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## ORIGINAL ARTICLE

# Diagnostic value of NT–PRO BNP in cardiogenic and non cardiogenic pleural effusions

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### KEYWORDS

NT-proBNP;  
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**Abstract** *Background:* The finding of an exudative effusion usually requires an extensive diagnostic workup, leading to an unnecessary exposure to invasive and expensive diagnostic procedures. Thus a strategy of identifying pleural effusions due to heart failure and possibly avoiding unnecessary diagnostic thoracentesis and/or further diagnostic procedures would be an attractive and potentially beneficial approach [6]. NT-proBNP measured in serum is a sensitive marker of cardiac dysfunction and proven to be a useful tool in the diagnosis of acute and chronic systolic and diastolic left ventricular heart failure [7,8].

*Purpose:* The present study was conducted to assess the diagnostic value of NT-proBNP in the differentiation of cardiogenic and non cardiogenic pleural effusion.

*Patients and methods:* Forty patients with pleural effusion were included in this study. Twenty patients with cardiogenic pleural effusions (pleural effusion due to cardiac cause) and 20 patients with non cardiogenic pleural effusions (pleural effusion due to non cardiac cause). All patients were subjected to full history, clinical examination, investigation to detect the etiology of the pleural effusion and measurement of serum and pleural fluid NT-proBNP.

*Results:* In this study we found that pleural fluid NT-proBNP levels were significantly higher in patients with cardiogenic pleural effusions than that of patients with non cardiogenic pleural effusions (Mean  $\pm$  SEM, 5231  $\pm$  671.1 and 628.8  $\pm$  120.1 respectively, *P* value < 0.0001). Also NT-proBNP levels in the serum of the patients with cardiogenic pleural effusions were significantly higher than that of patients with non cardiogenic pleural effusions (Mean  $\pm$  SEM,

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4792 ± 612.7, and 604.0 ± 120.1 respectively,  $P$  value < 0.0001). There was also a highly significant positive correlation between NT-proBNP levels in serum and pleural fluid Spearman's Coefficient of rank correlation is 0.992 ( $p < 0.0001$ ). We found also that at a cut-off value of 1.591 pg/ml, pleural fluid NT-proBNP level had a sensitivity of 95% and a specificity of 90% in the diagnosis of cardiogenic pleural effusion. Also at a cut off value of 1570 pg/ml, serum NT-proBNP level had a sensitivity of 95% and a specificity of 90% in the diagnosis of cardiogenic pleural effusion.

**Conclusion:** It is concluded that serum and pleural fluid NT-proBNP levels are very useful in establishing the diagnosis of cardiogenic pleural effusions.

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## Introduction

CHF is probably the most common cause of pleural effusion [1]. The incidence of pleural effusion in patients with CHF is high. In one series of 60 patients with an exacerbation of stable CHF, chest CT scans demonstrated that 50 patients (83%) had a right-sided pleural effusion and 46 patients had a left-sided effusion. Approximately one third of the effusions had a volume that exceeded 700 ml [2]. The pleural fluid from a patient with CHF is usually a transudate, as defined previously by Light's criteria [3]. The criteria of Light et al. have been used to make this differentiation. The main problem with those criteria is that although they identify nearly all exudates correctly, they misidentify about 20 to 25% of transudates as exudates [4], especially after having received diuretic therapy [5].

The finding of an exudative effusion usually requires an extensive diagnostic workup, leading to an unnecessary exposure to invasive and expensive diagnostic procedures. Thus a strategy of identifying pleural effusions due to heart failure and possibly avoiding unnecessary diagnostic thoracenteses and/or further diagnostic procedures would be an attractive and potentially beneficial approach [6].

B-type natriuretic peptide (BNP) is a vasoactive peptide predominantly secreted by the heart. Its precursor molecule, pro-BNP, is cleaved to give the inactive N-terminal-pro-BNP (NT-proBNP) and the biologically active BNP. The synthesis of these peptides is stimulated by increased tension or stretching of the cardiac ventricle wall. NT-proBNP measured in serum is a sensitive marker of cardiac dysfunction and proven to be a useful tool in the diagnosis of acute and chronic systolic and diastolic left ventricular heart failure [7,8]. Recently, the diagnostic value of the NT-proBNP concentrations in pleural fluid has been evaluated and increased levels of NT-proBNP in the pleural fluid have been shown to be valuable in the discriminative diagnosis of pleural effusions related with cardiac disorders [9,10].

### *Aim of the work*

The aim of the present work was to investigate the diagnostic value of measuring NT-proBNP levels in pleural fluid and serum of patients with cardiogenic and non cardiogenic pleural effusions.

### *Patients and methods*

Forty patients with pleural effusions were prospectively studied between December, 2007 and November 2009 admitted at Alhayah National Hospital, Khames Mushyt, Kingdom Saudi

Arabia. The study protocol was approved by the local ethics committee. Informed consent was obtained from the patients.

The patients were classified according to their diagnosis into 20 patients with cardiogenic effusion and 20 patients with non-cardiogenic pleural effusion; 5 patients with malignant pleural effusion, 5 patients with tuberculous pleural effusion, 5 patients with parapneumonic pleural effusion and 5 patients with hepatic hydrothorax.

The diagnosis of cardiogenic pleural effusion was based on findings of the typical clinical picture of decompensated heart failure, including history, physical examination, chest radiography, electrocardiography and response to diuretic therapy, and confirmed by echocardiographical evidence of left ventricular systolic dysfunction and according to AHA guidelines [11].

Malignant effusions were diagnosed when malignant cells were detected on cytological examination of pleural fluid or on pathological examination of pleural biopsy or lung biopsy specimens in the absence of other causes of pleural effusion.

Tuberculous effusions were diagnosed when AFB were detected in pleural fluid or granuloma in pleural biopsy or lymphocytic pleural effusion with high ADA levels more than 40 u/l with positive tuberculine test, high ESR, and respond to antituberculous treatment.

Parapneumonic effusions were diagnosed when the clinical and radiological findings were compatible with pneumonia and response to antimicrobial treatment and/or detection of pus or positive bacterial cultures in pleural fluid.

Hepatic hydrothorax was diagnosed when the pleural effusion due to liver cirrhosis and there is ascites confirmed by abdominal ultrasound.

Inclusion criteria were any patient with radiologically determined pleural effusion that could be drained by thoracentesis and the diagnosis was confirmed. Exclusion criteria were any patient with renal failure, coagulopathy, or thorax deformity interfering with thoracentesis, or any effusion of undetermined origin, or with more than one possible cause.

All patients were subjected to the following: thorough medical history and clinical examination. Radiological examination PA, Lateral, sometimes lateral decubitus views, chest ultrasound and CT chest in selected patients. ECG and echocardiography were done for All patients. CBC, ESR, renal function, liver function and thoracentesis were done for all patients and pleural fluid samples were sent for biochemical analysis, bacterial and fungal cultures, acid fast bacilli smear and cytological examinations were performed to all patients regardless to their clinical examination. Pleural biopsies were sent for pathological examination in selected patients. Blood and pleural fluid specimens were collected in vacuumed tubes then centrifuged 15 min at 3500 rpm serum and the superna-

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