

RESEARCH ARTICLE

Effects of cesarean section duration on inflammation and postoperative parameters, a retrospective analysis

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Abstract

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Introduction: Cesarean section it is the most frequently applied surgical application. Every surgical procedure creates an inflammation. Neutrophil to lymphocyte ratio (NLR), which can be easily obtained from complete blood count, is used as subclinical systemic inflammatory markers. In this study, our aim is to understand the effect of the duration of the cesarean section on subclinical inflammation by looking at the neutrophil/lymphocyte ratio and the effect of this period on blood loss and postoperative recovery

Methods: We included a total of 188 operations between the ages of 18-45 in our study and created 2 groups according to the duration of the cesarean section. When grouped as short (0-39 min) and long (≥ 40 min) according to the operation time, NOL change was higher in the group with longer operation duration, but no significant difference was found in both groups. Similarly, although the decrease in hemoglobin was higher in the group with a long operation time, no significant difference was found. No difference was observed between the two groups in terms of wound healing on the postoperative 10th day. When we look at our other parameters, we found a significant relationship between those whose cesarean section ended within 40 minutes and those who had their first cesarean section.

Results: As a result of our study, we could not detect a significant difference in the duration of the cesarean section operations performed in our clinic on the postoperative parameters.

Conclusion: Although supportive studies are needed, it shows that the surgical rules of cesarean section operate correctly under optimal conditions.

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Introduction

Cesarean section was an operation performed in the early 1900s to save women's lives. Today, it is the most frequently applied surgical application.¹ Every surgical procedure creates an inflammation. Inflammation is the immune system's response to endogenous or exogenous stimuli, which is essential but non-specific for the continuation of life. The reason for this response is to repair the cellular damage caused by the stimulus, to eliminate the cells and foreign substances, and to prevent the harmful effects on the organism by limiting the stimulus. There can be many infectious (gram-positive and gram-negative bacteria, virus, fungus, parasite, etc.) or non-infectious (trauma, burn, foreign body, ischemia, etc.) reasons for triggering inflammation.² Inflammation can be created by several causes, such as a blood clot that induces an ischaemic stroke; an immune system disorder; a cancer; a chemical exposure from polycyclic aromatic hydrocarbons, dioxin, smoking, etc; a physical injury including trauma or a haemorrhagic stroke; or a neurological condition, such as Alzheimer's disease, depression, etc.³⁻⁷ Many infections by viral, bacterial, fungal and protozoan pathogens can cause inflammation.⁸ The mechanism of inflammation; It is characterized by increased blood flow as a result of first vasoconstriction and then vasodilation in the vascular bed, separation of plasma proteins and leukocytes from the circulation as a result of structural changes in the microcirculation, migration and proliferation of leukocytes to the microcirculation, activation of complement, coagulation activation system and chemical mediators.⁹

Neutrophils; It is the most abundant cell group in the circulation and the first to go to the site of infection and inflammation. These cells migrate by being affected by chemotactic agents (interleukin-8, leukotriene B4, etc.) released from the area of inflammation. All of these chemoattractants diffuse from the site of infection or injury to provide a chemotactic gradient for the migration of neutrophils and further activate neutrophils during transmigration.¹⁰⁻¹²

In recent years, it has been shown that the ratio of neutrophil count to lymphocyte count (NOL) can be an indicator of systemic inflammation and is associated with prognosis in many cardiovascular diseases, malignancies and chronic inflammatory diseases.¹³ Neutrophil to lymphocyte ratio (NLR), which

can be easily obtained from complete blood count, is used as subclinical systemic inflammatory markers.

In this study, our aim is to understand the effect of the duration of the cesarean section on subclinical inflammation by looking at the neutrophil/lymphocyte ratio and the effect of this period on blood loss and postoperative recovery.

Material and Methods

We retrospectively analyzed the cesarean section operations performed in Kırıkkale university medical faculty hospital, gynecology and obstetrics clinic in 2020 and recorded by anesthesiologist. The study was carried out after the approval of the local ethics committee (Date of 19.04.2023 and 2023.03.01 decision no.) in Kırıkkale university medical faculty. We included a total of 188 operations between the ages of 18-45 in our study. We excluded the cases with any additional disease and complications during the cesarean section. We created 2 groups according to the duration of the cesarean section. The first group was operated within 40 minutes (n1=91), the second group was operated for more than 40 minutes (n2=97). We compared these two groups in terms of the neutrophil-lymphocyte ratio at the postoperative 24th hour, the difference in hemoglobin hematocrit values before and after the operation, and the wound healing on the 10th postoperative day.

We performed the statistical analysis in SPSS (Statistical Package for Social Sciences) program. Pearson correlation coefficient was used to compare numerical variables, Spearman test and Chi-square tests were used to compare categorical variables. Statistical significance was considered with p values <0.05.

Results

In our study, in which we retrospectively analyzed 188 cesarean section operations, we also analyzed the cases such as age, gestational week, number of pregnancies, whether they had a previous cesarean section or not.

Table 1: There was no statistically significant difference between the groups' age, number of pregnancies, gestational week, preoperative and postoperative NLR and Hb values, and NLR and Hb changes according to the duration of the operation (t-test was performed in independent groups) - All distributions are non-parametric

Table 1

	<40 minutes	≥ 40 minutes	
	Median	Median	<i>p</i>
Operation time	33	51	0,000
Age	28	29	0,282
Gravida	2	3	0,017
Gestasyonel week	37+6	37+4	0,212
Preop NLR	5,1	5,1	0,962
Postop NLR	7,5	7,0	0,430
Delta NLR	-2,3	-1,9	0,516
Preop Hb	12,0	11,6	0,093
Postop Hb	10,4	10,1	0,141
Delta Hb	1,5	1,4	0,620

Our operation times are distributed between 20 minutes and 114 minutes, with an average time of 41.9 minutes and a median time of 40 minutes. 65 of our cases had undergone cesarean section before and it was the first cesarean section of 123 of our cases. Average age is 28, average gestational week is 37+5. We found the mean preoperative NLR=5.12, post-operative mean NLR: 7.23, pre-operative median HG: 11.8 g/dl, post-operative median HG: 10.3 g/dl.

We statistically analyzed the differences in neutrophil-lymphocyte ratios and hemoglobin in the hemogram panel of our groups before and after the operation at the 24th hour. When grouped as short (0-39 min) and long (≥40 min) according to the operation time, NOL change was higher in the group with longer operation duration, but no significant difference was found in both groups ($p=0.330$). Similarly, although the decrease in hemoglobin was higher in the group with a long operation time, no significant difference was found ($p=0.932$). No difference was observed between the two groups in terms of wound healing on the postoperative 10th day.

When we look at our other parameters, we found a significant relationship between those whose cesarean section ended within 40 minutes and those who had their first cesarean section ($P=0.35$).

Discussion

In our study in which we compared the subclinical inflammation, wound healing and blood loss parameters of the duration of the cesarean section; we thought that subclinical inflammation would increase as the duration of cesarean section was prolonged, as the duration of exposure to trauma and open wound air contact lengthened.

In 2017, Hang Cheng et al. in their study titled “Prolonged Operative Duration Increases Risk of Surgical Site Infections (SSI): A Systematic Review(14)”; concluded “prolonged operative time can increase the risk of SSI. Given the importance of SSIs on patient outcomes and health care economics, hospitals should focus efforts to reduce operative time”. However, in our study, we could not detect that subclinical inflammation increased with the prolongation of the operation time by looking at the NLR and wound healing evaluations. Operative time is an independent risk factor for SSI, which may be partially modifiable, unlike some patient risk factors such as diabetes mellitus. There are many parameters that can influence operative time, including preoperative planning, surgeon experience, surgeon fatigue, operating room staff experience and access to equipment. The exact mechanisms by which the incidence of SSI increases due to increased operative time are not fully understood, but several studies suggest plausible reasons. With increasing operative time, patients' open incisions are exposed to the environment for longer, which increases the risk of bacterial contamination. Longer operative time predisposes incisions to tissue drying, which may also increase the likelihood of contamination.^{15,16} Longer operative times may also mean increased surgical team fatigue and room for more technical errors.^{17,18,19} Moreover, longer operative times often represent more complex surgical procedures.¹⁵ Some of the factors that increase operative time can be modified while others may not. In any case, measures that can help reduce operative time and optimize workflow should be used. In patients with longer targeted or unexpected operative times, strict adherence to infection prevention measures is essential.^{16,20} Studies have reported that intra-procedural antibiotic dosing may be cost-effective in higher-risk patients.²¹ Although surgical procedures should not be unnecessarily shortened, many avoidable factors can cause delays. Familiarity of the surgical team

with the procedure and equipment should be addressed prior to the procedure. Preoperative planning can help reduce the time spent on intraoperative decision-making and predict material requirements.²² The design of device implants or instruments can help minimize the number of steps required in the procedure.^{23,24} It can also serve as an indicator or guideline for the standard, expected operative time, surgical quality and associated risk of complications for a given surgery. In a study reporting expected OR time across various surgeries, procedures longer than the expected OR time (i.e., greater than 95% CI of the expected OR time) were found to carry a significantly greater risk of complications, whereas procedures with shorter than expected duration were found to have a lower risk of postoperative events.²⁵ In summary, planning, procedure efficiency, and surgeon training should be optimized to minimize the impact of operative time on the incidence of SSI whenever possible.²⁶

We could not detect a relationship between operation time and blood loss. When we look at the literature, we did not see a study similar to ours.

The reason why we did not find a difference in terms of inflammation in cesarean section operations in our study may mean that surgical sterilization rules and antibiotic prophylaxis were fully followed.

We may not have been able to detect a difference between groups in terms of inflammation markers in our study, since pregnancy and childbirth itself already increase inflammation markers.

It can be considered critically that the organization of the time groups in our study was not to such an extent that it would affect the NLO.

When we look at the other parameters in our study, we found that the operation time was shorter in cases with the first cesarean section, which is a known fact that tissue adhesions slow down the operation in those who have had a previous cesarean section.

Conclusion

As a result of our study, we could not detect a significant difference in the duration of the cesarean section operations performed in our clinic on the postoperative parameters. Although supportive studies are needed, it shows that the surgical rules of cesarean section operate correctly under optimal conditions.

Disclosure statement

No potential conflict of interest was reported by the authors

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