

# Perikart Efüzyonu Yönetiminde Subksifoid Perkütan Kateter Drenaj Etkinliği

## Effectiveness of Subxiphoid Percutaneous Catheter Drainage in Management of Pericardial Effusions

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### Özet

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**Amaç:** Perikart efüzyonu sıkça karşılaşılabilen bir durumdur ve perikardiyosentez gerektiren perikart efüzyonlarının nedenleri çok değişkendir. Bu çalışmada klinik uygulamada sıkça tercih edilen geleneksel yöntemle floroskopi eşliğinde perikart sıvısı boşaltılan hastalardaki en sık etiyolojiyi ve işlemin tanılal değerinin yeterliliğinin araştırılması amaçlanmıştır.

**Gereç ve yöntemler:** Haziran 2008 ve Ocak 2010 tarihleri arasında kliniğimize başvuran hastaların tıbbi kayıtları geriye dönük olarak incelendi.

**Bulgular:** Hastaların ortalama yaşı  $54.9 \pm 16.7$  yılı ve hastaların 42' si bayandı (%59.2). En sık ilk başvuru şikayeti solunum güçlüğüydü (%94.3). Ekokardiyografide 58 hastada (%81.6) tamponad saptandı. Akciğer kanseri en sık saptanan kanser türüydü (15 hasta). Ortalama boşaltma süresi  $1.7 \pm 1.0$  gün, toplam boşaltılan sıvı hacmi  $1297 \pm 474$  ml idi. Hastaların %43,6' sında boşaltılan sıvı kanlı vasıftaydı. Histopatolojik incelemede sadece 8 hastada (%25.8) kanser hücreleri gösterilebildi. Sekiz hastanın ise perikart sıvı örneklerinde iltihabi hücreler saptandı. Sıvı örneklerinden yapılan ekimlerde 4 vakada mikroorganizma üremesi mevcuttu. İki hastada işleme bağlı komplikasyon görüldü. İlk 30 günde 8 hastada (%11.2) yineleyen sıvı toplanması oldu ve bu hastaların hepsi kanser hastalarıydı. Sonuç: Hastalarımız arasında boşaltım gerektiren perikart efüzyonunun en sık etyolojik nedeni kanserdi. Kısa boşaltma süreleri ve alta yatan kanser yineleme ile ilişkili bulunmuştur.

**Anahtar Kelimeler:** Perikart hastalıkları, perikart efüzyonu, tamponad

### Abstract

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**Objective:** Pericardial effusion is a common finding in everyday practice and causes of pericardial effusion requiring pericardiocentesis are very complex. We aimed to investigate the most common etiology of large pericardial effusions and diagnostic value of pericardiocentesis through a needle between our patients who underwent fluoroscopy guided pericardiocentesis because of large pericardial effusion or tamponade.

**Materials and methods:** Medical records of patients between June 2008- January 2010 were evaluated retrospectively.

**Results:** Mean age was  $54.9 \pm 16.7$  years, and 42 (59.2%) of patients were female. Most common presenting symptom was dyspnea (94.3%). Echocardiographic analysis showed tamponade in 58 patients (81.6%). Lung malignancy was the most common malignancy (15 patients). The average drainage period was  $1.7 \pm 1.0$  day, and total drainage volume was  $1297 \pm 474$  ml. The fluid was hemorrhagic in 31 (43.6%) patients. Histopathological examination of the pericardial fluid was positive for malignant cells in 8 (25.8%) of the 31 patient. Acute inflammatory cells were seen in 8 pericardial fluid samples. Microbiologic cultures identified the microorganisms in 4 cases. Periprocedural complications were seen in 2 patients. Recurrence was seen in 8 (11.2%) patients within 30 days, and all of these 8 patients had malignancy.

**Conclusion:** Malignancy is the most common cause of pericardial effusion requiring pericardiocentesis drainage in our hospital. Short drainage periods and underlying malignancy is associated with recurrence.

**Keywords:** Pericardial Disease, pericardial effusion, tamponade.

## Giriş

Pericardial effusion is a medical condition defined as fluid accumulation in pericardial sac.<sup>1</sup> Clinical manifestation of disease may vary from no symptoms to tamponade and shock according to fluid accumulation time and amount of fluid.<sup>1</sup> The etiology of a large pericardial effusion varies between case series. Malignancy, infection and complication of a cardiovascular operation are the most common causes of a large pericardial effusion.<sup>1,2</sup> There are no randomized, controlled studies, and established the optimal initial approach for management of large pericardial effusions. Large pericardial effusions can be treated medically, by pericardiocentesis through a needle with echocardiographic or fluoroscopic guidance or by surgical procedures like subxiphoid pericardial tube drainage.<sup>3,4,5</sup> Therapeutic and diagnostic value of fluoroscopy guided pericardiocentesis varies between series.<sup>6,7,8</sup>

We aimed to investigate the most common etiology of large pericardial effusions and diagnostic value of pericardiocentesis through a needle between our patients who underwent fluoroscopy guided pericardiocentesis because of large pericardial effusion or tamponade.

## Materials and Methods

Medical records of 4850 patients hospitalized to our cardiology department between June 2008- January 2010 were evaluated retrospectively. Number of patients diagnosed with pericardial effusion was 328. Of 328 patients, 126 underwent pericardiocentesis due to large pericardial effusion or tamponade. Nineteen patients underwent bedside echocardiography guided pericardiocentesis and were excluded. Twelve patients belonging to pediatric population and 24 adult patients who had missing data were excluded. Seventy-one adult patients with pericardial effusion who underwent subxiphoid fluoroscopy guided pericardiocentesis for the treatment of symptomatic pericardial effusion or tamponade in our cardiology clinic were included to this analysis. Patients' demographic findings, presenting symptoms, laboratory findings, 2 dimensional and Doppler echocardiographic analysis, drainage volumes, drainage periods, recurrence, procedure related complications, mortality, and diagnosis were evaluated. Cardiac tamponade was defined by two dimensional and Doppler echocardiography.<sup>9</sup> Two dimensional echocardiographic

criteria of tamponade were early diastolic collapse of the right ventricle, late diastolic collapse of the right or left atrium.<sup>9</sup> Doppler echocardiographic criteria of tamponade were major decreases (> 25%) of mitral E flow and major increases (> 40%) of tricuspid E flow during inspiration compared with apnoea.<sup>10</sup> Fluoroscopy guided pericardiocentesis was performed in the cardiac catheterization laboratory with ECG monitoring. The subxiphoid approach was performed with a long needle with an 18-gauge mandrel directed towards the left shoulder at a 45° angle to the skin. Once the needle was correctly positioned, a soft J-tip guide wire was introduced, and after dilatation exchanged for a multi-holed pigtail catheter.<sup>9</sup> The procedure was completed by providing a closed tube drainage catheter. Patients' one month medical records following procedure were also evaluated retrospectively for drainage volumes, drainage periods, recurrence, and mortality.

## Statistical analysis

All statistical analysis was performed using the SPSS version 9.0 statistical software package (Statistical Package for the Social Sciences, version 9.0, SSPS Inc, Chicago, Ill, USA). Continuous variables were described as mean.

## Results

The mean age of 71 patients was 54.9± 16.7 years and 42 (59.2%) of patients were female. Most common presenting symptom was dyspnoea (94.3%) and orthopnea (23.9%). Distribution of patients' symptoms is given in Table 1.

	n=71	%
Dyspnoea	67	94.3
Orthopnea	17	23.9
Chest pain	16	22.5
Oedema	15	21.1
Cough	11	15.4
Abdominal swelling	9	12.6
Palpitation	8	11.2
Fever	7	9.8
Chills	5	7
Syncope	1	1.4

Echocardiographic analysis showed tamponade in 58 patients (81.6%). The largest diastolic distance of effusion measured by echocardiography was  $29.6 \pm 8.5$  mm. Of the 71 patients, 43.6 % (31 of 71) were currently undergoing treatment for cancer or had a history of malignancy. Lung malignancy was the most common type among malignancies (15 patients). List of underlying diseases is shown in Table 2.

	n=71	%
Malignancy	31	43.6
Lung	15	21.1
Breast	5	7.0
Lymphoma	2	2.8
Ovarian	2	2.8
Oesophagus	2	2.8
Colon	2	2.8
Prostate	1	1.4
Cervix	1	1.4
Unknown primary	1	1.4
Renal Failure	9	12.6
Thyroid disease	5	7.0
Resent cardiac surgery/ procedure	4	5.6
Tuberculosis	3	4.2
Autoimmune Disease	2	2.8
Unknown etiology	17	23.9
Results are given as number and percentage (%)		

The mean drainage volume during procedure was  $535 \pm 322$  ml. The average drainage period was  $1.7 \pm 1.0$  day, and total drainage volume was  $1297 \pm 474$  ml. Lowest drainage volume was 300 ml and obtained from a patient who developed a ruptured right atrium during electrophysiological study. Highest volume was 2550 ml and obtained from a patient with end stage renal failure.

The fluid was transudate in 21 (29.5%) patients, hemorrhagic in 31 (43.6%) patients, exudate in 15 (21.1%), and purulent in 4 (5.6%) patients. Pericardial fluid properties are seen in Table 3. Histopathological examination of the pericardial fluid was positive for malignant cells in 8 (25.8%) of the 31 patients with known malignancy. However acute inflammatory cells were seen in 8 pericardial fluid samples, microbiologic

cultures identified the microorganisms only in 4 cases. The microorganisms were Staphylococcus Species (n=2), Citrobacter Freundii (n=1), and Streptococcus Viridans (n=1).

Mean drainage volume (ml)	535 $\pm$ 322
Average drainage period (day)	1.7 $\pm$ 1.0
Total drainage volume (ml)	1297 $\pm$ 474
Fluid characteristics (%)	
Transudate	29.5
Exudate	21.1
Hemorrhagic	43.6
Purulent	5.6
Albumin (g/dL)	2,6
Protein (g/dL)	4,3
Glucose (mg/dL)	101
Lactate dehydrogenase (U/L)	230,5

Periprocedural complications were seen in 2 patients. Ventricular arrhythmia requiring cardioversion occurred in 1 patient, and urgent surgical repair was needed because of right ventricular perforation in 1 patient. There was no procedure related mortality.

Recurrence was seen in 8 (11.2%) patients within 30 days, and all of these 8 patients had malignancy. Three patients died during this period, 2 of this patients were cancer and died because of multi-organ dysfunction; 1 patient died because of sepsis.

## Discussion

In this study we showed that malignancy is the most common cause of pericardial effusion requiring pericardiocentesis drainage in our hospital. Fluoroscopy guided pericardiocentesis seems to be effective for patients with large pericardial effusion or tamponade.

The mean age of our patients was 54.<sup>9</sup>, and mean age for pericardial effusion requiring pericardiocentesis drainage varies between different series. The most common etiology of a large pericardial effusion varies among case series, primarily determined by the patient population of the reporting institution. In a tertiary centre, malignancy is the most common cau-

se of pericardial effusion and subsequent tamponade.<sup>6</sup> According to Becit et al the most common cause was renal failure because their hospital has a big dialysis centre.<sup>11</sup> However, our hospital accepts patients with renal failure, as it has dialysis centre, the most common cause was malignancy among our patients (43.6%). Among malignancy patients, carcinomas of the lung and breast were the most common underlying malignancies. Gornik HL et al. also reported similar results.<sup>12</sup> Ma W. et al also reported that malignancy was the most common cause of large pericardial effusion among 140 Han Chinese patients and lung cancer was the most common (30 patients) underlying malignancy among the 54 malignancies.<sup>13</sup>

Presentation of pericardial effusion can range from a minimally symptomatic pericardial effusion to fatal shock. The most common presenting symptom was dyspnoea among our patients. This result is expected and consistent with previous series.<sup>11</sup> Pericardial tamponade is decompensate phase of cardiac compression caused by effusion accumulation and the increased intrapericardial pressure. Previous studies reported tamponade in 44% of patients.<sup>14,15</sup> Cardiac tamponade occurred in 81.6 % of our patients. This result may be seen high but we included only patients with pericardial effusion requiring pericardiocentesis drainage, not all the patients diagnosed with pericardial effusion.

It is prudent to drain the fluid in steps of less than 1 liter at a time to avoid the acute right-ventricular dilatation sudden decompression syndrome.<sup>9</sup> Among our patients the drainage volume during procedure was 535 ±321ml. Because of this, we think that we avoided from sudden decompression syndrome in our hospital.

No randomized, controlled studies have established the optimal drainage period. Prolonged pericardial drainage is performed until the volume of effusion obtained by intermittent pericardial aspiration (every 4–6 h) fall to <25 ml per day.<sup>9</sup> The average drainage period was 1.7 day in our study. It was a short period and closed tube drainage was preferred instead of intermittent pericardial aspiration. This result can explain the highness of recurrence rate (11.2%). Previously one study demonstrated that, even in idiopathic effusions extended pericardial catheter drainage (3±2 days, range 1–13 days)

was associated with a trend to lower recurrence rates (6% vs. 23%) than in those without catheter drainage during the follow-up of 3.8±4.3 years.<sup>16</sup>

The fluid was transudate in 21 (29.5%) patients, hemorrhagic in 31 (43.6%) patients, exudate in 15 (21.1%) patients, and purulent in 4 (5.6%). Becit et al reported that the most common type was transudate (49%) among their 368 subxiphoid pericardiostomy patients.<sup>11</sup> This difference may be explained by the patients' characteristics because the most common underlying disease was malignancy among our patients and the most common underlying disease was renal failure among Becit et al.s' series. Ma W. et al reported only 9 cases with transudate among 140 Chinese patient requiring pericardiocentesis. This difference probably depends on the source of the patients, the characteristics of the centre, and on the frequency distribution of the different etiologies in each geographic area.<sup>13</sup>

In patients with malignancy and pericardial effusion it is very important to determine whether the effusion is secondary to neoplastic pericardial involvement or if it is an epiphenomenon (non-malignant effusion) related to the management of the cancer (such as previous thoracic irradiation) or effusions of unknown origin. In this situation an invasive procedure may be warranted in the absence of tamponade as the diagnostic yield of pericardial fluid for malignancy but in appropriate clinical setting, normal cytology does not exclude the possibility of cancer-related effusion as a single pericardial cytology specimen has only moderate sensitivity for the detection of malignant cells.<sup>17,18,19</sup> Pericardial fluid was positive for malignant cells in 8 (25.8%) of our 31 patients with known malignancy. This result was similar to Healthier et al. s' findings (28.6%).<sup>12</sup> Rarely pericardial effusion may be the presenting finding in malignancy patients. No unknown malignancy was diagnosed among our patients. Purulent pericarditis is rare, but always fatal if untreated.<sup>1</sup> Microbiologic examination must be performed in patients, especially with purulent pericardial effusion. Most common etiologic microorganisms are Staphylococci, pneumococci, streptococci, Neisseria, proteus, gram negative rods, and Legionella.<sup>9</sup> The identified microorganisms among our patients were similar to the literature. Uncommonly unexpected organisms may be cultured from either pericardial fluid or tissue. Corey GR et al reported cytomegalovirus

(3 patients), *Mycoplasma pneumoniae* (2 patients), herpes simplex virus (1 patient), *Mycobacterium avium-intracellulare* (1 patient), and *Mycobacterium chelonae* (1 patient) among 75 consecutive patients.<sup>20</sup> Previous large echocardiographic series reported an incidence of major complications of 1.3–1.6%.<sup>6,7,16</sup> Periprocedural complications were seen in 2 of our patients. Ventricular arrhythmia requiring cardioversion occurred in 1 patient (1.4%), and urgent surgical repair was needed because of perforation in 1 patient (1.4%). There was no mortality. These results were similar to previous findings, but still seem to be high. We think that echocardiographic guidance may reduce complications.

Case series, many including patients from decades past, have established that malignant pericardial effusion is associated with a high rate of recurrence and poor prognosis.<sup>7,15,17</sup> Isolated pericardiocentesis prevents recurrence in only about 50% of cases. In such patients a more aggressive approach with surgery may be warranted. Patient management has to be individualized (type and stage of neoplasm, general condition, etc) as even the best possible treatment for responsive types of tumour with neoplastic pericardial involvement is associated with survival of only about one year.<sup>17</sup> Recurrence was seen in 8 of our patients (11.2%) between 25-30 days following procedure, and in accordance with the literature all of these 8 patients had malignancy. Videothoracoscopic fenestration is a good option to avoid recurrences. Pericardiectomy is recommended only in patients, with or without symptoms, in which repeat pericardiocentesis is not followed by notable or complete diminution of the effusion.<sup>17</sup> Three patients died during one month period, 2 of this patients were cancer and 1 patient died because of sepsis.

Pericardiocentesis is both therapeutic and diagnostic in most cases.<sup>6,8</sup> Examination of pericardial fluid was diagnostic only in 12 of our 71 patients (16.9%) (8 malignant, 4 infectious

etiology). This result is consistent with the literature. The series of Levy et al included 204 patients, all of them were submitted to both noninvasive systematic diagnostic testing and pericardiocentesis and a definite etiologic diagnosis was made in only 11 patients from pericardial fluid analysis and among 141 patients considered to have idiopathic pericarditis, 44 (32.1%) gained an etiologic diagnosis by Levy and colleagues' systematic testing strategy (including serologic evaluation of serum, antinuclear antibody level, throat and stool samples).<sup>21</sup> Detailed systematic test results were not achieved among our patients because medical records were evaluated retrospectively. This condition shows the importance of systematic testing and may be the reason of high proportion of unknown etiology among our patients. Surgical treatment modalities are also superior due to obtain biopsy samples, especially in patients with unknown etiology.

#### Conclusions:

We found malignancy to be the most common cause of pericardial effusion in our tertiary centre. Subxiphoid percutaneous catheter drainage is performed successfully in our hospital with acceptable periprocedural complication ratio. Malignancy related pericardial effusion markedly reduced survival, and recurrence is more often.

Subxiphoid percutaneous catheter drainage is an effective option for treatment for large effusions and tamponade, but it is not useful enough for diagnosis. The known underlying diseases are still the most important diagnostic clues and systematic testing strategy may be helpful to lower proportion of unknown etiology. Prolonged pericardial drainage by intermittent pericardial aspiration may be useful to obtain recurrence. Especially in idiopathic and recurrent effusions biopsy and surgical treatment modalities may be more useful for both diagnosis and treatment of disease.

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