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RESEARCH ARTICLE

Procalcitonin Testingreduce Unnecessary Antibiotic Use in Bacterial Infection

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Abstract

Conventional diagnostic test have limitations to deferential diagnosis in clinical suspicion ofbacterial infection cases, that in some cases lead to inappropriate antibiotic therapy and increases antibiotic resistance. A new diagnostic insight is procalcitonin (PCT) test to improve diagnosis of bacterial infections and to guide antibiotic therapy. Serum PCT levels are of useful test as a biomarker in patients with bacterial infections for several reasons. Initial rise of PCT levels due to bacterial infection, subsequent sequential PCT levels can be used to assess the effectiveness and duration of antibiotic therapy. Based on clinical researches results, in bacterial infections, promising good results obtained when use of PCT used as differential diagnostic test. But further intervention studies are needed before use of PCT in clinical routine tests. The goal of this review is to study the PCT reliability as infections diagnostic biomarker.

Keywords: Procalcitonin Testing- Bacterial infection- biomarker- antibiotic resistance

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Introduction

Among all types all diseases, for example [1], cancer than ever much more important [2-3]. Cancer has always been the most important of all diseases. The types of cancers include gastric cancer, brain cancer, breast cancer, ovarian cancer, lung cancer [4-10]. Many studies have shown that there is a relationship between the presence of infectious agents and the incidence of cancers. Many human infections are caused by bacteria. For example, brucellosis in humans is an infectious disease produced by the brucella bacteria. This bacterium causes infectious disease in the heart, brain and bone tissues. Genetic studies of the bacterium in infectious patients have led researchers to focus on cancer humans [11]. Therefore early diagnosis of bacterial infection is appropriate to successful treatment and reduce mortality rate due to it and reducing the risk of cancer. Serious bacterial infections can be treated with antibiotics, which work by disrupting the bacterium's metabolic processes, but antibiotic-resistant strains are starting to emerge, indeed early identification of bacterial infections, is important because they can be life-threatening. It allows proper prescription of specific treatment for bacterial inflammatory disease and avoid santibiotic resistance phenomena and unnecessary antibiotics administration. On the other hand the inappropriate use of antibiotics in the cases which the illness is not bacterial in origin, may cause delays in proper treatment [12-13]. The convention al diagnostic tests, included inflammatory markers such as C-reactive protein (CRP), erythrocyte sedimentation rate (ESR) and leukocyte count,… helps to solve clinical suspicion of infection, but use these tests have some limitation because of their lack of specificity for infections origins. these tests cant differentiating between bacterial infections , viral infections and systemic inflammation. On the other sides, Microbiologic tests (culture) last where abouts 24-48 hr, and negative results do not show

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the definite absence of infection. Moreover, only low percent of blood cultures show microorganisms. So, differentiation between infections origin, infection states and aseptic inflammation is often a challenge in clinical practice Therefore, there is an obvious need to specific tests to decisive diagnosis [12].

Discussion

Procalcitonin (PCT) engagement etiology in bacterial infection

The initiator element for elevated level of PCT is infection and PCT as component of the complex proinflammatory activity of the innate immune system [14-15]. different surveys have demonstrated that patients with sepsis have elevated serum PCT levels that this increscent is related with the outcome of the disease [16]. Increase in Serum PCT levels have been indicated increasing severity of bacterial infection. So a elevated PCT level might be as an indicator for infectious process [17]. PCT relation with bacterial infection in the pathogenesis of bacterial infection inflammatory. Cytokines have important role. These cytokines initiate the innate immune system's response to the bacterial pathogen (IL)-1β, tumor necrosis factor (TNF), and IL-6). The role of proinflammatory cytokines during the innate immune activity is a major component of the pathophysiology of bacterial infection [18-19]. In inflammatory condition because of bacterial infection, CALC-1 gene expression increased that leading to release of PCT that related with bacterial infection status [15-20]. New studies identified that PCT is a Promoter agent of inflammatory cascade such as increase in leukocyte secreted inflammatory cytokines, expression of surface markers on leukocyte, increases leukocyte-derived cytokines and also incensement in nitric oxide [15- 21].

Procalcitonin (PCT) as diagnostic test for bacterial infection

Procalcitonin is a peptide precursor of calcitonin composed of 116 amino acids that produced by parafollicular cells of the thyroid and neuroendocrine cells of the lung and the intestine. Calcitonin being involved with calcium homeostasis. In the 1997s, researchers founded that the PCT levels were raised in bacterial infection patients [15-22]. later in further studies, researchers founds, increased plasma PCT was could be additional and helpful criteria for definition of bacterial infection origin (2003y) [15-23]. Chris et al (2004y) in Cluster-randomized, Single-Blinded Intervention Trial found that the procalcitonin level can help guide antibiotic therapy. In this experiment, based on evaluate serum procalcitonin concentrations, use of antibiotics was more or less discouraged (<0.1 μg/L or <0.25 μg/L) or improved (≥ 0.5 μg/L or ≥0.25 μg/L), respectively [24]. In an earlier survey nonrandomized trial, study results indicated "limited, prognostic value" of procalcitonin measurement [25]. Research Trials from 2009 (Schuetz, et al) and 2008 (Briel, et al) have presented data that shown, procalcitonin test may be useful guide therapy in bacterial infection and reduce antibiotic use, these ways can help save on cost of antibiotic administration and antibiotic resistance [26-27]. The procalcitonin test is relatively new, but its utilization is increasing. In Differential Diagnosis procedures, Procalcitonin levels may be helpful to distinguish bacterial infections from nonbacterial infections. The procalcitonin test has been approved by the U.S. Food and Drug Administration (FDA) for ordered in along with other laboratory assessments as effective diagnostic criteria in critically ill patients for progression of systemic bacterial infections. For diagnostic purposes, it is best used during the first days of infections. It may be used later on to monitor the response to treatment. Procalcitonin may be ordered, along conventional tests such as a C-reactive protein (CRP), blood culture, complete blood count (CBC),....The procalcitonin level in the healthy individuals blood is low as below the limit of detection (0.01 μg/L) of clinical assays [12]. The procalcitonin level rises in a proinflammatory conditions, especially with bacterial provenance. In proinflammatory cases, procalcitonin produced mainly by the cells of the lung and the intestine. Bacterial origin infections with an associated systemic response rises, the blood levels of procalciton into 100 μg/L (half-life of 25 to 30 hours in serum). Low levels of procalcitonin in a seriously ill person represent a low risk of sepsis but do not except it. Low concentrations may indicate a localized infection. It may also show another origin such as viral infection, or trauma elevated levels mark a high probability of bacterial sepsis and higher risk of progression to severe state. Moderate increscent may be because of non-infectious condition or due to an early infection. The procalcitonin test provides additional data that may help appropriate treatment to be initiated sooner.

In conclusion, Recent studies have shown that it has promise in helping to evaluate the seriously ill person situation is with systemic bacterial infection. Elevated serum PCT show the severity of the inflammation, and a reduced level is a indicator of improvement, indeed reducing procalcitonin levels in a person being treated for a severe bacterial infection indicate a response to therapy during bacterial treatment. PCT evaluating test offer important procedure in early diagnosis in during antimicrobial treatment in bacterial infections.

In fact, PCT can be useful for antimicrobial treatment and its utilization may safely cause decrease in unnecessary antimicrobial therapy [15-28]. Research show that, treatment based on PCT-test protocols is effective guide for antibiotic treatment in bacterial infections [29]. Occasionally, a procalcitonin test may be ordered at intervals to monitor the effectiveness of antimicrobial treatment.

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