed in our Department of Internal Medicine. Every bronchoscopy was preceded by
sedation with midazolam and phentanyl and local mucosal anesthesia with mepivacain 1%, and accomplished with a Wang endoscopic needle (MW-122; Mill Rose Labs; Mentor, OH), through the 2.8-mm channel of a flexible fiberoptic bronchoscope (Olympus TE; Olympus Europe; Hamburg, Germany). After an accurate evaluation of CT scanning, bronchoscopy was performed under conscious sedation. The airways were rapidly explored to exclude any visible abnormality. The catheter containing the endoscopic needle was then introduced into the scope channel, and the needle was completely inserted through the anterior wall of the left lower lobe bronchus (Fig 2), when the purpose was the evacuation of a posterior pericardial effusion, or through the tracheal wall (second intercartilage space of the distal trachea at 12 o'clock; Fig 3), in order to reach the aortic recess of the pericardium. The puncture was performed without any radiologic or sonographic guide according to the "pushing technique" described by Wang\(^\text{18}\): the needle tip is first lodged in the mucosa of the puncture site, after which the catheter is further advanced, so that the entire length of the needle protrudes out of the tip of the bronchoscope; the operator then fixes the proximal end of the catheter to the bronchoscope with one or two fingers, and pushes the bronchoscope and the catheter into the bronchial wall as one unit. Suction was then applied by a 20-mL syringe connected to the proximal end of the endoscopic needle, and the fluid collected was flushed into a sterile jar.

**Case Reports**

The first case regarded an abundant pericardial effusion in a 66-year-old white woman, who had received radiotherapy for a right lung cancer 3 years before. An accurate evaluation of CT imaging allowed us to recognize a contiguity between pericardium and left lower lobe bronchus. We decided on an attempt to evacuate the fluid through a transbronchial route. No impression could be seen on the left bronchial tree by bronchoscopy; transbronchial pericardiocentesis was carried out by puncturing the anterior wall of the left lower lobe bronchus, and 220 mL of serosanguineous exudate was collected. There were no subsequent complications, and the patient reported relief of symptoms and an improvement of the dyspnea. The cytologic examination of the fluid revealed no neoplastic cells.

In the second case, a 66-year-old white woman was admitted to our department because of a bilateral pleural effusion due to metastasis of an anaplastic carcinoma of the ovarian epithelium. A chest CT showed that an aortic recess of the pericardium was full of fluid (Fig 4). A bronchoscopy was performed, and during this examination a sample of fluid from the aortic recess of the pericardium was obtained transbronchially through the second intercartilage space of the distal trachea at 12 o’clock. This puncture produced around 10 mL of clear fluid, in which

![Figure 1. Large pericardial effusion bringing the pericardium in contact with the left lower lobe bronchus.](http://journal.publications.chestnet.org/pdfaccess.ashx?url=/data/journals/chest/21993/ on 06/25/2017)
papillary-like aggregates of atypical cells were found, compatible with the diagnosis of pericardial carcinomatosis (from ovarian celomic epithelium).

The third patient, an 82-year-old white man, had suffered for several years from a moderate-sized pericardial effusion that had worsened at the last echocardiography; previous attempts at both transbronchial and subxyphoid percutaneous evacuation had failed. After a chest CT, the patient underwent transbronchial pericardiocentesis through the left lower lobe bronchus, near the basal pyramid. The evacuation, which the patient tolerated perfectly, was prudently stopped after 700 mL of clear fluid was collected (Fig 5, top, A, and bottom, B).

**Discussion and Conclusions**

Pericardiocentesis is a technique of fundamental importance both for etiologic diagnosis and for therapeutic evacuation of pericardial effusions, especially when cardiac tamponade occurs. Percutaneous subxyphoid or parasternal echocardiography or sometimes CT-guided access is commonly used; however, when the effusion is posterior, it often cannot be reached in this way, and a surgical approach is necessary.

Our suggestion to use transbronchial access in selected cases could offer a simple and direct way to obtain a diagnosis or, in patients with severe diseases (i.e., lung cancer), to evacuate pericardial effusions during the diagnostic examination. Sometimes, it could also represent an interesting, less invasive alternative to surgery when evacuation cannot be performed via either subxyphoid or parasternal puncture.

In order to perform the procedure, it is essential that a chest CT is carried out to confirm that it will be feasible, i.e., that the pericardium is in contact with the large airways. When attempting to reach a large posterior pericardial effusion through the anterior wall of the left lower lobe bronchus, there is no danger that the needle will touch the myocardium, because it is the pericardium, and not the myocardium that comes nearer the bronchus when there is a large effusion. During evacuation, as the effusion decreases, the pericardium moves further away from the bronchus until the needle cannot reach it anymore; therefore, the process stops. However, we suggest for the sake of prudence that the procedure be performed under echocardiographic control, in order to get real-time information about the entity of residual effusion and to decide if and when to stop the maneuver.

A particular access to the pericardial fluid is the puncture of the superior aortic recess of the pericardium (which represents the cranial extension of the pericardial transverse sinus); in fact, this maneuver can offer a simple and safe way of sampling even slight effusions for diagnostic purposes. The aortic recess of the pericardium, when full of fluid, moves quite close to the anterior wall of the distal trachea; therefore, it can be reached with accuracy without any risk of touching the myocardium, thus enabling an otherwise difficult diagnosis. Wider use of endobronchial ultrasound or of CT fluoroscopy will make it easier in the future to check for the presence and the position of the pericardial effusion during bronchoscopy, as well as to aspirate any effusion found safely and accurately.

Theoretically, it is possible that puncturing the pericar-
dium from a potentially nonsterile environment (the bronchial lumen) could lead to infection of the pericardial cavity. No published scientific articles have dealt with this issue; nevertheless, some conclusions can be drawn from the experience of transbronchial needle aspiration of mediastinal lymph nodes. Witte et al reported that they

Figure 3. Puncture of the aortic recess of the pericardium through the anterior wall of the trachea, at the carinal level.

Figure 4. Aortic recess of the pericardium (arrows).
found no fever or bacteremia after transbronchial needle aspiration; indeed, our own data confirm that this procedure, even in the absence of antimicrobial treatment or prophylaxis, has never produced infectious mediastinal complications in the approximately 700 cases examined.\(^{21}\)

In the first case reported, evacuation of the pericardial fluid induced an immediate benefit, that lasted for > 1 month, after which recurrence of the dyspnea required further hospitalization. In the second case, the puncture of the aortic pericardial recess, which we have successfully
Carried out in other cases too, represented a rapid and safe method to recognize the neoplastic involvement of the pericardium, in spite of the scanty effusion. Finally, in the third case, a transbronchial approach was the only way to obtain a large amount of pericardial fluid after the failure of the conventional percutaneous approach.

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References


Pulmonary Embolism in Idiopathic Pulmonary Fibrosis Transplant Recipients

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The objectives of the study were the assessment of the incidence of pulmonary embolism (PE) in lung transplant recipients. We performed a retrospective review of the medical records in a tertiary center lung transplant program. A total of 72 lung transplants were performed. There were seven symptomatic PE events diagnosed among six patients (group 1). All PE events were in the subgroup of patients with idiopathic pulmonary fibrosis (IPF) [6 of 23 patients (27%) vs 0 among all other patients (0%); p < 0.001]. All patients were out of the hospital, not receiving oxygen therapy, and were ambulatory at the time of the event. The median time to occurrence of the PE was 175 days posttransplant (range, 26 to 541 days). All patients who developed PEs were men. The group of IPF patients with no PEs was evenly split between genders (group 2; p < 0.009). PE patients required a longer posttransplant hospitalization (mean [± SD], 18.5 ± 3.9 vs 13.5 ± 4 days, respectively; p < 0.018). Aside from this, there was no apparent difference in patient functional status between the two groups. PEs appear to be relatively common in IPF lung transplant recipients. This should be considered in the differential diagnosis of

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