

## Pericardiopleural window creation with a small anterior thoracotomy

*Küçük anterior torakotomi ile perikardiyoplevral pencere açılması*

Murat Biçer,<sup>1</sup> Bülent Özdemir,<sup>2</sup> İrem İris Kan,<sup>1</sup> Hüseyin Melek,<sup>3</sup> Ahmet Sami Bayram<sup>3</sup>

Departments of <sup>1</sup>Cardiovascular Surgery, <sup>2</sup>Cardiology, <sup>3</sup>Thoracic Surgery,  
Medical Faculty of Uludağ University, Bursa, Turkey

### ABSTRACT

**Background:** This study aims to investigate the efficacy of pericardiopleural window created by small anterior thoracotomy in the treatment and diagnosis of the pericardial effusion.

**Methods:** Between January 2006 and January 2011, data of a total of 52 patients (27 males, 25 females; mean age 61.8 years; range 45 to 78 years) underwent pericardiopleural window due to pleural effusion were retrospectively analyzed. Pericardial effusion was diagnosed with echocardiography or computed tomography. A pericardiopleural window was created via a small anterior thoracotomy in the right or left sixth or seventh intercostal space according to the main pathology. Incisions were about 5 to 7 cm long. A 2x2 cm window in size was created from anterior surface of the pericardium to the phrenic nerve.

**Results:** Indications for pericardiopleural window creation were malignant effusions in 20 patients, idiopathic causes in 20 patients, infective causes in nine patients and previous cardiac surgery in three patients. The mean duration of surgery was 42.2 minutes (range, 32 to 65). No intraoperative and postoperative mortality and morbidity was seen. The mean length of hospital stay was 5.6 (range 2 to 15) days.

**Conclusion:** Pericardiopleural window creation with small anterior thoracotomy is an effective technique for drainage of the pericardial fluid and pericardial biopsy.

**Keywords:** Pericardial effusion; pericardiopleural window; thoracotomy.

### ÖZ

**Amaç:** Bu çalışmada, küçük anterior torakotomi ile açılan perikardiyoplevral pencerenin perikardial efüzyon tanı ve tedavisindeki etkinliğinin araştırılması amaçlandı.

**Çalışma planı:** Ocak 2006 - Ocak 2011 tarihleri arasında, plevral efüzyon nedeniyle perikardiyoplevral pencere açılan toplam 52 hastanın verileri (27 erkek, 25 kadın; ort. yaş 61.8 yıl; dağılım 45-78 yıl) retrospektif olarak incelendi. Perikardiyal efüzyon tanısı ekokardiyografi veya bilgisayarlı tomografi ile konuldu. Perikardiyoplevral pencere ana patolojiye bağlı olarak sağ veya sol altıncı veya yedinci kaburgalar arası aralıktan küçük anterior torakotomi ile açıldı. İnsizyonlar yaklaşık 5 ila 7 cm uzunluğundaydı. Perikardın anterior yüzünden frenik sinire doğru 2x2 cm boyutunda bir pencere açıldı.

**Bulgular:** Perikardiyoplevral pencere açılma endikasyonları 20 hastada malign efüzyon, 20 hastada idiyopatik nedenler, dokuz hastada enfektif nedenler ve üç hastada geçirilmiş kardiyak ameliyat idi. Ortalama ameliyat süresi 42.2 dakika (dağılım 32-65) idi. Ameliyat sırası ve sonrası morbidite ve mortalite ile karşılaşılmadı. Ortalama hastanede kalış süresi 5.6 (dağılım 2-15) gün idi.

**Sonuç:** Küçük anterior torakotomi ile perikardiyoplevral pencere açılması, perikardiyal mayinin drenajı ve perikardiyal biyopsi için etkili bir tekniktir.

**Anahtar sözcükler:** Perikardiyal efüzyon; perikardiyoplevral pencere; torakotomi.

Pericardial effusion may result from the several diseases, and infections, toxic materials, and malignancy are the most common causes.<sup>[1]</sup> The fluid accumulation in the pericardial sac induces the varying degree important

symptoms. The large volume of fluids prevents to the cardiac functions and leads to fatal outcomes.<sup>[1]</sup> A rapid accumulation of low amount of fluid causes cardiac tamponade, as well.<sup>[1]</sup> Recurrences are more



common in pericardial effusions, and malignancies and idiopathic reasons may cause to persistent fluid accumulation in the pericardial sac.<sup>[1]</sup>

Repeated pericardiocentesis may be required and the need for more efficient and long-lasting solutions may arise. The implementation of surgical procedures which can more efficiently relieve symptoms and prevent heart failure and mortality risk due to cardiac tamponade is required. Pericardial fenestration is a surgical procedure that can sometimes be implemented as the last resort.<sup>[1]</sup> Chronic pericardial effusions resistant to medical therapy can effectively be treated by a creating of pericardiopleural window. During the procedure, effective drainage and taken of biopsy specimens can be performed as both diagnostic and therapeutic targets.<sup>[2]</sup>

In this study, we aimed to investigate the efficacy of pericardiopleural window created by small anterior thoracotomy in the diagnosis and treatment of the pericardial effusions.

## PATIENTS AND METHODS

A total of 52 patients' data (27 males, 25 females; mean age 61.8 years; range 45 to 78 years) underwent pericardiopleural window operation between January 2006 and January 2014 due to chronic pericardial effusion were retrospectively evaluated. All medical reports were manually reviewed and traumatic pericardial effusions were excluded. Pericardial effusion was diagnosed with echocardiography or computed tomography (Figure 1). In all cases, a



**Figure 1.** A computed tomography image showing clinically evident pericardial effusion and metastasis in a patient with inoperable lung cancer. One liter of pericardial fluid was drained during the pericardiopleural window operation.

pericardial window was created via a small anterior thoracotomy in the sixth or seventh intercostal space from the right or left hemithorax according to the main pathology. The incision was about 5 to 7 cm long (Figure 2). Through the intercostal space, we entered the pleural cavity over the superior margin of the rib. After placing of a retractor, we obtained samples of pleural effusion. We palpated the lung tissue and, then, we took biopsy specimens of pericardium and the lung tissue, if required. The pericardium was incised anterior to the phrenic nerve. A surgical fenestration with a window about 2x2 cm diameter was performed. A hemovac drain (Bıçakçılar, Türkiye, Bvak 400, drainage kit 12ch) was inserted into the pleural cavity.

## Statistical analysis

The average and standard deviation of the data were calculated by using Excel program (Microsoft®, 2010, USA).

## RESULTS

Indications for pericardiopleural window creation were malignant effusion in 20 patients (38.4%), idiopathic causes in 20 patients (38.4%), infective causes in nine patients (17.4%) and previous cardiac surgery (5.8%) in three patients. The mean incision diameter was 6.3 cm (range 5 to 7 cm). Left thoracotomy was used for pericardiopleural window creation in 43 patients



**Figure 2.** An image of postoperative skin incision.

(82.7%). The mean duration of surgery was 42.2 (range 32 to 65) minutes. The mean length of hospital stay was 5.6 (range 2 to 15) days. No intraoperative and postoperative early stage mortality and morbidity was seen. However, the mortality rate was 23.1% and 25% at six and 12 months, respectively. The mortalities were seen in patients with malignancies. Renal and hepatic failure was seen in three patients. Infections were the cause of mortality in seven patients. One patient had intracranial hemorrhage, and one patient had gastrointestinal bleeding. Massive pulmonary embolism was the cause of death in one patient. Three patients (5.8%) were diagnosed with lymphoma. Eleven patients (21.2%) had inoperable lung cancer. Seven patients (13.5%) had tuberculosis-related recurrent pericardial effusion requiring surgery. Two patients (3.5%) had thymic carcinoma; while another two patients (3.8%) were operated for breast cancer. Three patients (5.8%) had recurrent pericardial effusion.

## DISCUSSION

In the present study, we reported our experience with transthoracic pericardial window operation. The study results showed that pericardial window operation with a small anterior thoracotomy approach was effective with a low complication rate, compared to sternotomy or subxiphoid approach. The length of hospital stay was also short with a low rate of recurrence. Having no early stage postoperative death also suggests that pericardiopleural window creation was effective and safe way of treating pericardial effusions. The etiologies of the pericardial effusions have showed that malignant and idiopathic conditions are more often in our clinic, although some of the indications for pericardial window are; symptomatic pericardial effusions, asymptomatic effusions that warrant definitive diagnosis, coexisting pericardial, pleural or pulmonary pathology chylopericardium.<sup>[3]</sup> The main specialties which refer patients to our clinic for pericardial effusion surgery are cardiology, oncology, and endocrinology. Indeed, most idiopathic etiologies may represent undiagnosed viral infections and rheumatic diseases. Pericardiocentesis can be also used for the treatment of pericardial effusions. However, this method is associated with high recurrence rates and may not be helpful for definitive treatment.<sup>[4]</sup> Therefore, we should keep in mind that pericardial window operation cannot prevent recurrences, although it can markedly reduce the frequency.<sup>[5]</sup> Based on the literature data, recurrence rates of pericardial effusion in pericardial window operation range between 0% and %33.<sup>[6]</sup>

Although there are numerous methods for treating pericardial effusion, we used pericardial window operation to eliminate pericardial tamponade risk permanently. In addition, massive intractable pericardial effusions can be treated with pericardial window operation alone successfully.<sup>[1]</sup> It is recommended for the definitive treatment of pericardial effusion with malignant origin.<sup>[3,7]</sup> Surgical methods with minimal invasive techniques are also being more often used.<sup>[3]</sup> The most prevalent surgical approaches include subxiphoid and transthoracic approaches which are also well-tolerated by patients. In a study comparing both techniques, the authors reported that both required short operation times with similar postoperative complication rates, and length of hospital stay as well as recurrence rates were also low with both procedures.<sup>[6]</sup> Furthermore, minimally invasive surgery (video-assisted thoracoscopy), laparoscopic transabdominal pericardial window, and percutaneous balloon pericardial window are other common techniques used for surgical treatment of pericardial effusion.<sup>[7,8-10]</sup>

The main limitation of the present study is its retrospective design. However, this rare type of surgery is uncommonly able to be performed in the prospective setting in a single-center. Therefore, large-scale studies which compare surgical techniques in terms of pleural effusion types should be designed to establish a definite conclusion.

In conclusion, pericardiopleural window creation with small anterior thoracotomy is an effective technique for drainage of the pericardial fluid and pericardial biopsy.

### Declaration of conflicting interests

The authors declared no conflicts of interest with respect to the authorship and/or publication of this article.

### Funding

The authors received no financial support for the research and/or authorship of this article.

## REFERENCES

1. Kamata Y, Iwamoto M, Aoki Y, Kishaba Y, Nagashima T, Nara H, et al. Massive intractable pericardial effusion in a patient with systemic lupus erythematosus treated successfully with pericardial fenestration alone. *Lupus* 2008;17:1033-5.
2. Vogel B, Mall W. Thoracoscopic pericardial fenestration-diagnostic and therapeutic aspects. *Pneumologie* 1990;44:184-5.
3. Komanapalli C, Sukumar M. Thoracoscopic pericardial window. Available from: [http://www.ctsnet.org/sections/clinicalresources/thoracic/expert\\_tech-32.html](http://www.ctsnet.org/sections/clinicalresources/thoracic/expert_tech-32.html). [Accessed: May 25, 2010].

4. Laham RJ, Cohen DJ, Kuntz RE, Baim DS, Lorell BH, Simons M. Pericardial effusion in patients with cancer: outcome with contemporary management strategies. *Heart* 1996;75:67-71.
5. Mueller XM, Tevæearai HT, Hurni M, Ruchat P, Fischer AP, Stumpe F, et al. Long-term results of surgical subxiphoid pericardial drainage. *Thorac Cardiovasc Surg* 1997;45:65-9.
6. Liberman M, Labos C, Sampalis JS, Sheiner NM, Mulder DS. Ten-year surgical experience with nontraumatic pericardial effusions: a comparison between the subxyphoid and transthoracic approaches to pericardial window. *Arch Surg* 2005;140:191-5.
7. Toth I, Szucs G, Molnar TF. Mediastinoscope-controlled parasternal fenestration of the pericardium: definitive surgical palliation of malignant pericardial effusion. *J Cardiothorac Surg* 2012;7:56.
8. del Barrio LG, Morales JH, Delgado C, Benito A, Larrache J, Martinez-Cuesta A, et al. Percutaneous balloon pericardial window for patients with symptomatic pericardial effusion. *Cardiovasc Intervent Radiol* 2002;25:360-4.
9. Romano EJ, Glass PS. Laparoscopic pericardial window: anesthetic implications. *J Cardiothorac Vasc Anesth* 2002;16:623-5.
10. Mack MJ, Landreneau RJ, Hazelrigg SR, Acuff TE. Video thoroscopic management of benign and malignant pericardial effusions. *Chest* 1993;103:390-393.