Original Research

Assessment of change in serum cytokine levels among patients undergoing general anesthesia

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ABSTRACT

Background: The present study was conducted for assessing the change in serum cytokine levels among patients undergoing general anesthesia. **Materials & methods:** A total of 20 patients of ASA grade I/II were enrolled. Complete demographic and clinical details of all the patients was obtained. Only those patients were enrolled which were scheduled to undergo surgeries under general anesthesia. Preoperatively, blood samples were obtained. Serum cytokine levels were recorded. Anesthesia was induced with thiopental and succinylcholine, and endotracheal intubation was performed. Serum blood samples were obtained again and serum cytokine levels were evaluated. All the results were analyzed using SPSS software. **Results:**Mean IL-6 levels before surgery and after surgery was 2.39 pg/ml and 6.21 mg/ml respectively. Significant results were obtained while comparing IL-6 levels before and after surgery (p-value < 0.05). Mean IL-10 levels before surgery and after surgery was 3.23 pg/ml and 3.85 mg/ml respectively. Non-significant results were obtained while comparing IL-6 levels before and after surgery. **Conclusion:**Significant alteration of cytokine levels occurs among patients undergoing general anesthesia.

Key words: General, Cytokine

INTRODUCTION

The immune system has evolved to protect the body through developing appropriate immune responses against potentially harmful pathogens and non-compliant antigens. The immune system uses several mechanisms to regulate these responses which may lead to tumor growth, rejection of organ transplantation, autoimmune diseases, asthma, and allergies. The prevalence of diseases related to immune regulation has increased significantly in recent decades.[1, 2]The immune response is the response to microbial components and macromolecules such as proteins, polysaccharides, and small chemicals that are identified as foreigners, regardless of their physiological and pathological consequences. The body's defense system against germs contains two parts, the innate immunity (which comes into play immediately after identifying the pathogen) and the acquired immune responses. Cytokines are key modulators of inflammation that play both inflammatory and anti-inflammatory roles. Cytokines contribute to the removal of antigens and play a key role in the drugs and systemic inflammatory responses.[3, 4]Interferon-gamma (IFN-γ) and interleukin 6 (IL-6) play important roles in hematopoiesis and immune response during stress and surgery. IL-10 and IL-4 suppress the production of a variety of inflammatory cytokines, including IFN-γ and IL-6. The IL-17 family plays a central role in the control of infections and directs many inflammatory factors against microorganisms in immune system-related diseases. Transforming growth factor-beta (TGF-β) has multi-activities such as cell differentiation, inhibition of cell growth to modulation, and suppression of immune and inflammatory responses.[5- 8]Hence; the present study was conducted for assessing the change in serum cytokine levels among patients undergoing general anesthesia.

MATERIALS & METHODS

The present study was conducted for assessing the change in serum cytokine levels among patients undergoing general anesthesia. A total of 20 patients of ASA grade I/II were enrolled. Complete demographic

and clinical details of all the patients was obtained. Only those patients were enrolled which were scheduled to undergo surgeries under general anesthesia. Preoperatively, blood samples were obtained. Serum cytokine levels were recorded. Anesthesia was induced withthiopental and succinylcholine, and endotracheal intubation was performed. The muscle relaxant was reversed with atropine and neostigmine, and the subjects were extubated and transferred to the recovery room. Serum blood samples were obtained again and serum cytokine levels were evaluated. All the results were analyzed using SPSS software.

RESULTS

Mean age of the patients was 41.7 years. 60 percent of the patients were males while the remaining were females. 65 percent of the patients were of ASA grade II.Mean IL-6 levels before surgery and after surgery was 2.39 pg/ml and 6.21 mg/ml respectively. Significant results were obtained while comparing IL-6 levels before and after surgery (p-value < 0.05). Mean IL-10 levels before surgery and after surgery was 3.23 pg/ml and 3.85 mg/ml respectively. Non-significant results were obtained while comparing IL-6 levels before and after surgery.

Table 1: Demographic data

Variable	Number	Percentage
Mean age (years)	41.7	
Males	12	60
Females	8	40
ASA Grade I	7	35
ASA Grade II	13	65

Table 2: Comparison of serum cytokine levels

Cytokine levels (pg/ml)	Before surgery	After surgery	p-value
IL-6	2.39	6.21	0.000*
IL-10	3.23	3.85	0.121

*: Significant

DISCUSSION

The introduction of general anesthesia is evaluated as one of the prominent achievements for the development of modern medical science. Since William Morton conducted an operation by using general anesthetics for the first time, the mechanism has not been clearly understood yet.Still, there is no objectively agreed definition of general anesthesia. The behavioral responses are various depending on the concentration of anesthetics, and can include amnesia, excitation, analgesia, hypnosis and hyperreflexia in a low concentration, and deep sedation, muscle relaxation, and reduced motor and autonomic response to noxious stimuli in a high concentration. Many studies have been recently done on the mechanisms of general anesthesia. Each of the behavioral responses of general anesthesia selectively functions on different parts of the brain and various molecular targets. In particular, the binding sites of ion channel receptors are closely related to the functional sites of general anesthetics. Out of various ion channels, the γ-aminobutyric acid type A (GABAA) subunit receptor has been known to play the most important role as a functional site of general anesthetics.[8- 11]Hence; the present study was conducted for assessing the change in serum cytokine levels among patients undergoing general anesthesia. Mean IL-6 levels before surgery and after surgery was 2.39 pg/ml and 6.21 mg/ml respectively. Significant results were obtained while comparing IL-6 levels before and after surgery (p-value < 0.05). Mean IL-10 levels before surgery and after surgery was 3.23 pg/ml and 3.85 mg/ml respectively. Non-significant results were obtained while comparing IL-6 levels before and after surgery.Yeager MP et al, in a previous study, assessed cerebrospinal fluid cytokine levels after surgery with spinal or general anesthesia. Samples were taken from surgical patients before and after surgery under general anesthesia or spinal anesthesia performed with or without a spinal catheter. Reference samples were also obtained from healthy control subjects.Both plasma and CSF levels of IL-6 increased substantially after major surgery with either general or spinal anesthesia. No significant correlation was observed between plasma IL-6 and CSF IL-6 levels, suggesting a central origin for increased CSF cytokine levels. IL-10 did not change in plasma or CSF after surgery. Plasma and CSF IL-6 and IL-10 cytokine levels were very low or undetectable in healthy controls.Major orthopedic surgery leads to elevated CSF levels of the proinflammatory cytokine, IL-6.[10]Hassanshahi et al compared the effect of general anesthesia (GA) and spinal anesthesia (SA) on immune system function in elective CS.They were randomly divided into GA and SA groups. The serum concentrations of interleukin

(IL)-4, IL-6, IL-10, and IL-17 and interferon-gamma (IFN-γ) were measured using ELISA method prior to anesthesia (T0), immediately after the uterine incision (T1), 2 h post CS (T2), and 24 h post CS (T3). No significant differences were observed between the GA and SA groups regarding the serum levels of IL-4, IL-6, IL-10, IL-17, and IFN-γ. The serum levels of transforming growth factor beta (TGF-β) in the SA group were significantly more than that of the GA group at T3.According to the angiogenesis properties of TGF-β, it seems that SA probably affects the rate of recovery more than that of the GA.[11]

CONCLUSION

Significant alteration of cytokine levels occurs among patients undergoing general anesthesia.

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