

Available online at www.sciencedirect.com**ScienceDirect**

Journal of the Egyptian Society of Cardio-Thoracic Surgery 24 (2016) 249–254

<http://www.journals.elsevier.com/journal-of-the-egyptian-society-of-cardio-thoracic-surgery/>

Original article

Video-assisted thoracoscopic pleuro-pericardial window for recurrent massive pericardial effusion in patients with known malignancy

Amr M. Allama*

Cardiothoracic Surgery Department, Faculty of Medicine, Menoufia University, Sheben-Elkom, Yassen Abd-Elghaffar Street, Menoufia, Postal Code 32511, Egypt

Received 4 October 2016; revised 18 October 2016; accepted 23 October 2016

Available online 27 October 2016

Abstract

Background: Multiple treatment options for pericardial effusion are present including medical treatment, needle pericardiocentesis, percutaneous catheter drainage, and surgical drainage. Surgical intervention includes subxiphoid drainage and pleuro-pericardial window. This study focuses on video-assisted thoracoscopic surgery as a treatment option for recurrent massive malignant pericardial effusion.

Methods: This was a prospective study carried out at Menoufia Faculty of Medicine University Hospital. It included 20 patients with a known history of malignancy and an echocardiographic evidence of massive recurrent pericardial effusion. We used video-assisted thoracoscopy to create a large window in the pericardium to the pleura.

Results: This study included 20 patients with a mean age of 45 years. The primary malignancy was breast cancer in 11 cases (55%), lung cancer in 4 cases (20%), lymphoma in 3 cases (15%), leukemia in 1 case, and cancer cervix in 1 case. The operative time ranged from 40 to 75 min. Postoperative complications occurred in 2 cases (10%). The chest tube duration ranged from 2 to 7 days, and the mean postoperative hospital stay was 4.6 ± 1.8 days. Histopathology of the pericardial specimen was positive for malignancy in 11 cases (55%) and revealed non-specific pericarditis in 9 cases (45%). We did not record postoperative mortality, but at 3 months postoperatively, 3 patients were dead due to progression of their primary malignancy, and one patient developed recurrence.

Conclusion: We concluded that thoracoscopic pleuropericardial window is an excellent treatment option for recurrent massive malignant pericardial effusion in patient who could tolerate the procedure.

Copyright © 2016, The Egyptian Society of Cardio-thoracic Surgery. Publishing services by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Keywords: Thoracoscopy; VATS; Pericardium

* Fax: +20 482573339.

E-mail address: amrallama2005@yahoo.com.

Peer review under responsibility of The Egyptian Society of Cardio-thoracic Surgery.

1. Introduction

Pericardial effusion occurs when the rate of pericardial fluid production is more than the rate of fluid absorption. The nature of the fluid may be serous, purulent, or hemorrhagic, or a combination of these types [1]. Pericardial effusion secondary to malignancy classically occurs either by direct local invasion of the pericardium, and sometimes the myocardium itself, or by distant metastatic involvement of the pericardium. It could also result from lymphatic drainage obstruction due to mediastinal lymphadenopathy [2]. A wide range of treatment options are present including medical treatment, needle pericardiocentesis, percutaneous catheter drainage, and surgical drainage [3]. Needle pericardiocentesis is better done with echocardiographic guidance. It is used for diagnostic purpose, and it could be used to relieve tamponade and insertion of a percutaneous catheter for continuous drainage. Percutaneous echocardiographic guided balloon pericardiotomy could be used for drainage of the pericardial space by creating a hole between it and the pleural space [2]. Surgical intervention includes subxiphoid drainage and pleuro-pericardial window. In subxiphoid drainage, a large drain is inserted in the pericardial space through a small upper abdominal incision. In pleuro-pericardial window, a larger opening is made in the pericardium allowing continuous drainage of the pericardial space into the larger pleural space. The retrieved fluid and pericardial tissue can be further examined for diagnostic purposes. This could be done by a limited anterior thoracotomy or thoroscopically [3]. This study focuses on video-assisted thoracoscopic surgery (VATS) as a treatment option for recurrent massive malignant pericardial effusion.

2. Patients and methods

This was a prospective study carried out at Menoufia Faculty of Medicine University Hospital from February 2014 to July 2016. The ethics committee of Faculty of Medicine Menoufia University approved this research. Inclusion criteria included patients with a known history of malignancy and an echocardiographic evidence of massive recurrent pericardial effusion. Exclusion criteria included; children (less than 18 years), patients with pericardial effusion without associated malignancy (pericarditis, renal, or cardiac), patients with first presentation pericardial effusion (not recurrent), patients with constrictive pericarditis (marked pericardial thickening), patients with bad general condition unfit for general anesthesia or not tolerating single lung ventilation, and emergency cases requiring rapid relief of tamponade (in these patients subxiphoid drainage was preferred). All patients had full preoperative laboratory investigations (including complete blood count, liver function tests, kidney function tests, prothrombin time, random blood sugar, and arterial blood gases), electrocardiography, chest X-ray, and echocardiography. Computerized tomography scan was performed to all cases to exclude constrictive pericarditis, to determine the presence of localized or loculated pericardial effusion, and to detect the presence of associated pleural effusion.

The side of the operation was selected according to the presence of loculated pericardial effusion and the association of pleural effusion, otherwise, the left side was selected. If there was a huge pericardial cavity occupying most of the left hemithorax and limiting the working space, the right side was selected. All patients were operated under general anesthesia with double-lumen endotracheal intubation (single lung ventilation). Patients were in the supine position with elevation of the operated side.

We used 0° telescope which was introduced by 10 mm trocar mostly in the 5th intercostal space at the anterior axillary line. Two working ports were made in the 4th and 6th intercostal spaces at the mid-axillary line. The pleural cavity was explored for any abnormalities and any associated pleural effusion was aspirated. A large window (about 3–4 cm diameter) was made after identification and preservation of the phrenic nerve (Fig. 1). The window was made posterior and or anterior to the phrenic nerve in the left side, and anterior to the phrenic nerve in the right side and the pericardial fluid was aspirated. Any septations or loculations were taken down. The pericardial specimen was sent for histopathology. A pleural space drain (size 32 to 36) was inserted through the 6th space port and was removed when the daily drainage was less than 150 ml. Echocardiography was done at discharge and after 3 months for detection of recurrence.

2.1. Statistical analysis

Data has been collected and entered to the computer using SPSS (Statistical Package for Social Science) program for statistical analysis, (version 20; Inc., Chicago. IL). Quantitative data has been shown as mean, and SD, while qualitative data was expressed as frequency and percent.

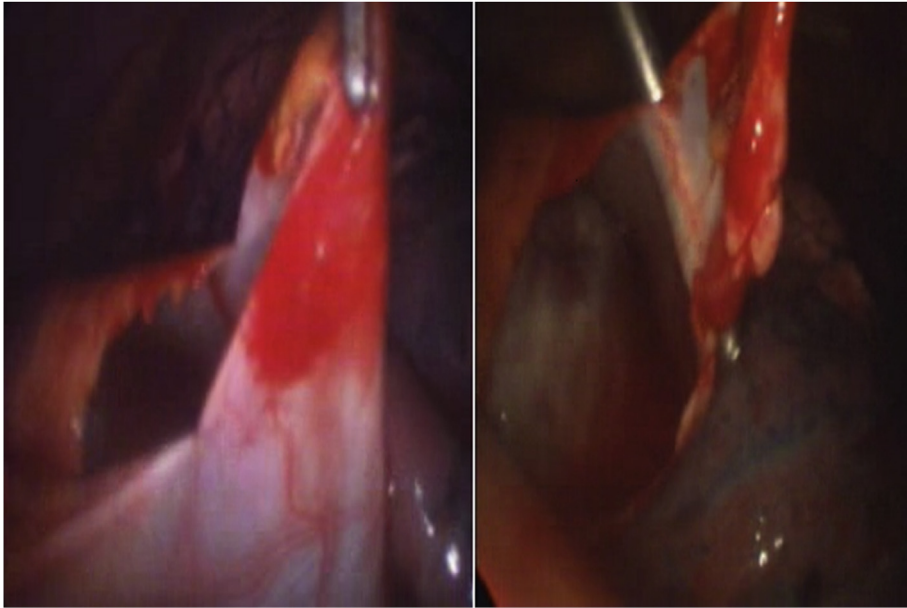


Fig. 1. A large window was made in the pericardium.

3. Results

This study included 20 patients (Table 1) with a mean age of 45.2 ± 9.7 years. There were 13 females (65%) and 7 males (35%). The most frequent presenting symptom was dyspnea which was present in all cases. It was associated with chest pain in 3 cases (15%), and fever in 1 case (5%). The primary malignancy (Table 2) was breast cancer in 11 cases (55%), lung cancer in 4 cases (20%), lymphoma in 3 cases (15%), leukemia in 1 case (5%), and cancer cervix in 1 case (5%). Preoperative echocardiography revealed septations and loculations in 3 cases (15%) and preoperative pericardial fluid cytology was positive for malignancy in 6 cases (30%). Associated pleural effusion was present in 14 cases (70%), and it was bilateral in 5 cases (25%). The window was done on the left side in 13 cases (65%) and on the right side in 7 cases (35%) (Table 3). The operative time ranged from 40 to 75 min (mean 55 ± 9.9 min). In patients

Table 1
Preoperative data.

Parameter	
Age (years)	45.2 ± 9.7
Female gender	13 (65%)
Preoperative EF	50.4 ± 6.9
Preoperative septated effusion	3 (15%)
Preoperative positive cytology	6 (30%)
Associated pleural effusion	14 (70%)

Table 2
Primary malignancy.

Primary malignancy	Number (%)
Breast	11 (55)
Lung	4 (20)
Lymphoma	3 (15)
Leukemia	1 (5)
Cervix	1 (5)

Table 3
Operative and postoperative data.

Parameter	
Left sided approach	13 (65%)
Operative time (minutes)	55 ± 9.9
Operative pleural drainage (ml)	1425 ± 488.2
Operative pericardial drainage (ml)	732.5 ± 258.2
Operative complications	1 (5%)
Postoperative complications	2 (10%)
Chest tube duration (days)	3.5 ± 1.1
Hospital stay (days)	4.6 ± 1.8
Specimen positive for malignancy	11 (55%)
Recurrence at 3 months (of 17 alive)	1 (5.9%)

with pleural effusion, the amount of drained pleural fluid intraoperatively ranged from 650 ml to 2100 ml (1425 ± 488.2 ml). The mean amount of pericardial fluid drainage intraoperatively was 732.5 ± 258.2 ml. No operative complications were recorded except for a small lung tear due to trocar insertion in 1 case (5%). Postoperative complications occurred in 2 cases (10%), one developed postoperative supra-ventricular tachyarrhythmia, and the other developed postoperative pulmonary edema requiring mechanical ventilation for 48 h. The chest tube duration ranged from 2 to 7 days (mean 3.5 ± 1.1 days), and the mean total postoperative hospital stay was 4.6 ± 1.8 days (range 3–10 days). Cytological analysis of the drained pericardial effusion for malignant cells increased the total number of patients with positive cytology of malignancy from 6 cases (30%) preoperatively to 9 cases (45%). Histopathology of the pericardial specimen was positive for malignancy in 11 cases (55%) and revealed non-specific pericarditis in 9 cases (45%). If this number of patients with tissue diagnosis of malignancy is analyzed together with those patients with positive cytology of malignancy the total number of patients with proven malignant pericardial effusion increased to 15 patients (75%). We did not record postoperative mortality, but at 3 months postoperatively, 3 patients were dead due to progression of their primary malignancy. Of the 17 alive patients, only one developed recurrence of the pericardial effusion but without any related manifestations.

4. Discussion

Despite the presence of several treatment options for the drainage of pericardial effusion, surgically performed window recorded the lowest rate of recurrence (from 8% to 10%) [3]. Pericardial effusion may develop in up to 20% of patients with advanced malignancy, and when treated by pericardiocentesis alone the recurrence rate may reach up to 90% in 3 months [4]. The aim of creating an opening (window) in the pericardium is to allow the collected fluid to be drained in the pleural cavity to avoid reaccumulation of fluid in the pericardial cavity [5]. This also allows symphysis between the epicardial surface of the heart and the inner layer of the pericardium which develops after several days of drainage [6].

The mean age in our study was 45.2 years, which is younger than that recorded by Neragi-Miandoab et al. [4] (54.8 years), and O'Brien et al. [3] (54.5 years). This may be because the main pathology in our study was breast cancer, while it was lung cancer in their study. This also explains why females constituted 65% of our patient while it was 33% [3] and 45% [4] in their studies. Associated pleural effusion was present in 70% of our patients, while it was 50% in Geissbuhler et al. [7] and Georghiou et al. [8], 40% in O'Brien et al. [3], and 36.4% in Nataf et al. [9]. Our approach was from the left side in 65% of cases. In Nataf et al. study [9], 95.4% of cases were done from the left side, while it was 40% in O'Brien et al. [3], 34% in Geissbuhler et al. [7], and 11% in Georghiou et al. [8]. Our mean operative time was 55 min, which was close to that recorded by Geissbuhler et al. [7] (45 min), and Georghiou et al. [8] (46 min). O'Brien et al. [3] and Muhammad [10] recorded a much longer time (117.1 min and 111.3 min, respectively), but they recorded all the anesthetic time instead of the true operative time. The mean amount of pericardial fluid drained intraoperatively was 732.5 ml, which is close to that of O'Brien et al. [3] (735 ml) and Nataf et al. [9] (622 ml). We did not operate on patients with tamponade and in this situation we preferred subxiphoid window as it could be done faster and with local anesthesia. We also preferred the subxiphoid approach in patients with short life expectancy and advanced metastatic disease.

Regarding operative complications, only one case (5%) had a single lung tear complicated by postoperative air leak for 2 days. The same complication occurred with O'Brien et al. [3] in also 1 case (6.7%), but air leak continued requiring discharge of the patient after insertion of Heimlich valve. They also reported another case of pneumothorax after removal of the chest tube but without evidence of lung tear. Many researchers reported no postoperative complications with this technique [7,8,10]. We recorded 2 cases of postoperative complications (10%), one case of supraventricular tachycardia, and another case of pulmonary edema. Geissbuhler et al. [7] reported postoperative complications in 3 cases (12%), one case developed supraventricular tachyarrhythmia, another case developed vertigo due to minor cerebrovascular event, and the third case had peripheral pulmonary embolism. In their series, Georghiou et al. [8] had only one case of his 18 patients that developed supraventricular tachyarrhythmia. Neragi-Miandoab et al. [4] had one patient (1.6%) who needed postoperative mechanical ventilation for 2 days after surgery. Positive malignant involvement of the pericardial specimen was present in 55% of our patients, which was so close to that recorded by Neragi-Miandoab et al. [4], who had positive pericardial specimen in 28 of their 50 patients (56%). In this study, the combination of cytological examination for malignant cells and the tissue histopathological examination of the pericardium raised the number of patients with positive malignant pericardial effusion to 15 (75%). This indicates that this technique apart from its therapeutic value, it aids in improving diagnosis. Apart from the possibility of false negative results in the remaining patients, it is important to mention that the effusion may be due to non malignant causes. The latter include: associated cardiac, renal or hepatic dysfunction, hypoproteinemia and lymphatic obstruction by malignant dissemination to mediastinal lymph nodes. Theoretically, the diagnosis of the pericardial disease could be more accurate with thoracoscopic window as it allows direct visualization of a large area of the pericardium and inside the pericardial cavity and selection of the biopsy site even away from the area where the window was created. Also it allows exploration of the entire pleural cavity and taking biopsies from any suspicious areas.

Our mean chest tube duration was 3.5 days. It is close to that recorded by Muhammad [10] (3.4 days), O'Brien et al. [3] (3.3 days), Geissbuhler et al. [7] (3.3 days), and Georghiou et al. [8] (2.3 days). The mean hospital stay was 4.6 days, which is close to that of Georghiou et al. [8] (6.4 days). Other authors recorded a longer hospital stay; 12.4 days in O'Brien et al. [3], 10.2 days in Muhammad [10], and 10.4 days in Geissbuhler et al. [7] who stated that hospital stay more than 5 days was mainly due to the underlying disease, not due to the surgical procedure. We had only one case of recurrence (5%) at 3 months follow-up. No recurrence occurred with Georghiou et al. [8], or Muhammad [10]. Geissbuhler et al. [7], Nataf et al. [9], and O'Brien et al. [3] had also 1 case of recurrence (4.2%, 4.5%, and 8%, respectively). Neragi-Miandoab et al. [4] reported a higher recurrence rate (11%) which may be due to a longer period of follow-up.

We concluded that thoracoscopic pleuropericardial window is an excellent treatment option for recurrent massive malignant pericardial effusion in patient who could tolerate the procedure.

Conflict of interest

There is no conflict of interest in this study.

References

- [1] Press OW, Livingston R. Management of malignant pericardial effusion and tamponade. *J Am Med Assoc* 1987;257:1088–92.
- [2] Refaat MM, Katz WE. Neoplastic pericardial effusion. *Clin Cardiol* 2011;34:593–8.
- [3] O'Brien PK, Kucharczuk JC, Marshall MB, Friedberg JS, Chen z, Kaiser LR, Shrager JB. Comparative study of subxiphoid versus videothoracoscopic pericardial window. *Ann Thorac Surg* 2005;80:2013–9.
- [4] Neragi-Miandoab S, Linden PA, Ducko CT, Bueno R, Richards WG, Sugarbaker DJ, Jaklitsch MT. VATS pericardiectomy for patients with known malignancy and pericardial effusion: survival and prognosis of positive cytology and metastatic involvement of the pericardium: a case control study. *Int J Surg* 2008;6:110–4.
- [5] Mangi AA, Torchiana DF. Pericardial disease. In: Cohn LH, editor. *Cardiac surgery in the adult*. 3rd ed. McGraw-Hill; 2008. p. 1465–78.
- [6] Sugimoto JT, Little AG, Ferguson MK, Borow KM, Vallera D, Staszak VM, Weinert L. Pericardial window: mechanisms of efficacy. *Ann Thorac Surg* 1990;50:442–5.
- [7] Geissbuhler K, Leiser A, Furer J, Ris H. Video-assisted thoracoscopic pericardial fenestration for loculated or recurrent effusions. *Eur J Cardiothorac Surg* 1998;14:403–8.
- [8] Georghiou GP, Stamler A, Sharoni E, Fishman-Horn S, Berman M, Vidne BA, Saute M. Video-assisted thoracoscopic pericardial window for diagnosis and management of pericardial effusions. *Ann Thorac Surg* 2005;80:607–10.

- [9] Nataf P, Cacoub P, Regan M, Baron F, Dorent R, Pavie A, Gandjbakhch I. Video-thoroscopic pericardial window in the diagnosis and treatment of pericardial effusion. *Am J Cardiol* 1998;82:124–6.
- [10] Muhammad MI. The pericardial window: is a video-assisted thoracoscopy approach better than a surgical approach? *Interact CardioVasc Thorac Surg* 2011;12:174–8.