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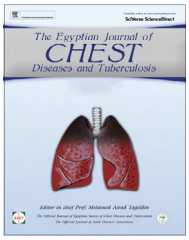

ORIGINAL ARTICLE

Diagnostic utility of soluble triggering receptor expression on myeloid cells-1 in complicated parapneumonic pleural effusion

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KEYWORDS

Diagnosis;
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Abstract *Background:* The differentiation between complicated parapneumonic effusions (CPPE) or empyema, which require chest tube drainage, and uncomplicated parapneumonic effusions (UCPPE), which respond to antibiotic therapy alone, is sometimes unclear. Delay in diagnosis results in substantial delay in the commencement of treatment and may contribute to the high mortality of this infection.

The aim of the study: Evaluation of the utility of soluble triggering receptor expression on myeloid cells-1 (sTREM-1) as an early marker in the diagnosis and management of complicated parapneumonic effusions and empyema.

Patients and methods: This study included 58 patients who were diagnosed as having PPE and admitted to the Chest Department, Zagazig University Hospitals during the period from March 2012 to March 2013. Patients were diagnosed PPE if they had a pleural effusion and showed one or more clinical manifestations typical of pneumonia, including acute febrile illness, sputum production, chest pain, leukocytosis and infiltrate(s) on chest X-ray. They were divided into two groups.

Group (1): Complicated parapneumonic effusion (22 patients), according to at least one of the following criteria on pleural fluid examination: macroscopic pus, presence of organisms on Gram-

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stain or culture, fluid pH < 7.2 with normal peripheral blood pH, or fluid glucose concentrations < 40 mg/dL.

Group (2): Uncomplicated parapneumonic effusion (36 patients), according to the following criteria: pleural effusion associated with a non purulent pleural fluid, negative fluid microbiological studies; fluid pH > 7.2 with normal peripheral blood pH and fluid glucose > 40 mg/dL.

Exclusion criteria: A history of pleural disease or any underlying disease that could potentially cause pleural effusions, such as tuberculosis, malignancy, heart failure, systemic lupus erythematosus and chronic renal failure, were excluded. Pleural fluid samples were examined for level of sTREM-1, pH, LDH and glucose. The sTREM-1 levels were expressed as pg/mL. Microbiological studies included: Gram and Ziehl–Neelsen stains and cultures on conventional media for aerobic and anaerobic micro-organisms in the pleural fluid samples.

Results: The median sTREM-1 level in pleural fluid was significantly higher in the bacterial PPE (688 ± 398 pg/mL) than in the non-bacterial PPE (45 ± 79 pg/mL). The cut-off value of pleural fluid sTREM-1 for diagnosis of bacterial PPE was 130 pg/mL with 93% sensitivity and 92% specificity, while it was 7.237 for pleural fluid pH with 91% sensitivity and 96% specificity and 640 mg/L for pleural fluid glucose with 92% sensitivity and 86% specificity and 800 IU/L for pleural fluid LDH with 81% sensitivity and 90% specificity.

In conclusion: Combination of classical criteria with pleural fluid sTREM-1 could be useful in discrimination between nonpurulent complicated and non complicated parapneumonic pleural effusions and hence early pleural drainage in patients with complicated parapneumonic effusions which may affect disease outcome.

Introduction

Pleural effusion is a common clinical entity that occurs in a great variety of diseases [1]. Various studies listing the etiologies of pleural effusions have reported that parapneumonic effusions account for 11–40% of all pleural effusions [2]. Unfortunately, the differentiation between complicated parapneumonic effusions (CPPE) or empyema, which require chest tube drainage, and uncomplicated parapneumonic effusions (UCPPE), which respond to antibiotic therapy alone, is sometimes unclear [3].

Delay in diagnosis results in substantial delay in the commencement of treatment and may contribute to the high mortality of this infection. Treatment of all patients with suspected pleural effusion with antibiotics while waiting for microbiological results is not a good option since this practice increases antibiotic resistance. Diagnosis and differential diagnosis of parapneumonic effusions pose a great problem. Biochemical parameters are often non-specific and Gram stain has a low sensitivity. Pleural fluid cultures, even though being specific, may take days to reveal a positive culture and in 30–35% of cases, the organism fails to be cultured [1].

Triggering receptor expressed on myeloid cell (TREM) proteins are a family of cell surface receptors expressed broadly on myeloid cells. The first TREM identified (TREM-1) is a recently-discovered cell surface molecule expressed by neutrophils and monocytes. TREM-1 is a 30-kDa glycoprotein belonging to the immunoglobulin super family, and its expression is upregulated by various ligands for Toll-like receptors (TLRs). The initial characterization of TREM-1 demonstrated that TREM-1 expression is upregulated in response to lipopolysaccharide and other microbial products. TREM-1 acts synergistically with receptors for pathogen-associated molecular patterns, including both TLRs and Nod-like receptors. Activation of TREM-1 expressed on neutrophils and monocytes by an agonistic monoclonal antibody has been shown to stimulate the expression of various proinflammatory cytokines, chemokines, and cell surface molecules. TREM-1 exists in both a membranous and a soluble form (soluble triggering receptor expressed on myeloid cells-1 (sTREM-1) [4].

TREM-1 is shed by the membrane of activated phagocytes after exposure to bacteria and fungi and, its soluble form, sTREM-1 can be detected in the body fluids [5]. sTREM-1 is a diagnostic marker for sepsis and inflammation. It has been described as a diagnostic marker with a high accuracy and sensitivity in detecting microbial infections as underlying disease in critically ill patients [6]. The levels of sTREM-1 have previously been investigated in plasma, bronchoalveolar lavage fluid and exhaled breath [7].

Few studies have investigated the clinical significance of sTREM-1 in pleural effusions and found that patients with PPE or empyema exhibited the highest pleural fluid concentrations of this biomarker. However, there were discrepancies regarding its discriminative properties as well as its optimal cut-off point [8]. Taking into account that the management of complicated pyogenic bacterial effusions may be delayed using classic diagnostic procedures the aim of this work was to evaluate the utility of sTREM 1 as an early marker in the diagnosis and management of complicated parapneumonic effusions and empyema.

Patients and methods

Patients

The study included 58 patients diagnosed PPE admitted to the Chest Department, Zagazig University Hospital during the period from March 2012 to March 2013. A written informed consent was obtained from all patients. Patients were diagnosed as having PPE if they had a pleural effusion and showed one or more clinical manifestations typical of pneumonia, including acute febrile illness, sputum production, chest pain,