

Role of IL-6 and Acute phase protein in burn patients

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ABSTRACT

The current study aimed to show some of the immunological variations associated with burn injuries in the body of the injured, which increases the rate of septicemia and death among these patients. During the period from February 2018 to August 2019, blood samples (64) were collected from burn patients in Al-Hussein-Teaching Hospital in Karbala Governorate and found acute phase protein(CRP) values increased directly with the intensity of the burn, reaching 64.1 mg/L in minor burns, while it reached (90.2 and 125) mg/L for both moderate and severe burns, respectively. While the significant increase was ($p \leq 0.05$) in cellular kinetic values. IL-6 to (118, 86 and 33) pg/ml in patients with mild, moderate and severe burns, respectively

Keywords: interlukin 6 (IL-6), acute phase protein (CRP)

INTRODUCTION

Burns are one of the most destructive forms of bruising to the skin as a result of loss of its protective mechanism which leaves room for infection, Therefore, quick medical attention is required to prevent injuries and fatalities among burn patients (1). Burns are also considered one of the most harmful conditions to mental and physical health, as they have negative psychological repercussions that are sometimes so severe that they necessitate post-burn medical and psychological therapy (2).

Major immunological and physiological changes occur in a patient who has experienced a severe thermal injury, such as burns, especially second- and third-degree burns. The activity of these cells, which in turn leads to stimulating the production of primary inflammatory mediators, such as prostaglandins for example(TNF, IL-6,IL-1)and other inflammatory factors, thus making the patient vulnerable to septicemia, in addition to the accompanying

failure in many activities. The physiology of the organs in the body of the burn victim, It is regarded as one of the major factors that contribute to morbidity and mortality in these patients (3). Cytokines are glycoproteins with different peptide chains, their molecular weight ranges between (10–50) kDa. Tissue regulation of the acquired and autoimmune response by proliferation of T and B cells and regulation of their functions. The most important functions of monophasic proteins are to stimulate the process of phagocytosis, the formation of immune complexes, the activation of the classical complement pathway in the absence of a specialized antigen, the activation of mononuclear cells, and the activation of clotting, and it has a role in the natural immunity to infection. As well as distinguishing between bacterial and viral infections if it does not rise in viral cases (4). The level of CRP may increase in the sera of patients with burns, especially those with bacterial infections. Some studies have indicated a high level of CRP, which may reach about 10mg/dl (5).

Cytokines are produced by macrophages, monocytes, T lymphocytes, fibroblasts, and Natural killer (NK) cells, as well as from skin cells, where they are released by Langerhans cells and keratinocytes. Cytokines (6), burn injuries cause marked changes in the levels of cellular kinetics during the first week of the trauma in which it releases inflammatory mediators, including cellular kinetics, which may contribute to the morbidity and failure of many organs in the body suffering from severe burn injuries (7). There are many cellular kinetics, including IL-6, which is a glycoprotein with a molecular weight of 26 kDa. It is produced by monocytes, macrophages, lymphocytes, endothelial cells, B cells, T cells, and corneas. in others' skin as well. Two glycoprotein chains make up the IL-6R receptor. IL-6 attaches to the alpha chain with a low affinity, and the resulting complex will bind to the beta chain, increasing the binding affinity and signal transmission into the cell (8).

In the event of damage to body tissues, such as burns, for example, many cellular kinetics will be released before inflammation in both local and systemic responses, such as IL-6 cellular kinetics, and here is meant by local response, that is, the role of cellular kinetics in skin inflammation where Langerhans cells cooperate with neighboring T cells and keratinocytes (9). It has in the epidermal area by secreting many immune components such as cytokine, includes cytokinesis, which plays a significant role in the body's immune, such as IL-6 and TNF and together they form the immune system of the skin called the skin associated lymphoid tissue (SALT), the increase in the level of IL-6 cytokines one week after the burn was considered a marker for the severity of the disease. As this increase in the concentration of most cytokines, including IL-6, is related to the size of the burn, and the concentration may increase to hundreds of times in the event of septicemia (Septicemia) or severe burn injuries (10).

METHOD OF SOLUTION

1. Estimation of the level of cytokinesis 6 by Enzyme- linked immune-sorbent assay (IL.6 ELISA). An assay kit prepared to the manufacturer's specifications (Elabscience) was used.
2. Detection of acute phase protein CRP

The fluorescent scanning technology adopted by the i-CHROMATM Reader device was used to monitor and diagnose chronic diseases such as rheumatic diseases, hormonal imbalances, heart diseases and cancerous tumors in less than 5 minutes, with the most accurate results. Where the device works by placing the ID chip or the code inside the device and blood or serum is withdrawn, then the serum is mixed with the Detector buffer through a single-use pipette, then the mixture is shaken gently. The chip is inserted into its designated place inside the i-CHROMATM Reader . After three minutes, we notice the presence of the reading on the screen of the i-CHROMATM Reader.

Statistical analysis: The results of the current study were analyzed using the Axccl program, where the mean and standard deviation were extracted using single factor-Anova and finding the smallest difference LSD at $P \leq 0.05$.

RESULTS AND DISCUSSION

IL-6 concentration in burn patients

According to the study's findings, burn patients' sera had higher IL-6 kinetic values than healthy controls. The findings of the statistical analysis also showed that patients with mild, moderate, and severe burns (101,86, and 33 pg/ml, respectively) and the control group (15 pg/ml) had significantly different IL-6 kinetic values at the probability level ($p \leq 0.05$). As shown in table. Cytokines such as (TNF, IL-1, IL-6, and IL-8) are excreted in significant amounts in severe inflammatory burns, and the quantity of excretion varies depending on the kind of those burns and wounds, according to several practical research. Additionally, the extent of the burns and the patient's age (11).

An acute inflammatory response that is dysfunctional is an infection. It symbolizes an intricate series of cellular activities that govern infection. Inflammatory mediators like IL-1 and TNF are released by macrophage cells that are stimulated by bacterial infection and are mediated by microbial signals. This increases local inflammation, which draws neutrophils to the area to destroy germs. Additionally, because the majority of skin cells, like keratinocytes, T-cells with macrophages may produce cellular kinetics, their effects are confined before spreading into the bloodstream (12). Injecting subcutaneous lipopolysaccharide from Gram-negative bacteria in experimental mice led to the establishment of an inflammatory state and the appearance of significant levels of IL-6 cellular kinetics in the circulation. A severe burn injury will typically activate the primary inflammatory response, which will increase blood production and release. IL-6 indicates the kinetics of primary inflammatory cells that act to block the entry of harmful microorganisms, and it can be seen that these factors increase 12 to 24 hours after an injury or burn (10), (13).

Table (1): shows the cellular kinetics of IL-6 in patients in relation to the degree of burn.

Degree burn				
Third:degree burn	Second:degree burn	First: degree burn	Control	
M± SD	M± SD	M± SD	M±SD	
118.86±30.15	68.81±14.89	33.38±11.72	15.79±4.88	IL-6

L.S.D(0.05) = 11.804

C-reactive protein (CRP) concentration in burn patients

In comparison to healthy controls, the acute phase protein values in the serum of patients with burns rose. According to the statistical analysis's findings, there were significant differences between burnt individuals of all degrees (simple, moderate, and severe) and healthy individuals at the probability level $p \leq 0.05$. based on the table (2).

The reason for the increase in acute -phase protein concentration is due to the increase in concentration in cases of inflammation and tissue damage. A study by Jeschke indicated that higher CRP concentrations are associated with type, size and severity of those burns. Some scientific studies have also indicated that it is not possible to rely on the acute phase protein concentration as a conclusive or conclusive evidence for determining the severity of burn injuries because it is a non-specialized test that increases or decreases in cases of viral microbial infection or bacterial infection accompanying the burn as well (14)(15).

Table (2): The concentration of acute-phase protein (CRP) in healthy controls and burn patients in relation to the degrees of burn.

Degree burn				
Third: degree burn	Second:degree burn	First: degree burn	Control	
M± SD	M± SD	M± SD	M±SD	
125±17.4	90.3±26.2	64.1±30.5	4.3±2.2	CRP

L.S.D(0.05) = 14.72

CONCLUSIONS

A significant variance was observed in the immunological parameters of burn patients through an increase in the concentration of acute phase proteins, where the increase was directly proportional to the degree of burn, and the level of IL-6 significantly increased according the degree and severity of the burn.

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