



## Research Article

# Pleural Effusion in End Stage Renal Failure Patients

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### Abstract

**Objectives:** The aim of this study was to determine the causes of pleural effusion in patients who experienced end-stage renal failure and did not demonstrate any regression of effusion with dialysis treatment.

**Methods:** Patients with pleural effusion that did not regress though they attained dry weight with dialysis and those with 2 years of follow-up were included in the study. The mean age of the patients was  $48.16 \pm 14.5$  years. Thirty-five patients were receiving hemodialysis treatment and 8 (18%) were continuous peritoneal dialysis patients. Ascites (n=6), pleural effusion (n=13), both ascites and pleural effusion (n=5), and pleural effusion that was bilateral (n=22, 51%), right-sided (n=13, 30%), and left-sided (n=8, 18%) were detected. According to Light's criteria, the pleural effusion was classified as exudate in 40 (93%) cases and transudate in 3 (7%). Microbiological examination did not identify any pathological agent in any case, and cytological examinations did not reveal atypical cells. The causes of pleural effusion were infection (tuberculosis: n=20, 46%), pneumonia (n=3, 7%), empyema (n=1, 2%), malignancy (lung cancer: n=3, 7%; renal carcinoma: (1, 2%), collagen diseases (n=1, 2%), hepatic abscess (n=1, 2%), pulmonary thromboembolism (n=2, 4%), and idiopathic causes (n=11, 25%).

**Results:** The causes of pleural effusion were infection (tuberculosis: n=20, 46%), pneumonia (n=3, 7%), empyema (n=1, 2%), malignancy (lung cancer: n=3, 7%; renal carcinoma: n=1, 2%), collagen disease (n=1, 2%), hepatic abscess (n=1, 2%), pulmonary thromboembolism (n=2, 4%), and idiopathic cases (n=11, 25%).

**Conclusion:** Tuberculosis was the most common cause of pleural effusion that did not regress with dialysis treatment.

**Keywords:** Dialysis; end-stage renal failure patients; pleural effusion.

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Pleural effusion may persist even after end-stage renal failure (ESRF) patients achieve dry weight through dialysis. Dry weight can be simply defined as the normal body weight of the dialysis patient; it is the lowest weight of patients who are clinically normovolemic, hypotensive, or non-hypertensive after dialysis treatment without the need for any antihypertensive. The incidence of pleural effusion has been reported to be approximately 3% in end-stage renal disease (ESRD) cases and no correlation was found between the severity of the disease and the presence of pleural effusion.<sup>[2]</sup>

Pleural effusion developing in ESRD cases may be associated with excessive fluid load, heart failure, hypoproteinemia, chronic pleural infection (especially tuberculosis), malignant disease, or pulmonary embolism. Hypervolemia and heart failure are the most common causes.<sup>[3, 4, 5]</sup> The presence of ESRF is associated with a 6.9 to 52.5 times greater likelihood of tuberculosis. Smear-negative and extrapulmonary tuberculosis forms are frequently encountered in these cases. Pleural fluid is the most common extrapulmonary form. For this reason, it is necessary to clarify the etiopathogenesis of persistent pleural effusion despite unilateral dialysis.<sup>[5, 6, 7]</sup>

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In this study, the data of patients who had undergone dialysis treatment due to ESRF and who were reduced to dry weight by dialysis were examined and recorded. The patients included in the study were followed up for 2 years and their final status was evaluated.

## Methods

The study is retrospective study. The dialysis treatment plan of patients who had persistent pleural effusion following dialysis treatment was re-examined and revised by the nephrology department. The dry weight of the patients was measured using the same scale at the end of dialysis treatment when their arterial blood pressure was within normal limits

The details of the patient medical history, physical examination, and posteroanterior chest X-rays were evaluated. Thoracentesis was performed in all cases and Light's criteria were used for a biochemical analysis of pleural effusion.<sup>[8]</sup> Protein, albumin, sugar, and lactate dehydrogenase values as well as serum values and ratios were determined using the thoracentesis fluid. In addition, a cytological examination including a leukocyte count was performed. All examples of pleural effusion were examined microbiologically, using a Gram culture antibiogram, Ziehl-Neelsen staining for acid-resistant bacteria, and Löwenstein-Jensen medium for a tuberculosis culture.

A purified protein derivative (PPD) test was performed in all cases and the findings were recorded after 48 to 72 hours. Invasive techniques used by the radiology department, primarily imaging methods and pleural biopsy, led to the discovery of previously undiagnosed cases. Pleural biopsies were performed in 2 ways. A closed pleural needle biopsy (CPB), which is a cheap and easy method, was used for patients in the chest diseases clinic. The procedure was performed under local anesthesia while the patient was sitting upright. An Abrams needle was inserted under the upper level of the pleural fluid and through the intercostal space.<sup>[9]</sup>

Video-assisted thoracic surgery (VATS), a safe and effective method, was used by the department of thoracic surgery in operating room conditions in selected cases. The study cases included the data and final status recorded after 2 years of follow-up.

## Statistical Analysis

The data obtained were recorded in a database prepared for the study. SPSS for Windows, Version 15.0 (SPSS Inc., Chicago, IL, USA) was used for the statistical analysis. Descriptive statistics were calculated for categorical variables as number and percentage. Numerical variables were rep-

resented with the mean, SD, minimum, and maximum. The statistical significance level was accepted as  $p < 0.05$ .

## Results

Of the 43 patients included in the study, 18 were female and 25 were male. Despite achieving dry weight through dialysis treatment, 43 (3.2%) were determined to have persistent pleural effusion. The mean age of the patients was  $48.16 \pm 14.5$  years. In the group, 35 patients (81%) were treated with hemodialysis and 8 patients (18%) with continuous ambulatory peritoneal dialysis. HIV serology was negative in all cases. The chest radiographs of the patients evaluated by a chest physician revealed bilateral, right-sided, and left-sided pleural effusion in 22 (51%), 13 (30%), and 8 (18%) cases, respectively.

The reasons for referral of the patients are presented in Table 1; the most common presenting symptom was shortness of breath.

Pleural effusion was associated with ascites in 6 cases, pericardial effusion in 13, and both ascites and pericardial effusion in 5 cases.

Of the 43 ESRD patients whose pleural effusions did not regress, it was observed that 33 (76%) had a negative PPD. In the remaining cases, the PPD value was  $\geq 10$  mm in 6 (13%) and  $< 10$  mm in 5 (11%) patients. The pleural effusion of the patients who were examined using thoracentesis was classified as hemorrhagic in 5 patients, dark yellow-green in color in 2, and serohemorrhagic in the remainder. According to Light's criteria, the pleural effusion consisted of exudates in 40 (93%) and transudate in 3 (7%) patients. No pathological factor was detected in the microbiological examination of pleural effusion samples and cytological examination did not reveal any atypical cells.

The causes of pleural fluid and the diagnostic procedures and treatment modalities applied are shown in Table 2. After treatment, the pleural fluid regressed in 30 patients. The patients included in the study were followed up for 2 years in the department of nephrology and chest diseases. Ten patients died during 2 years follow up. The treatment provided and the final health status of the patients is provided in Tables 3 and 4.

**Table 1.** Admission symptoms and frequency

Symptoms	Number of cases n (%)
Shortness of breath	28 (65)
Coughing	13 (30)
Fever	26 (60)
Flank pain	5 (11)
Hemoptysis	2 (0.4)

**Table 2.** Differential diagnosis of pleural fluid and diagnostic methods

Diagnosis: n (%)	Characteristics of the pleural fluid (n)	Diagnostic procedures (n)
Infection		
*Tuberculosis: 20 (46%)	Exudate (20)	Pleural biopsy (4), thoracic CT (4), bronchoscopy (1), liver, lymph node, rib biopsy (3), clinical manifestations (8) PA X-ray (2), hemoculture (1) Biochemical analysis of the pleural fluid
*Pneumonia: 3 (7%)	Exudate (2), Transudate (1)	
*Empyema: 1 (2%)	Exudate (1)	
Malignancy		
*Lung cancer: 3 (7%)	Exudate (3)	Bronchoscopy (3)
*Kidney cancer: 1 (2%)	Exudate (1)	Abdominal CT (1)
Collagen tissue disease		
*SLE: 1 (2%)	Exudate (1)	Multisystem involvement
Other		
*Liver abscess: 1 (2%)	Transudate (1)	Abdominal CT (1)
*Pulmonary embolism: 2 (4%)	Exudate (1), Transudate (1)	V/Q scanning (2)
Idiopathic: 11 (25%)	Exudate (11)	Pleural biopsy (7), VATS (1)

CT: Computed tomography; PA: Posteroanterior; Systemic lupus erythematosus (SLE) is collagen tissue disease; V/Q: Ventilation-perfusion; VATS: Video-assisted thoracoscopic surgery.

**Table 3.** Treatment according to the cause of pleural effusion

Diagnosis: n (%)	Treatment: n
Infection	
*Tuberculosis: 20 (46%)	Antituberculosis treatment
*Pneumonia: 3 (7%)	Antibiotherapy
*Empyema: 1 (2%)	Thoracic tube placement
Malignancy	
*Lung cancer: 3 (7%)	Chemotherapy
*Kidney cancer: 1 (2%)	Surgery
Collagen tissue disease	
*SLE: 1 (2%)	Immunosuppressive treatment
Other	
*Liver abscess: 1 (2%)	US-guided abscess drainage
*Pulmonary embolism: 2 (4%)	Anticoagulant treatment
Idiopathic: 11 (25%)	Thoracic tube drainage (1), pleural decortication

SLE: Systemic lupus erythematosus; US: Ultrasound.

## Discussion

In patients with ESRD undergoing hemodialysis treatment, cellular immunity and host resistance to *Mycobacterium tuberculosis* are impaired, which leads to a significant incidence of tuberculosis in these patients.<sup>[9, 10]</sup> However, the tuberculin skin test is often negative in this patient population.<sup>[10, 11]</sup>

In our study, the PPD was applied and evaluated by a chest diseases specialist in all cases. A negative induration was detected in 33 (76%) cases.

Gopi et al.<sup>[11]</sup> found that the fluid tested in patients with pleural effusion who had been on dialysis was predominantly exudate. Similarly, in our study, it was observed that the majority of the pleural effusion samples had exudate characteristics after the results of the diagnostic procedures were examined. Often, a light-yellow fluid can suggest transudate, while yellow-green or hemorrhagic fluid can indicate exudative fluid; however, this colorimetric method is not a diagnostic marker per se.<sup>[11, 12]</sup> In our study, patients with pneumonia and empyema were diagnosed based on macroscopic examination of the pleural fluid. Hemorrhagic pleural fluid was detected in 4 cases diagnosed as tuberculosis and had a pleural fluid that was dark yellow-green in color. One case was diagnosed as a thromboembolism. These results were consistent with the literature.

CPB is indicated as an invasive diagnostic method in cases of pleural effusion.<sup>[13, 14]</sup> VATS is recommended as a more invasive method in patients who cannot be diagnosed with CPB or who are considered to have empyema.<sup>[15]</sup> CPB was performed in the majority of the cases in this study. Only 1 case could not be diagnosed with CPB, and VATS was applied under general anesthesia.

The most common reason for pleural effusion despite dialysis is tuberculosis. Following pleural fluid analysis, CPB is the most sensitive invasive method to obtain pleural fluid for examination. It is our hope that the findings of 2 years of follow-up after diagnosis in this study may constitute a valuable contribution to the literature.

**Table 4.** Final health status of the patients

Diagnosis	Number of cases	Outcome (n)
Infection		
*Tuberculosis	20	Effusion regressed (n=18), exitus (n=2)
*Pneumonia	3	Effusion regressed (n=3)
*Empyema	1	Effusion regressed (n=1)
Malignancy		
*Lung cancer	3	Exitus (n=3)
*Kidney cancer	1	Exitus (n=1)
Collagen tissue disease		
*SLE	1	Effusion regressed (n=1)
Other		
*Liver abscess	1	Effusion regressed (n=1)
*Pulmonary embolism	2	Effusion regressed (n=2)
Idiopathic	11	Exitus (n=4), persistent effusion (n=3), effusion regressed (n=4)

SLE: Systemic lupus erythematosus.

## Disclosures

**Ethics Committee Approval:** The patient files were examined for the study and no procedure was performed other than routine follow-up and examination. Therefore, the ethics committee of the hospital stated that there is no need for an ethics committee decision.

**Peer-review:** Externally peer-reviewed.

**Conflict of Interest:** There is no conflict of interest between the authors.

**Authorship contributions:** Concept – G.U., H.İ.; Design – G.U., H.İ.; Supervision – G.U., H.İ.; Materials – G.U., H.İ.; Data collection &/or processing – G.U., H.İ.; Analysis and/or interpretation – G.U., H.İ.; Literature search – G.U., H.İ.; Writing – G.U., H.İ.; Critical review – G.U., H.İ.

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