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Percutaneous Tube Pericardiostomy

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ABSTRACT

The classic subxiphoid pericardial window technique and the newer, minimally invasive percutaneous fluoroscopy–controlled method of surgical treatment of pericardial effusions and/or tamponade are reviewed and compared based on 12 years of surgical experience. Since 1988, 114 patients underwent surgery for treatment of pericardial effusion and/or tamponade. The classic subxiphoid approach was used on 66 patients, and since 1993, the percutaneous tube pericardiostomy method was employed on 48 patients. In choosing a method for pericardial decompression, disease etiology and patient characteristics must be considered as well as the experience of the surgeon.

INTRODUCTION

Pericardial disease has undergone major changes in the past decades. Surgical treatment of pericardial effusion and tamponade has become the most frequently used procedure on the pericardium, whereas in the past, treatment of constrictive pericarditis was the existing main surgical challenge.

Different surgical methods for treating pericardial effusion and/or tamponade have been described [Blalock 1943, Cassell 1967, Dean 1973] since Larrey [1829] described the subxiphoid pericardial window. We were strong proponents of the subxiphoid approach and applied it, until recently, since 1975 [Lajos 1975, Santos 1977].

In light of the development of minimally invasive methods [van der Schelling 1994, Law 1997], I describe my 12-year surgical experience and review the presently employed percutaneous fluoroscopy–controlled method, including its indications compared to the classic subxiphoid technique.

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MATERIAL

Since 1988 I performed surgery on 114 patients with different presentations of pericardial effusions and/or tamponade. The classic subxiphoid approach was used on 66 patients, and since 1993, the percutaneous method was employed on 48 patients. There were 60 male and 54 female patients with an age range of 20 to 96 years and an average age of 60 years. The etiologies of the disease presentations are summarized in Table 1.

METHODS

Classic Subxiphoid Pericardial Window Method

Sixty-six patients underwent surgery that employed the classic subxiphoid pericardial window. This surgery is performed with the patient under either general or local anesthesia with 0.5% lidocaine, 80 to 100 mL. The linea alba is divided 2 to 3 inches below the xiphoid process, which is removed as exposure necessitates it. The peritoneum is retracted, caudad, and the pericardium is incised. Necessary biopsies and cultures are performed accordingly. One anterior and one posterior pericardial #22-#28 tubes are inserted. The incision is closed with interrupted fascia stitches followed by subcutaneous and subcuticular closure. We described this method in detail in 1975 [Lajos 1975].

Percutaneous Tube Pericardiostomy Method

In our institution, the minimally invasive percutaneous tube pericardiostomy method is currently used with fluoroscopic control in the operating room. Either local or general anesthesia is used. This surgery has been performed on 48 patients.

After the patient has been prepared and the anterior chest wall draped, the skin is infiltrated with a few milliliters of 0.5% xylocaine, followed by generous local infiltration in the subxiphoid area with 50 to 75 mL 0.5% xylocaine through a Cook introducer 18-gauge needle. Between the xiphoid and the rib cage the needle is aimed 45 degrees posteriorly and 45 degrees pointing toward the left shoulder. The soft tissues including the pericardium are gradually infiltrated. When the pericardium is penetrated, the fluid is obtained from the cavity and a guide wire is introduced through the needle to the pericardial cavity.

Table 1. Pericardial Decompression Method and Effusion Etiology*

	PTP	PW
Carcinoma (lung)	6	7
Atypical cytology	3	5
Bloody effusion	3	2
Hodgkin's disease	—	1
Renal failure	4	1
Clear effusion	5	6
Congestive heart failure	1	1
Chronic pericarditis	2	8
Acute myocardial infarction	1	2
Purulent pericarditis	—	1
Chylous pericarditis	1	—
Postoperative effusion	4	17
Perforation (pacemaker electrode)	1	1
Hypothyroid Crisis	—	1
Anticoagulation	2	—
Recurrence	1	6
Unknown	7	2
No etiology	7	5
Total	48	66

*PTP indicates percutaneous tube pericardiostomy; PW, pericardial window.

The guide wire in the pericardial cavity is visualized by fluoroscopy (see movie). It should be positioned posteriorly, with the flimsy end pointing toward the left shoulder. The guide wire should float in the pericardial fluid; no pulsation should be detected.

A 2-cm skin incision is made and a #18 Cook introducer is slid over the guide wire to the pericardial cavity. Proper insertion is again checked with fluoroscopy, and if it is acceptable then a #16 chest tube is threaded into the pericardium through the Cook introducer, which is peeled off afterward.

If indicated prior to introduction of the chest tube, a 4-quadrant pericardial biopsy can be performed with an Abrams biopsy needle. After completion of the procedure, the chest tube is introduced, secured to the skin with #20 silk, and connected to the Pleural Vac chest suction. The biopsy specimens are sent for the appropriate pathology and bacteriology analyses.

Anytime either the needle or the guide wire is not fully ascertained to be in the optimal position and/or smooth introduction of the guide wires is not possible, the procedure is converted to a classic subxiphoid pericardial window. We have had to convert the percutaneous decompression to a classic subxiphoid window on 3 patients in the past 10 years.

The pericardial tube or tubes are removed when drainage volume is less than 100 mL in 24 hours. If necessary in a benign effusion, doxycycline and/or chemotherapy are introduced through the tube prior to removal.

Because doxycycline infusion can be very painful, we now inject about 20 mL of 1% lidocaine into the pericardium approximately 10 minutes before infusing the doxycyline. The tube is clamped for a couple of hours, released, and then removed when the drainage is minimal.

Table 2. Pericardial Decompression: Repeat Operation (8 Patients)*

First Operation		Subsequent Operation		Subsequent Treatment
2 PTP	→	2 PW	→	Pericardectomy
3 PW	→	3 PW		
3 PW	→	3 PTP		

*PW indicates pericardial window; PTP, percutaneous tube pericardiostomy.

RESULTS

The percutaneous tube pericardiostomy procedure had no attributable morbidity. We have converted the procedure to the classic subxiphoid approach 3 times because of measuring questionable pressure in the pericardium through the #18 needle and/or obtaining fluid in the pericardium that appeared grossly bloody. We have experienced recurrence with this method in 2 patients. One patient had possible viral pericarditis; another patient with Down Syndrome had unexplained serositis following classic subxiphoid pericardial window and required a second operation with percutaneous tube pericardiostomy. The second procedure also proved inadequate, and he had to undergo partial pericardectomy. Eight patients had a second operation because of inadequate drainage after the initial full pericardial window (Table 2), 6 after the initial full pericardial window and 2 after PTP. Three of the 6 patients had PTP as a second operation, with 1 patient suffering recurrence. That patient was the one previously described who underwent pericardectomy and who had no specific pathology.

DISCUSSION

Minimally invasive percutaneous tube pericardostomy decompression is a delicate procedure that should be performed with great care. In the literature different methods and approaches are described, which are summarized below:

1. Needle aspiration. This method has been used for decades; the advantages and disadvantages have been well described in previous reports [Girardi 1997].
2. Small plastic tube drainage [Law 1997]. This method has a disadvantage, the small tube becomes plugged up and the pericardial fluid is left behind because of loculations.
3. Anterior thoracotomy [Fox 1976, Olsen 1991] with [van der Schelling 1994] or without video-assisted thoracic surgery. This method at times necessitates a chest tube [Shipley 1932].
4. Classic subxiphoid pericardial window [Larrey 1829, Willius 1948]. The safety of this method depends greatly on whether the pericardium contains fair amounts of fluid and/or is grossly adherent to the heart or occupied by metastatic tumor. Cases with bleeding into the pericardium due to imbalance of anticoagulants or to myocardial infarctions are problematic, and percutaneous tube pericardiostomy decompression should be considered only if the preoperative echocardiogram indicates significant pericardial effusion with fluid volume greater than 100 to 150 mL without loculation.

Postoperative heart patients who require emergency pericardial decompression should have the lower end of the ster-

notomy incision opened and approached under direct vision. This technique has also been well documented in the literature [Santos 1977]. The author's opinion is that 2 pericardial tubes should be introduced, one posteriorly and one anteriorly, otherwise reaccumulation occurs not infrequently (8 of 114 patients, 7%) (Table 2).

A pericardial window performed following chest trauma requires different considerations and is beyond the scope of this paper.

Patients should be treated with the appropriate methods of decompression according to the differing etiologies of their pericardial effusion (Table 1). This decision should be based on the experience of the surgeon and the suitability of the decompression method. The operation should be suited to the patient and not the patient to the operation.

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