

# Effect of surgical stress on agranulocytes count

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## Abstract

Patient undergoing surgery experiences sudden and intense changes in the normal physiological functions of the body. Leucocytes play key role in protecting the body during surgical stress which is a state of threatened homeostasis. The main objective is to evaluate the normal course and magnitude of surgical stress response with regard to agranulocyte count preoperatively, first and seventh post-operative days by Differential Leucocyte Count in the patients posted for elective surgery. Agranulocyte count during pre operative day was compared to first and seventh post-operative day in 30 subjects showed significant decrease with p-value<0.0001 on first post-operative day. Agranulocyte count before and after surgery can help the medical personnel to prevent post operative complications.

**Keywords:** Agranulocyte count, Leishman Staining technique, Pre-operative day, First post operative day, Seventh post operative day.

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damage and inflammation. An understanding of stress response will aid the Clinician / surgeon in preparing for the expected responses and perhaps correcting the deviations that account for potential complications. Different kinds of leucocytes - Neutrophils, Lymphocytes, Monocytes, Eosinophils and Basophils form an important part of host defense system; the major facets being Chemotaxis, Phagocytosis, Intracellular killing, Complement activation. Agranulocytes namely monocytes and lymphocytes also form important constituents of Cell Mediated Immunity and Humoral immunity.

## INTRODUCTION

Physical barriers and the immune systems defend the body against organisms that can cause infection. Physical barriers include the skin, mucous membranes, tears, ear wax, mucus, and stomach acid. The immune system includes different kinds of white blood cells and antibodies to identify and eliminate organisms that get through the body's physical barrier. Surgery is a medical speciality where-in operative procedure and instrumentation is used to investigate and treat a disease or injury. During surgery the skin, mucous membranes are cut and the internal tissues are exposed to external environment and Pathogens. It also produces tissue

## MATERIALS AND METHODS

The work was carried out at Kakatiya Medical College, in the department of Physiology, department of Surgery at Mahatma Gandhi Memorial Hospital, Warangal for the selection of subjects. Prior to the study consent was obtained from the College Ethical Committee and written consent was obtained from the subjects. We have selected 30 adult subjects of both sex groups posted for minor and major elective surgeries with no signs of infection pre-operatively. Subjects were excluded if they had received any hormonal therapy and blood transfusion during the 30 days prior to data collection. Each subject was informed

about the aim of the research protocol and the methods to be used. Along with routine pre-operative lab investigations, Differential Leucocyte Count of the pre operative, first and seventh post operative blood samples was done using Leishman Staining technique. Under strict aseptic precautions by using sterile disposable syringes on the day of admission prior to surgery, first and seventh post operative days 1ml of venous blood was collected for Differential Leucocyte Count. DLC was performed by using Leishman Staining technique. Agranulocytes i.e. monocytes and lymphocytes were

identified according to their size, nucleus, cytoplasm colour, cytoplasmic and nuclear ratio.

### OBSERVATIONS AND RESULTS

A total of 30 subjects of both sex groups were examined. Monocyte, Lymphocyte count was significantly affected on first post-operative day. Pre-operative agranulocyte count was considered as control group, first and seventh post operative day agranulocyte count was considered as case group1 and 2 respectively. The data obtained was analyzed by using unpaired student’s t-test for difference of means with unequal variances for statistical analysis.

**Table 1:** Comparison of agranulocyte count during pre-operative, first and seventh post-operative days

Parameter	Control Group (MEAN±SD)	Case Group1 (MEAN±SD)	Case Group2 (MEAN±SD)
Monocyte count	2.13±1.31	0.10±0.31	2.24±0.64
lymphocyte count	32.30±5.06	19.72±3.74	30.33±4.26

Contol group-Pre-operative day count

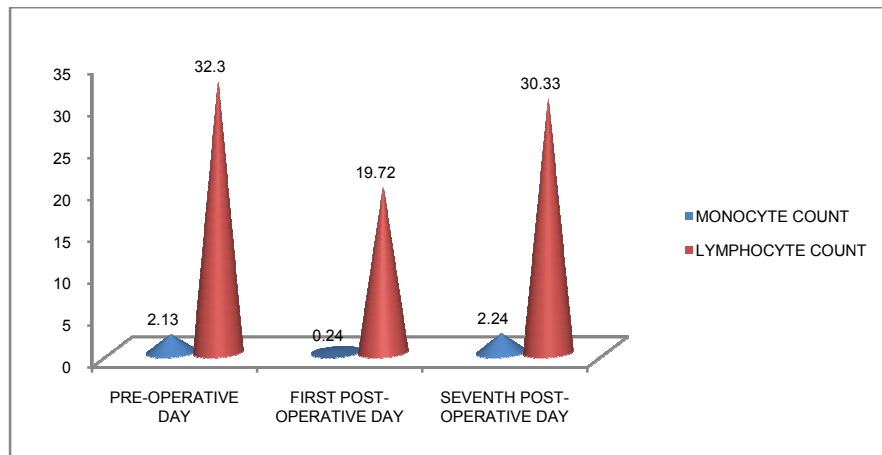
**Case group1:** First post-operative day count

**Case group 2:** Seventh post-operative day count

p-value for monocyte, lymphocyte count in control group and case group 1: <0.0001

p-value for monocyte, lymphocyte count in case group1 and case group 2: <0.0001

There is a significant decrease in agranulocyte count during first post operative day when compared to pre-operative day and the agranulocyte count returns to normal on seventh post-operative day as shown in the graph.



### DISCUSSION

Stress produces destabilization of homeostasis. The compensatory mechanisms existing in the human body battle with the stress induced effects and bring back the homeostatic state. In most instances such compensatory mechanisms operate via feed-back systems which are endocrine in nature. In the present study significant alterations have been observed in the relative proportions of different leucocytes in the immediate post operative period which tended to be restored to the preoperative values by seventh post operative day. Monocytes from the bone marrow enter into circulation. After about 72 hours they enter the tissues from blood and become tissue

macrophages. The life span in tissues is for about 3 months. The tissue macrophages include the Kupffer cells of liver, pulmonary alveolar macrophages and microglia in the brain. The macrophages become activated by lymphokines from T lymphocytes. The activated macrophages migrate in response to chemotactic stimuli and engulf and kill bacteria and play a key role in immunity. Lymphocytes are the key elements in the production of immunity. After birth some lymphocytes are formed in the bone marrow. Most of them are formed in the lymph nodes, thymus and spleen from precursor cells that originally came from the bone marrow. Lymphocytes enter the blood stream for the most part via

the lymphatics. At any given time, only about 2% of the body lymphocytes are in the peripheral blood. Most of the rest are in the lymphoid organs. A small number of activated B and T cells persist as memory B and T cells once they are exposed to a given antigen. In a later encounter with the same antigen these cells readily form effector cells. This ability persists for long periods of time even it can be lifelong.

## CONCLUSION

Evaluation of agranulocyte count preoperatively and post operatively gives an estimate of body defense response to surgical stress. The neural – endocrine – immune interactions provide an opportunity to know the immunology, underlying endocrine and cytokine mechanism. The decrease in agranulocyte count during surgery was regulated by the neuro-endocrine axis. The interactions between surgical stress and immune system provide a unique opportunity to link basic and clinical physiology and to evaluate the role of underlying stress and immuno- physiological mechanisms.

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