



# THE COMPARISON OF THE PREOPERATIVE AND POSTOPERATIVE NEUTROPHIL TO LYMPHOCYTE RATIO FOR EARLY PREDICTION OF COMPLICATIONS IN TRANSIT BIPARTITION SURGERY

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## Abstract

**Aim:** Metabolic surgery is a newly applied and effective treatment method in type 2 diabetes all over the world. For this reason, blood parameters have come to the fore more frequently in the last decade to predict possible complications early.

Our aim is to evaluate the neutrophil/lymphocyte ratio (NLR), which is a convenient and cheaper parameter for early diagnosis of complications in Transit Bipartition (TB-SG) surgery, which is the last modality in diabetes surgery.

**Methods:** In our study, we retrospectively evaluated diabetic patients who underwent TB-SG in the metabolic surgery clinic between May 2019 and March 2021 and their surgical results. NLR parameter values of the patients were examined on the 1st and 3rd postoperative days.

**Results:** 21 female and 19 male participants were included in our study. The mean age of the patients was 42.7 years and their body mass index (BMI) was 46.4 kg/m<sup>2</sup>. The mean hospital stay of the patients was 3.4 days (2.3–6.7 days) ( $p < 0.05$ ). In the logistic regression study applied, it was shown that the NLR value showed a significant direct ratio with the complications and a correlation was determined.

**Conclusions:** In the new metabolic surgery method such as TB-SG, NLR was found to be a useful and appropriate parameter in detecting possible complications in the postoperative period.

**Keywords:** *Diabetes mellitus, metabolic surgery, transit bipartition*

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## Introduction

Morbid obesity is widespread disease in all over the world, and the clear solution is bariatric surgery for the patients who have not utilized or profit from any non-surgical treatment methods.

Excess weight earnings led to inflammation and many diseases such as metabolic, cardiovascular, lung diseases, and various malignancies. Elevated levels of inflammatory markers caused to inflammation in the human body, furthermore these mediators are released from adipose tissue particularly in morbid obese patients<sup>1-3</sup>. Obesity leads to systemic inflammation and establish the obesity-associated comorbidities in adipose tissue<sup>4-6</sup>.

Many inflammatory markers investigate the inflammation in the body particularly Neutrophil-lymphocyte ratio (NLR) is one of them. NLR is also a forecasting marker for the possible illnesses, such as complications<sup>7-9</sup>. The advantage of NLR outcome has low costing and fastly reachable.

Metabolic surgery not only lead to weight loss but it also decline inflammatory marker activity. Laparoscopic sleeve gastrectomy (LSG) firstly described as a stepwise process for morbid obesity after this procedure it is understood that the patients who have underwent LSG participants blood glucose and insulin necessity decreased and also utilized for diabetic disease surgery<sup>5</sup>. Transit bipartition (TB-SG) was firstly showed and performed by Santoro in 2006 and purposed to join a metabolic constituent to the restrictive efficacy of the sleeve gastrectomy procedure<sup>6,7</sup>. Although more research are suggested, TB-SG has been performed for gaining better results in metabolic components of body physiology compared to conventional sleeve gastrectomy (SG). Furthermore, TB-SG has lead to less complications according to other processes<sup>8,9</sup>. Our purpose was to evaluate the differences in NLR after TB-SG surgery at preoperative and post-operative 1st and 3rd days.

## Materials and Methods

We have retrospectively detected 40 patients who underwent Transit bipartition (TB-SG) in metabolic surgery clinic, between the dates of May 2019 and march 2021. Exclusion criteria of this research were being under the age of having any inflammatory illness.

NLR outcomes were identified in the post-operative 1st and 3rd day. Local Ethics Committee has been approved this retrospective research (2020 / 8–decision number 173). The necessary consultations (endocrine, psychiatry, chest, and dietician) were made for the patients who applied before the operation. The BMI values of all patients were  $> 40 \text{ kg} / \text{m}^2$ . Bariatric procedures also performed by an experienced bariatric surgeon team.

### *Interventions*

All of the surgical procedures were applied under the anesthesia laparoscopically. low molecular weight heparin and pneumatic compression bands were performed for preventing the thromboembolism, was applied to all the participants. In the TB-SG technique which was described<sup>10</sup>. First, laparoscopic sleeve gastrectomy was performed with the aid of laparoscopic stapler, and then, 80 cm length from the ileocecal valve was prepared for the consociate way and gastro-ileal anastomosis was performed to the antral area which was 150 cm away from the consociate way. At the end, ileo-ileal anastomosis was applied. furthermore, all of the mesenteric gaps were closed by the aid of barbed sutures<sup>11</sup>.

### *Data collection*

All of the outcomes of patients who underwent surgery and also data were investigated from electronic outcomes of hospital data and also analyzed. The NLR were evaluated preoperatively and on the day of post-operative 1 and 3.

### Postoperative evaluation

Soluble Contrast agent drinking test is applied to all participants on postoperative day of 2. If there is no detected sign of leakage, water permission begins to the patients. All of the patients are called to the clinic weekly for examination during the postoperative first month. Possible postoperative complications recorded and also showed.

### Participants

Of 40 patients who have underwent TB-SG surgery. previous obesity surgery, presence of chronic respiratory disease, alcohol, smoking, and drug dependence were added as exclusion criteria.

### Statistical Methods

Data was analyzed using IBM SPSS Statistics 23 (SPSS, Inc., Chicago, IL, USA). The explanation of the marked factors were determined by the ANOVA test. Logistic regression analysis including demographic variables, pre-operative NLR, and PLR values was utilized for detecting the risk factors which can lead. multivariate logistic regression was used to estimate odds ratio (OR) of baseline factors and backward selection was used to select the final model. For all statistical results, P value  $\leq 0.05$  was accepted as significant for all statistical levels.

## Results

Totally 40 participants were identified (21 female and 19 male) in this study. The average age was 42.7 years and body mass index (BMI) was 46.4 kg/m<sup>2</sup>, however. The clinical characteristics of all participants are showed in Table 1. The length of stay in hospital was 3.4days (range2,3–6,7 days) (p < 0.05) (Table 1). WBC outcomes were significantly lower in the Preoperative period than Postoperative period. The widespread complication was hemorrhage of the operation lodge also detected in 3 patients,

all of them have observed in ICU and no needed any surgery, none of the patients needed second look. 1 patient with pulmonary embolism and 1 had portal thrombosis. Pulmonary complications showed as initially with dyspnea. Elevated liver enzymes have not lead any negative position. Table 2 shows the analysis of regression of univariate. We have detected the sensitivity of 68% and specificity of 93%. We have determined that positive predictive value of 62-78% for prior complications for post-bariatric applications (Table 3).

**Table 1.** Demographic and clinical characteristics of study patients.

	Total (n = 40)
Age (mean)	42.7 ± 4.2years
Female	21 (52.5%)
Male	19 (47.5%)
Mean BMI: kg/m <sup>2</sup> (range)	46.4 (35–53)
Length of stay in hospital (mean)	3.4 day (2.3–6.7)
Mortality	0
<b>Additional diseases (n = 28)</b>	
DM	40
HT	12
CAD	8
COPD	14
Hepatosteatosi	31
<b>Postoperative complications</b>	
Pulmonary embolism	1
Hemorrhage	3
Elevated liver enzymes	2
Portal vein thrombosis	1
Pulmonary complications	2
Neutrophil to lymphocyte ratio	2.1 (1.5-2.8)

SD: Standard deviation, BMI: Body mass index, NLR: Neutrophil to lymphocyte ratio

## Discussion

Metabolic surgery modalities are commonly performed for morbid obese population who have not adequately weight loss after the conservative treatment methods<sup>12</sup>. Bariatric Surgeons need to help for determining the possible complications in the early period and hence the inflammatory markers show their efficacy at this period.

**Table 2.** Univariate analysis of parameters associated with early post bariatric complications

Parameters	Odds ratio	95%confidence interval	P value
AGE	1.007	0.964-1.026	0.92
BMI	1.054	0.824-3.421	0.26
WBC	1.073	0.984-1.126	0.27
NLR	1.984	1.467-2.737	<0.05
Platelets	1.001	0.962-1.103	0.94
Platelets to lymphocyte ratio	1.017	0.997-1.106	<0.05
Creatinine	1.011	0.977-1.056	0.52
Bun(mg/dl)	1.015	0.866-1.234	0.47
ALT(U/L)	1.004	0.969-1.347	0.23
AST(U/L)	1.007	0.973-1.612	0.71

ALT: alanine aminotransferase,AST: aspartate aminotransferase, BUN: blood urea nitrogen,NLR: neutrophil to lymphocyte ratios, WBC: White blood count,BMI:body mass index

**Table 3.** Neutrophil to lymphocyte ratios cut off points with their demonstrative statistics

NLR	Sensitivity	Specificity	PPV
3-7.6	10-70	90-100	62-78
2-2.9	75-90	42-75	27-53
1.3-1.98	93-100	12-36	14-32

PPV:positive predictive value, NLR: neutrophil to lymphocyte ratios

Estimator factors such as CRP, NLR can help the surgeons for early detection time, to minimize mortality rate and be beneficial to discharge period. The main purpose of our research was to evaluate the relationship of NLR with post- metabolic process related complications.

Obesity-provoking inflammation is related with elevated adipose tissue volume. These immunological actions lead to increasing in NLR levels<sup>13-16</sup>. NLR is a parameter for forecasting the inflammation process<sup>17</sup>. In addition, NLR levels were determined as a beneficial parameter for identifying the patients who have the risk of morbidities<sup>18</sup>.

Santoro et al was firstly demonstrated the technique of TB-SG<sup>19</sup>. TB-SG is plain and easily applicable surgical technique according to other malabsorptive surgical methods. this method does not have any substantial compound and lead to weight loss easily. In this surgical method the digested food went to the ileum by passing the pass proximal ileum and also malabsorption may not be or less detected according to other malabsorptive methods such as biliopancre-

atic diversion and Roux N y gastric bypass<sup>20</sup>.

Carbajo et al. demonstrated that the major complications which are described in the postoperative early phase were uncontrollable such as bleeding, and gastric leakage. In present research, bleeding was showed in two patients, in first patient underwent the second look surgery and in the second stopped by hemodynamic followings. Furthermore, The determined marginal ulcers after the TBSG surgery range among 1% and 7.2%.<sup>21</sup>.

On the other hand, Kansou et al. have demonstrated postoperative stenosis rate of 16.9% in this type operations<sup>7</sup>. In this research the follow-up time was 2 years for these group patients and there has been no stenosis detected in patients<sup>22</sup>.

NLR marker was utilized for estimating the possible mortality, and morbidity in participants with underwent surgery for malignancy or any inflammatory illness. Furthermore, NLR is a novel studied marker for bariatric surgery types and modalities<sup>23-25</sup>. Da Silva et al found that NLR can estimate

the complications in the early phase of post-operatively bariatric and metabolic procedures<sup>26</sup>. In addition, NLR is a very convenient and inexpensive method due to its easily accessible marker and early warning role for surgeons.

The Guclu et al. demonstrated that NLR have a significant role for prognosing the possible infectious illnesses and sepsis<sup>27-31</sup>. Furthermore, NLR play a role in detecting pneumonia and malignancies. Morbid Obese patients are showed as lower inflammatory outcomes than other type patient's, Therefore, as we have shown in our study, the property of NLR, its applicability and efficacy in the setting of bariatric surgeries has been believed and trusted<sup>32</sup>.

It is significant to explain that clinical finding are the best idea to detect the possible complications however if there are any lack of symptoms these forecasting biomarker may take an important role for detecting the bariatric surgery complications<sup>33</sup>.

The percentage of NLR is more forecasting parameter for the patients who have undergone surgical process<sup>34</sup>.

Furthermore Halazun et al. have focused on the efficacy of NLR on participants who have underwent hepatic transplantation due to malignancy and found significantly higher NLR levels<sup>35</sup>. In present research, it is detected that NLR has a relationship with complications and utilized as an independent valuable forecasting marker for bariatric surgery modalities.

There are also some limitations of present research. Firstly, its retrospective design, and may hinder the explication of our study outcomes. Secondly the follow up period is short, and patient have not called again in first month control, thirdly the low number of complications such as grade 4 and 5 type according to Clavien–Dindo classification are, the absence, as the fourth study was carried out in a tertiary single bariatric center.

## Conclusion

TB-SG is an effective bariatric process for morbid obesity and metabolic surgery. Complications which may have occurred after this process may cause high morbidity and mortality rates. Present research clearly showed that NLR parameter has positive relationship with complications which are associated with bariatric surgery. We suggest utilizing this marker for estimating the bariatric surgery complications earlier. Further prospective research are also needed to approve our outcomes.

### Author contributions

Author read and approved the final manuscript.

### Conflict of interest

Author declares that they have no conflict of interest.

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### Ethical approval

The study was approved by the University Faculty of Medicine Clinical Research Local Ethics Committee, decision number 2020 / 8 – decision number 173

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