



Effects of Weight Loss with Bariatric Surgery on Platelet Count and Volume

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ABSTRACT

Objective: Obesity is a chronic metabolic disorder that leads to the increased risk of cardiovascular diseases. This study aims to investigate the effect of weight loss on the platelet count and volume, which is associated with cardiovascular diseases.

Methods: In total, 56 obese patients were recruited for the study. The parameters were retrospectively evaluated before and after 6 months of surgery.

Results: The mean weight of the patients was 126.2±23.1 kg before surgery and 91.8±20.5 kg after surgery (p<0.001). The mean platelet counts were 292.5±58.6×10³/μL before surgery and 246.8±59.1×10³/μL after surgery (p<0.001). The mean platelet volumes were 10.4±1.0 fL and 11.6±0.9 fL before and after surgery, respectively (p<0.001). The mean platelet counts before surgery were correlated with the mean platelet volume,

mean weight, and mean body mass index (p<0.01, r=-0.39, p<0.01, r=0.35, p<0.01, r=0.41, respectively). The mean platelet counts after surgery were correlated with the mean platelet volume (p<0.001, r=-0.68).

Conclusion: This study demonstrated decreased platelet counts and increased platelet volume at 6 months after surgery in obese patients. Further long-term and prospective studies are warranted to clarify these results and pathophysiological mechanisms involved.

Keywords: Bariatric surgery, obesity, platelet count, platelet volume

Introduction

Obesity is a chronic, metabolic disease associated with increased risk of cardiovascular disease and characterized by increased mortality and morbidity (1). Coronary artery disease is the leading cause of obesity-related cardiovascular diseases, and platelet activation and aggregation are important pathophysiological mechanisms in the development of cardiovascular disease (2, 3). Although the mean platelet volume (MPV) and number is an important determinant for platelet activation, it has been found to be associated with cardiovascular diseases such as myocardial infarction, stroke and preeclampsia (4-6). Higher MPV in obese patients in comparison

to healthy population is considered to be one of the mechanisms that explain the increase in cardiovascular risk in obese patients (7). However, there are a limited number of studies on the effect of weight loss on platelet count and especially on MPV in obese patients. Previous studies have indicated that weight loss through diet and exercise may be associated with MPV (8).

Bariatric surgery in obese patients is a treatment option in which weight loss in the short term is achieved and the risk of cardiovascular disease significantly decreases in long-term follow-up (9). The mechanisms that explain the risk reduction of cardiovascular disease after bariatric surgery are not fully

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understood, and platelet activation and aggregation may be among the factors affecting this condition. The aim of this study is to determine the changes in the number and volume of thrombocytes in patients who have undergone bariatric surgery.

Methods

The study included 56 morbidly obese patients who were admitted for bariatric surgery between January 2011 and December 2016. The patients who had a body mass index $>40 \text{ kg / m}^2$ or $>35 \text{ kg / m}^2$, who had a concomitant obesity-related disease (type 2 diabetes, cardiovascular disease, hypertension, obstructive sleep apnea syndrome, dyslipidemia) and who underwent bariatric surgery with sleeve gastrectomy were included in the study. The patients with severe psychotic disease, eating disorders, mental retardation, alcohol or drug dependence were not included in the study (10). The patients who were admitted to the outpatient clinic for the first time and were not followed up regularly by our hospital were excluded from the study. The study was designed as a retrospective file-scan study and the findings of the patients before the bariatric surgery were compared with the 6th month controls. Approval was obtained from the Ethics Committee of Bezmalem Foundation University (Feb 07, 2017, 3/26) for this study.

Statistical analysis

SPSS (version 20, Statistical Package for the Social Sciences Inc., Chicago, IL, USA) was used for data analysis. The parameters were expressed as mean \pm SD. The data before the surgery and the data 6 months after the surgery were compared with Paired Samples T Test. Pearson correlation test was used to evaluate the relationship between two variables. $P < 0.05$ was accepted as statistically significant.

Results

Demographic characteristics of the study group are shown in Table 1. The mean weight of the patients was $126.2 \pm 23.1 \text{ kg}$ before the surgery and $91.8 \pm 20.5 \text{ kg}$ in the 6th postoperative month. The mean body mass index was $46.7 \pm 6.8 \text{ kg / m}^2$ before the surgery and $33.9 \pm 6.2 \text{ kg / m}^2$ after the surgery. It was seen that the weight and body mass indexes of the patients decreased significantly in the 6th postoperative month ($p < 0.001$, $p < 0.001$).

Mean platelet count of the patients was $292.5 \pm 58.6 \times 10^3 / \mu\text{L}$ before the surgery and $246.8 \pm 59.1 \times 10^3 / \mu\text{L}$ after the surgery (Table 2). This decrease in mean platelet count after the surgery was found to be statistically significant ($p < 0.001$). Mean platelet volume was found to be $10.4 \pm 1.0 \text{ fL}$ before the surgery and $11.6 \pm 0.9 \text{ fL}$ after the surgery. This increase in mean platelet volume was found as statistically significant ($p < 0.001$).

Preoperative mean platelet count of the patients was found to be correlated with preoperative mean platelet volume, mean weight and mean body mass index ($p < 0,01$, $r = -0,39$, $p < 0,01$, $r = 0,35$, $p < 0,01$, $r = 0,41$, respectively). The postoperative mean platelet count was found to be correlated with the postoperative mean platelet volume ($p < 0.001$, $r = -0.68$).

Table 1: Demographic characteristics of patients (n=56)

Age	35.6 \pm 9.9
Gender (F/M)	46/10
Weight (kg)	126.2 \pm 23.1
BMI (kg/m ²)	46.7 \pm 6.8
Fasting glucose (mg/dL)	100.6 \pm 32.8
HbA1c	5.8 \pm 0.9
Total cholesterol (mg / dL)	203.2 \pm 38.2
LDL cholesterol (mg/dL)	137.0 \pm 33.4
HDL cholesterol (mg/dL)	50.1 \pm 15.9
Triglycerides (mg / dL)	132.3 \pm 54.4

F: female; M: male; BMI: body mass index; LDL: low density lipoprotein; HDL: high density lipoprotein

Table 2: PLT and MPV values of the patients before and after surgery (n=56)

	Before surgery	After surgery	p
Weight (kg)	126.2 \pm 23.1	91.8 \pm 20.5	<0.001
BMI (kg / m ²)	46.7 \pm 6.8	33.9 \pm 6.2	<0.001
PLT ($\times 10^3 / \mu\text{L}$)	292.5 \pm 58.6	246.8 \pm 59.1	<0.001
MPV (fL)	10.4 \pm 1.0	11.6 \pm 0.9	<0.001

BMI: body mass index; PLT: platelet; MPV: mean platelet volume

Discussion

In the literature, platelet count and MPV are generally associated with cardiovascular risk factors such as diabetes mellitus, hypertension and hypercholesterolemia (11, 12). There is limited and contradictory information about the effect of obesity on platelet count and function. In a study conducted in patients with obese and metabolic syndrome in our country, platelet count and MPV were found to be similar to the control group (13). In another study, Çoban et al. reported that MPV was significantly higher in the obese group compared to the healthy group and no significant difference was found in terms of platelet count (7). The same researchers observed a significant decrease in MPV along with a decrease in BMI after applying a diet for 3 months in the obese group (8). In a study performed in obese patients in whom an effective weight loss was provided through bariatric Surgery, platelet counts were found to be significantly lower after the 12th month of bariatric surgery compared to preoperative values (14). In the same study, Raoux et al. reported a significant increase in MPV in the 6th month, and in the 12th month, they found findings similar to preoperative values. In our study, thrombocyte count decreased significantly in the 6th month after bariatric surgery and MPV was found to be significantly increased. The results of our study support the previous study that was conducted on the effect of bariatric surgery on platelet count and MPV. The different results between the study by Çoban et al. and our study may have been caused by the fact that the body mass index of obese patients was significantly higher in our study, and that weight loss was more in bariatric surgery than in conservative diet. In our study and in the previous bariatric

surgery study, it is noteworthy that significant changes in MPV became prominent in the 6th month when the postoperative weight loss was maximum (15).

It is not clearly known by which mechanism bariatric surgery and weight loss affect the platelet counts and functions. Platelet regeneration has increased in obese patients compared to the normal weight population, which is associated with a high adipocyte count in bone marrow (16, 17). In our study, the increase in MPV in the 6th month after surgery may be due to the increase of young platelets in circulation (18). On the other hand, insulin resistance and adipocytokines are among the prominent mechanisms in the effect of bariatric surgery and weight loss on platelet function. The increase in abdominal fat tissue triggers insulin resistance and causes changes in adipocytokine levels such as leptin and adiponectin. While adiponectin levels increase in parallel with rapid weight loss after bariatric surgery, leptin levels decrease (19). Antithrombotic effect of adiponectin and prothrombotic effect of leptin were shown in previous studies (19, 20). In addition to adipocytokines, stimulating effect of insulin on megakaryocytes may also be one of the reasons for the decrease in the mean platelet count after bariatric surgery (21). However, further studies are needed to clarify the underlying mechanisms.

The limitation of this study is the fact that the data were evaluated in the 6th month after surgery, which was a relatively short period. It should be kept in mind that the patients were still obese at the time of evaluation and the results may change in long-term follow-ups.

Conclusion

Our study showed that thrombocyte count decreased and platelet volume increased in the 6th month after bariatric surgery in morbidly obese patients. However, further studies are needed for the long-term effect of weight loss on these parameters and for the underlying mechanisms.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Bezmialem Vakıf University (07.02.2017, 3/26).

Informed Consent: Due to the retrospective design of the study, informed consent was not taken.

Peer-review: Externally peer-reviewed.

Author Contributions

Concept - M.İ., Ö.K.; Design - M.İ., S.T.; Supervision - Ö.K., E.T.; Resources - A.İ.Y., M.İ.; Materials - A.İ.Y., S.T.; Data Collection and/or Processing - M.İ., A.İ.Y., S.T.; Analysis and/or Interpretation - M.İ., S.T., E.T.; Literature Search - M.İ., A.İ.Y., S.T.; Writing Manuscript - M.İ., Ö.K.; Critical Review - S.T., E.T.

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