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Drainage of Pericardial Effusions: Percutaneous or Surgical?

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LEUNG, ET AL: ***Drainage of Pericardial Effusions: Percutaneous or Surgical? Background:*** *There are 2 modes of drainage of pericardial effusions: percutaneous pericardiocentesis (PP) and surgical pericardiotomy (SP). Certain features, which are indicative of cardiac tamponade, should guide us to the choice of drainage of pericardial effusions. It is unclear if this is followed in clinical practice.* ***Objective:*** *To review patients with pericardial drainage done for a period of 36 months, and to correlate the features with the choice of drainage mode.* ***Results:*** *39 patients and 47 procedures (20 PP and 27 SP) were reviewed. Several clinical features were correlated with the use of PP: dyspnoea on exertion, dyspnoea at rest, orthopnoea, tachycardia, elevated jugular venous pressure and hypotension. Pulsus paradoxus was not adequately checked. Electrocardiographic and radiographic findings were similar between the 2 modes. 91% of the patients had large effusions by echocardiography. Right atrial collapse and right ventricular collapse occurred more frequently in the group of PP.* ***Conclusion:*** *Some features were more relied by us to indicate the presence of cardiac tamponade. Their presence should lead us more to the use of percutaneous drainage and they should be checked thoroughly. The decision to drain and the selection should be assessed after an integration of all these features. (J HK Coll Cardiol 1999;7:104-108)*

Pericardial effusion, Pericardiocentesis, Pericardiotomy, Cardiac tamponade, Echocardiography

摘要

背景：有兩種心包積液的引流方式：經皮腔心包穿刺術或外科心包切除。提示心臟壓塞的某些臨床特征應該可以指導我們選擇心包積液的引流方法。但在臨床實踐中是否遵循這些指導原則尚不清楚。目的：回顧為期3 6 個月內在不同臨床背景這兩種引流方式的應用病人，并將不同的臨床、心電圖、X- 線胸片和超聲心動圖特徵與選擇首次引流方式加以聯系。結果：對39例病人和47次操作（20次經皮和27次經外科手術）進行了回顧。幾個臨床特徵與應用經皮引流相關：勞力性呼吸困難、端坐呼吸、心動過速、頸靜脈壓升高和低血壓。奇脈未作為常規充分檢查。心電圖和X-線胸片分析不能區分選擇不同引流方式的病人。在超聲心動圖方面，大多數病人（91%）有大量心包積液。右房萎陷更多發生於經皮腔穿刺組。結論：我們依靠一些特徵警惕心臟壓塞的可能性，這些特徵應指引我們用經皮刺引流。在決定引流與否和何種方式前，應詳細評估這些特徵。

關鍵詞：心包積液　心包穿刺術　心包切除術　心臟壓塞　超聲心動圖

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Introduction

Pericardial effusions may be clinically silent or overt. The occurrence of a clinical effusion depends on both the size and the rapidity of development of the effusion.[1] This can be identified by the presence of different clinical features and echocardiographic features. The extreme form of manifestation is the occurrence of cardiac tamponade, which appears when there is compression of the heart by fluid within the pericardial sac that impairs diastolic filling of the ventricles.

The judgement on the mode of drainage used to treat clinical pericardial effusion is important. Both the percutaneous pericardiocentesis (PP) and the surgical pericardiotomy (SP) are safe. In principle, it is believed that PP should be used to relieve effusion severe enough to cause cardiac tamponade. SP is beneficial for patients in the following conditions: (a) loculated pericardial effusion (especially in the absence of an anterior effusion); (b) small pericardial effusion; (c) conditions that require concomitant surgical treatment (e.g. leaking from left ventricle or aortic aneurysm) or (d) conditions that require adequate pericardial biopsy specimen for bacteriological and histological examination (e.g. tuberculous pericarditis and malignancy).

It is well known that the appearance of certain clinical features indicates the presence of cardiac tamponade. Although some clinical definitions of cardiac tamponade had been suggested,[2,3] they have never been widely accepted. The use of typical echocardiographic features to guide the decision of drainage is also not universal. At times, a patient with pericardial effusion demonstrates echocardiographic evidence of cardiac tamponade, without any of the usual clinical signs.[4] These lead to the uncertainty of whether to pursue on emergency tapping. On the other hand, the use of SP may not be as straightforward as expected. The diagnostic yield of the pericardial fluid or the pericardial biopsy may be low according to some studies.[5,6] The use of SP rather than PP for cardiac tamponade had also been recommended by some authors.[7,8]

To see if these features had guided us for a proper management of pericardial effusion, and to review what we had achieved, we analyzed retrospectively 39 patients who had pericardial drainage performed. Special attention was paid to look into those factors that affected the choice of drainage mode.

Methods

The case notes of patients who were admitted between January 1995 to December 1997 to Princess Margaret Hospital with the diagnoses of pericardial effusions were screened. Those with pericardial drainage performed were included. The features related to pericardial effusion were analyzed and correlated with the choice of drainage mode. The features included symptoms, clinical signs, electrocardiographic (ECG) findings, chest X-ray (CXR) findings, and echocardiographic findings. The significance of the correlation was assessed by the Pearson Chi-square Test and the Fisher's Exact Test. The test was significant when the p value was less than 0.05.

Results

A total of 39 patients (23 males, 16 females) were included. 47 procedures were performed. 13 patients had PP, 22 patients SP, 4 patients both. Only the first drainage mode was considered for the last 4 patients. The features related to pericardial effusion were successfully collected from 36 patients (data missed in 3) and tabulated with the drainage mode. These features included symptoms (Table 1), clinical signs (Table 2), ECG findings (Table 3) and CXR findings (Table 4). Echocardiographic findings (Table 5) were traceable in 34. The size of effusion was quantified as: (a) large effusion: effusion totally surrounding the heart, with greatest width > 1 cm; (b) moderate effusion: effusion surrounding the heart, with greatest width of 1 cm or less, or effusion localized (anteriorly or posteriorly), with greatest width of > 1 cm; (c) small effusion: effusion localized (anteriorly or posteriorly), with greatest width of 1 cm or less.

When analyzing the frequency of each feature according to the drainage mode, the following were found to be more statistically frequent in the group of PP: dyspnoea on exertion, orthopnoea, tachycardia (pulse rate more than 100 per minute), elevated jugular venous pressure (JVP), hypotension (systolic blood pressure less than 100 mmHg) and right atrial (RA) collapse. The following were more (although not statistically) frequent in PP: dyspnoea at rest (p=0.090) and right ventricular (RV) collapse (p=0.082). No ECG or CXR findings showed statistically significant differences.

Table 1. Symptoms: Frequency according to the drainage mode

	Overall (%)	Drainage Mode		P value
		PP (%)	SP (%)	
Total number	36 (100)	17 (100)	19 (100)	
Dyspnoea on exertion	26 (72)	15 (88)	11 (58)	0.047*
Dyspnoea at rest	24 (67)	15 (88)	9 (47)	0.090
Cough	20 (56)	11 (65)	9 (47)	NS
Fever	17 (47)	9 (53)	8 (42)	NS
Orthopnoea	16 (44)	11 (65)	5 (26)	0.021*
Chest pain	16 (44)	7 (41)	9 (47)	NS
Leg swelling	10 (28)	6 (35)	4 (21)	NS
Abdominal swelling	4 (11)	3 (18)	1 (5)	NS
Paroxysmal nocturnal dyspnoea	3 (8)	1 (6)	2 (11)	NS
Night sweats	1 (3)	0 (0)	1 (5)	NS
Syncope	0 (0)	0 (0)	0 (0)	NS
None	3 (8)	1 (6)	2 (11)	NS

*: significant difference; NS: not significant

PP: percutaneous pericardiocentesis; SP: surgical pericardiotomy

Table 2. Clinical Signs: Frequency according to the drainage mode

	Overall (%)	Drainage Mode		P value
		PP (%)	SP (%)	
Total number	36 (100)	17 (100)	19 (100)	
Respiratory rate > 16/min	32 (89)	15 (89)	17 (89)	NS
Pulse > 100/min	21 (58)	13 (76)	8 (42)	0.037*
Elevated jugular venous pressure	21 (58)	13 (76)	8 (42)	0.037*
Fever	16 (44)	8 (47)	8 (42)	NS
Rales	15 (42)	9 (53)	6 (32)	NS
Edema	11 (31)	7 (41)	4 (21)	NS
Systolic blood pressure < 100 mmHg	9 (25)	8 (47)	1 (5)	0.049*
Pulsus paradoxus	9 (25)	6 (35)	3 (16)	NS
Hepatomegaly	9 (25)	4 (24)	5 (26)	NS
Friction rub	8 (22)	3 (18)	5 (26)	NS
Ascites	6 (17)	4 (24)	2 (11)	NS
Murmur	5 (14)	2 (12)	3 (16)	NS
Kussmaul's sign	4 (11)	2 (12)	2 (11)	NS
Soft 1st or 2nd heart sound	4 (11)	3 (18)	1 (5)	NS

Table 3. ECG Findings: Frequency according to the drainage mode

	Overall (%)	Drainage Mode		P value
		PP (%)	SP (%)	
Total number	36 (100)	17 (100)	19 (100)	
Sinus tachycardia	22 (61)	11 (65)	11 (58)	NS
Low voltage	21 (58)	11 (65)	10 (53)	NS
Electrical alternans	5 (14)	4 (24)	1 (5)	NS
Atrial fibrillation	5 (14)	3 (18)	2 (11)	NS
PR depression	4 (11)	2 (12)	2 (11)	NS
Diffuse T wave inversion	2 (6)	2 (12)	0 (0)	NS
Diffuse ST elevation	1 (3)	1 (6)	0 (0)	NS
Diffuse ST depression	0 (0)	0 (0)	0 (0)	NS

Table 4. CXR Findings: Frequency according to the drainage mode

	Overall (%)	Drainage Mode		P value
		PP (%)	SP (%)	
Total number	36 (100)	17 (100)	19 (100)	
Enlarged silhouette	36 (100)	17 (100)	19 (100)	NS
Water bottle shape	15 (42)	6 (35)	9 (47)	NS
Left pleural effusion	13 (36)	7 (41)	6 (32)	NS
Right pleural effusion	10 (28)	5 (29)	5 (26)	NS
Lung mass	10 (28)	5 (29)	5 (26)	NS
Congestive heart failure	3 (8)	1 (6)	2 (11)	NS
Lung infiltrate	2 (6)	1 (6)	1 (5)	NS
Normal	0 (0)	0 (0)	0 (0)	NS

Table 5. Echocardiographic Findings: Frequency according to the drainage mode

	Overall (%)	Drainage Mode		P value
		PP (%)	SP (%)	
Total number	34 (100)	16 (100)	18 (100)	
Size: Large	31 (91)	16 (100)	15 (83)	NS
Moderate or small	3 (9)	0 (0)	3 (17)	NS
Right atrial collapse	21 (62)	13 (81)	8 (44)	0.028*
Right ventricular collapse	18 (53)	11 (69)	7 (39)	0.082
Intrapericardial strands, masses or particles	2 (6)	2 (13)	0 (0)	NS

Discussion

This retrospective analysis looked into those patients who had pericardial drainage performed. It touched several important areas that can be discussed. Dyspnoea on exertion, dyspnoea at rest and cough were the most frequent symptoms, followed by fever, orthopnoea, and some others (Table 1). Markedly similar results were obtained from Wall[7] who looked into the clinical features of 57 patients with large pericardial effusions. Dyspnoea on exertion, dyspnoea at rest and orthopnoea were more frequent in the group of PP. This corresponds well with the concept that patients with severe symptoms like dyspnoea on exertion and orthopnoea require emergency tapping. Indeed, dyspnoea is the only symptom that has been included in a clinical definition of cardiac tamponade.[4] It is utmost important to look for its presence in patients with pericardial effusion.

Tachypnoea, tachycardia and elevated JVP were among the most frequent clinical signs found (Table 2). They were also found to be present more in tamponade than in non-tamponade in Wall's study.[7] Tachycardia and elevated JVP were more frequent in the group of PP. Another important sign was hypotension. It had been noted as being infrequent,[2,9] and appeared in only 25% in this study. But it is a sign of emergency. Pulsus paradoxus was also claimed to be markedly differentiating by Wall[7] and others,[2] although in certain situations it may be absent,[10,11] such as left ventricular dysfunction. Our data showed that its frequency of occurrence was lower than expected. The most likely reason was the sign was missed by front-line doctors, and so was not mentioned in the case notes. From Table 3 and 4, We can deduce that it is important not to rely on electrocardiographic and radiographic findings to determine the clinical severity of pericardial effusion, or the need of emergency tapping. This is by large similar to what was observed in Wall's study.[7]

Echocardiography is now the gold standard for identifying pericardial effusions. Determining the size of an effusion carries not only diagnostic but also prognostic value. Eisenberg[12] showed that effusion size was the most powerful echocardiographic predictor of cardiac tamponade and/or drainage procedures. In our review, 31 out of 34 (91%) patients had large effusions (Table 5). RA and RV collapses occurred more frequently in the group of PP. These signs may occur early during the development of cardiac tamponade.[13] But recent studies have shown that they lack specificity and sensitivity.[12,14,15] Indeed, it has been suggested by Fowler[4] that many patients with echocardiographic

findings of pericardial effusion and right heart compression who do not have clinical signs can be observed closely and urgent drainage is unnecessary. He concluded that the occurrence of both clinical and echocardiographic features markedly improve the specificity to tamponade.

Other echocardiographic features have been described in the literature but were not analyzed in this study. These features include abnormal respiratory changes in ventricular dimensions, abnormal respiratory variation in tricuspid and mitral flow velocities, dilated inferior vena cava with lack of inspiratory collapse, and swinging heart. In general, it is more time-consuming to look for these features, and so in the emergency setting they were not performed routinely. Their specificity and the yield on additional prognostic information are also questioned.[16]

As mentioned before, the cause and the site of pericardial effusion may interfere the choice of drainage mode. We had 1 case of posteriorly loculated effusion and 3 cases of small-to-moderate effusions that did not allow PP. There were no cases of leaking left ventricle or acute haemopericardium that required concomitant surgical treatment. We encountered 1 case of aortic dissection and PP was performed because of tamponade. The need of the pericardial biopsy may interfere the selection of drainage mode. But it has to be stressed that at all times the relief of cardiac tamponade is the most important, and biopsy can be collected in a subsequent occasion. This is also the approach adopted by us.

Limitations to this study are noted. First, our study population was small. Some of the correlations did not approach statistical power. Second, those patients who had massive effusions but were not drained could not be assessed. Third, this is a retrospective study. The data was by no means complete, and some essential features, such as pulsus paradoxus or certain echocardiographic findings, could not be retrieved. Finally, because this is a retrospective study, there is also bias for the selection of drainage mode.

In conclusion, we have presented our local data on the comparison of two drainage modes of pericardial effusion. Some features were more relied by us to indicate the presence of cardiac tamponade. Their presence should lead us more to the use of percutaneous drainage and they should be checked thoroughly. The decision to drain and the selection should be assessed after an integration of all these features.

References

1. Lorell BH. Pericardial diseases. In: Braunwald E, editor. Heart disease - A textbook of cardiovascular medicine, 5th edition. W.B.Saunders, 1997:1478-1534.
2. Guberman BA, Fowler NO, Engel PJ, Gueron M, Allen JM. Cardiac tamponade in medical patients. Circulation 1981; 64: 633-640.
3. Reddy PS, Curtiss EI. Diseases of the pericardium: Cardiac tamponade. Cardiology Clinics 1990; 8: 627-637.
4. Fowler NO. Cardiac tamponade: A clinical or an echocardiographic diagnosis? Circulation 1993; 87: 1738-1741.
5. Permanyer-Miralda G, Sagrista-Sauleda F, Soler-Soler J. Primary acute pericardial disease: A prospective series of 231 consecutive patients. Am J Cardiol 1985; 56: 623-630.
6. Krikorian JG, Hancock EW. Pericardiocentesis. Am J Med 1978; 65: 808-814.
7. Wall TC, Campbell PT, O'Connor CM, et al. Diagnosis and management (by subxiphoid pericardiotomy) of large pericardial effusions causing cardiac tamponade. Am J Cardiol 1992; 69:1075-1078.
8. Alcan KE, Zabetakis PM, Marino ND, et al. Management of acute tamponade by subxiphoid pericardiotomy. JAMA 1982; 247:1143-1148.
9. Levine MJ, Lorell BH, Diver DJ, Come PC. Implications of echocardiographically assisted diagnosis of pericardial tamponade in contemporary medical patients: Detection before hemodynamic embarrassment. J Am Coll Cardiol 1991; 17: 59-65.
10. Reddy PS, Curtiss EI, O'Toole JD, et al. Caridac tamponade: Hemodynamic observations in man. Circulation 1978; 58:265-272.
11. Hoit BD, Gabel M, Fowler NO. Cardiac tamponade in left ventricular dysfunction. Circulation 1990; 82: 1370-1376.
12. Eisenberg MJ, Oken K, Guerrero S, et al. Prognostic value of echocardiography in hospitalized patients with pericardial effusion. Am J Cardiol 1992; 70:934-939.
13. Singh S, Wann LS, Schuchard GH, et al. Right ventricular and right atrial collapse in patients with cardiac tamponade - a combined echocardiographic and hemodynamic study. Circulation 1984; 70:966-971.
14. Klopfenstein HS, Cogswell TL, Bernath GA, et al. Alterations in intravascular volume afftect the relation between right ventricular diastolic collapse and the hemodynamic severity of cardiac tamponade. J Am Coll Cardiol 1985; 6:1057-1063.
15. Gillam LD, Guyer DE, Gibson TC, et al. Hydrodynamic compression of the right atrium: A new echocardiographic sign of cardiac tamponade. Circulation 1983; 68:294-301.
16. Appleton CP, Hatle LK, Popp RL. Cardiac tamponade and pericardial effusion: Respiratory variation in transvalvular flow velocities studied by Doppler echocardiography. J Am Coll Cardiol 1988; 11:1020-1030.