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Ateroskleroz ve koroner arter hastalığı ile ilişkili kan parametrelerinin paratiroidektomi sonrası değerlendirilmesi

Assesment of blood parameters relevant to aterosclerosis and coronary artery disease after paratiroidectomy

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SUMMARY

Objective: The preoperative and postoperative calcium, parathormone levels, platelet counts, mean platelet volume values of the patients were compared in order to investigate the changes in the risk of atherosclerosis and coronary artery disease in parathyroidectomy.
Method: Twelve male and 43 female patients who underwent parathyroidectomy between 01.01.2008 and 01.01.2018 at the Cumhuriyet University Surgical Oncology Clinic were included in the study. On the tenth preoperative and postoperative day, blood was drawn for the platelet, mean platelet volume, calcium and parathyroid hormone levels after a fasting period of twelve hours. The preoperative and postoperative calcium, parathormone levels, platelet counts, mean platelet volume values of the patients were compared in order to investigate the changes in the risk of atherosclerosis and coronary artery disease in parathyroidectomy.
Results: The mean pre-operative blood calcium levels of the patients included in the study were 10.75 ± 1.49 mg / dl, . Mean postoperative blood calcium level was 8.59 ± 1.14 mg / dl. The mean preoperative mean platelet volume of the patients was 26.1 ± 121.55 fL, Postoperative mean platelet volume was 9.36 ± 1.26 fL. The mean preoperative parathormone level was 535,08 ± 711,08, The mean postoperative parathyroid hormone level was 74.47 ± 128.02 pg / ml. The mean preoperative blood platelet count of the patients included in the study was 418000 ± 8000 / mm^3, The mean postoperative blood platelet count was 252000 ± 7000 / mm^3.
Conclusions: In our study, we found that the decrease in serum parathormone level, serum platelet level, mean platelet volume, after parathyroidectomy was statistically significant. Mean platelet volume and platelet count were decreased after parathyroidectomy, which are indicators of atherosclerosis and coronary artery disease; Parathyroidectomy reduces the risk of atherosclerosis and coronary artery disease. Additional clinical and laboratory studies are needed to support the risk of atherosclerosis and coronary artery disease after parathyroidectomy.
Keywords: Aterosclerosis, Coronary artery disease, Paratiroidectomy.

ÖZET

Amaç: Çalışmamızda; paratiroidektomi cerrahisinin atereskleroz ve koroner arter hastalığı riskini hangi yönde değiştirdiği araştırmak için hastaların ameliyat öncesi ve ameliyat sonrası kalsiyum, parathormon düzeyleri, trombosit sayıları ve ortalama trombosit hacim değerleri karşılaştırıldı.
Yöntem: Cumhuriyet Üniversitesi Cerrahi Onkoloji Kliniğinde 01.01.2008- 01.01.2018 tarihleri arasında paratiroidektomi operasyonu yapılan 12'si erkek 43'ü kadın birey alındı. Ameliyat öncesi onuncu günde ve ameliyat

sonrası onuncu günde, on iki saatlik açlıktan sonra trombosit, ortalama trombosit hacmi, kalsiyum ve parathormon düzeylerinin tayini için kan alındı.

Bulgular: Çalışmaya dahil edilen hastaların pre-operatif ortalama kan kalsiyum düzeyleri 10.75 ± 1.49 mg/dl idi. Postoperatif ortalama kan kalsiyum düzeyi 8.59 ± 1.14 mg/dl idi. Hastaların ameliyat öncesi ortalama trombosit hacmi 26.1±121.55 fL, ameliyat sonrası ortalama trombosit hacmi 9.36 ± 1.26 fL idi. Preoperatif parathormon düzeyi ortalama 535.08 ± 711.08, ortalama postoperatif paratiroid hormon düzeyi 74.47 ± 128.02 pg/ml, çalışmaya dahil edilen hastaların preoperatif ortalama kan platelet sayısı 418000 ± 8000 /mm³, postoperatif ortalama kan trombosit sayısı 252000 ± 7000 /mm³ idi.

Sonuç: Çalışmamızda paratiroidektomi sonrası serum parathormon düzeyi, serum trombosit düzeyi, ortalama trombosit hacmindeki azalmanın istatistiksel olarak anlamlı olduğunu bulduk. Paratiroidektomi sonrası ateroskleroz ve koroner arter hastalığının göstergeleri olan ortalama trombosit hacmi ve trombosit sayısı azaldı. Paratiroidektomi ateroskleroz ve koroner arter hastalığı riskini azaltmaktadır. Paratiroidektomi sonrası ateroskleroz ve koroner arter hastalığının riskini desteklemek için ek klinik ve laboratuvar çalışmalarına ihtiyaç vardır.

Anahtar sözcükler: Ateroskleroz, Koroner arter hastalığı, Paratiroidektomi.

INTRODUCTION

Atherosclerosis is a multifactorial, morbid and mortal systemic disease which can be stopped or regressed if the causes are identified and treated and affects all arterial structures, not only coronary vessels. It is known that various factors have a role in the etiology of atherosclerosis. These include gender, age, family history, hypertension, diabetes mellitus, dyslipidemia, tobacco use, sedentary lifestyle, obesity and personality. Thrombocytes play an important role in the pathogenesis of atherosclerotic vascular diseases [1]. It is reported that increased platelet volume is associated with increased platelet reactivity and shortening of bleeding time, and that large platelets contain metabolic and enzymatically more active granules and have higher thrombotic potential [2-3]. In addition, increased platelets contain more dense granules, are more rapidly activated with collagen, produce more thromboxane B2, secrete more serotonin and beta-thromboglobin, and have the capacity to express more glycoprotein (GP) Ib, GPIIb/IIIa receptor. As a result, the capacity of platelets to bind to both subendothelial tissue and to each other increases [4-5].

Mean platelet volume (MPV) is a quantitative measurement of mean platelet size and is among routine blood tests. MPV is the mean volumes of platelets in the blood and is included in routine blood tests. When there is an increase in platelet production, MPV is also increased. Platelet volumes greater than 10 femtoliters (fl) are large and values lower than 6 fl are small [6].

Large platelets have enzymatically more active and higher homeostasis than smaller platelets. The use of a minimally invasive, inexpensive and widely used method, the mean platelet volume and platelet count will increase the chance of an early diagnosis for coronary artery disease [7-8]. MPV is considered to be an indicator of increased cardiovascular risk because larger platelets are more reactive. The changes in the volume parameters of platelets are diagnostic in thrombotic and pretrombotic events. MPV has recently emerged as a potential marker for cardiovascular disease [9]. A relationship between MPV and coronary artery disease risk factors such as obesity, impaired fasting glucose, diabetes mellitus, hypertension and hypercholesterolemia has been shown in many studies [10].

Parathormone (PTH) is a peptide-secreted hormone secreted from parathyroid glands and its release is induced by a low serum calcium and phosphorus level. PTH increases the absorption of calcium from the kidneys and bones and increases the production of 1.25 (OH)2D3 vitamin in the kidneys [11]. Recent studies have shown increased cardiovascular mortality in patients with primary hyperparathyroidism [12-13]. In a study, the prevalence of cardiovascular disease was reported to be higher in the population with high PTH levels compared to the general population [14]. Increased arterial stiffness, changes in arterial reactivity, left ventricular hypertrophy, and increased prevalence of calcification in mitral and aortic valves were found in patients with primary hyperparathyroidism [15-16]. In some in vitro animal experiments, elevated PTH levels have been shown to cause abnormal energy metabolism and decreased cardiac output in the cardiovascular system [17]. In rat experiments, hypertrophy has been reported in cardiomyocytes with high PTH levels [17-18]. Serum PTH level was thought to be related to atherosclerotic process due to its vascular effects.

In this study, platelet count, mean platelet volume, serum calcium and serum parathormone levels

were compared before and after parathyroidectomy.

MATERIAL AND METHODS

Twelve male and 43 female patients who underwent parathyroidectomy between 01.01.2008 and 01.01.2018 at the Cumhuriyet University Surgical Oncology Clinic were included in the study. The age and gender of the applicants were recorded. On the tenth preoperative and postoperative day, blood was drawn for the platelet, mean platelet volume, calcium and parathyroid hormone levels after a fasting period of twelve hours. The preoperative and postoperative calcium, parathormone levels, platelet counts, mean platelet volume values of the patients were compared in order to investigate the changes in the risk of atherosclerosis and coronary artery disease in parathyroidectomy. Patients with a history of coronary artery disease, severe valvular heart disease, uncontrolled hypertension, liver or kidney failure, bone metabolism related diseases, effective drug use on calcium metabolism, cancer or osteoporosis, or patients over 75 years of age were not included in the study.

Statistical Analysis

Statistical analysis was done by SPSS ver 21.0 package program. Kolmogorov Smirnov test was used to select the appropriate test, and p values were less than 0.05, so Mann Whitney U test was selected for all variables.

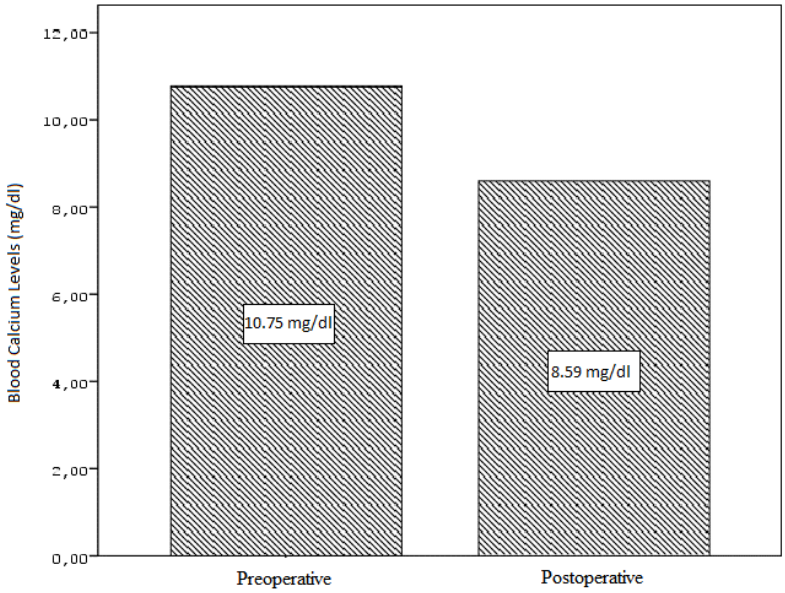
RESULTS

Data of 55 patients who underwent parathyroidectomy in our department were examined. Of the 55 patients included in the study, 43 were female and 12 were male (46 ± 7.0 years).

Table 1: Evaluation of mean blood calcium levels, blood parathormone levels, blood platelet count, and mean platelet volume before and after surgery.

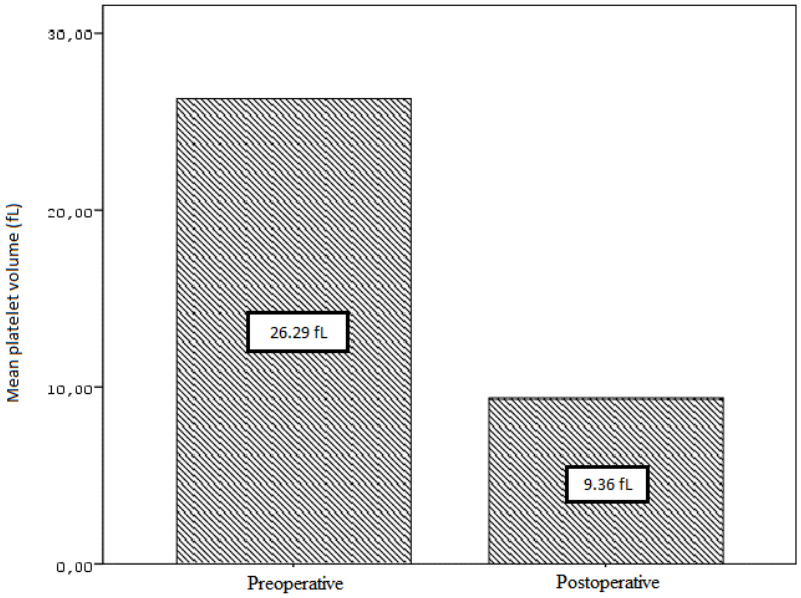
Variables	Mean ± Std. (Min.Max)		p
	preoperative	postoperative	
Blood Calcium Levels (mg/dl)	10.1±1.49 (1.1-13.1)	8,59±1.14 (1.8-10.3)	<0,001
Mean platelet volume (fL)	26.1±121.55 (7.1-29.6)	9,36±1.26 (6.7-12.7)	0,046
Blood Parathormone Level (pg/ml)	535,08±711,08 (55-2651)	74,47±128,02 (5.2-859)	<0,001
Blood Platelet Count (/mm^3)	418000±8000 (405000-435000)	252000±7000 (238000-264000)	<0,001

The mean pre-operative blood calcium levels of the patients included in the study were 10.75 ± 1.49 mg / dl, minimum being 1.1 mg / dl, and maximum being 13.1 mg / dl. Mean postoperative blood calcium level was 8.59 ± 1.14 mg / dl, minimum being 1.8 mg / dl, maximum being 10.3 mg / dl (Graphic 1). When pre- and postoperative values were compared, the decrease in blood calcium levels was statistically significant ($p<0.05$).



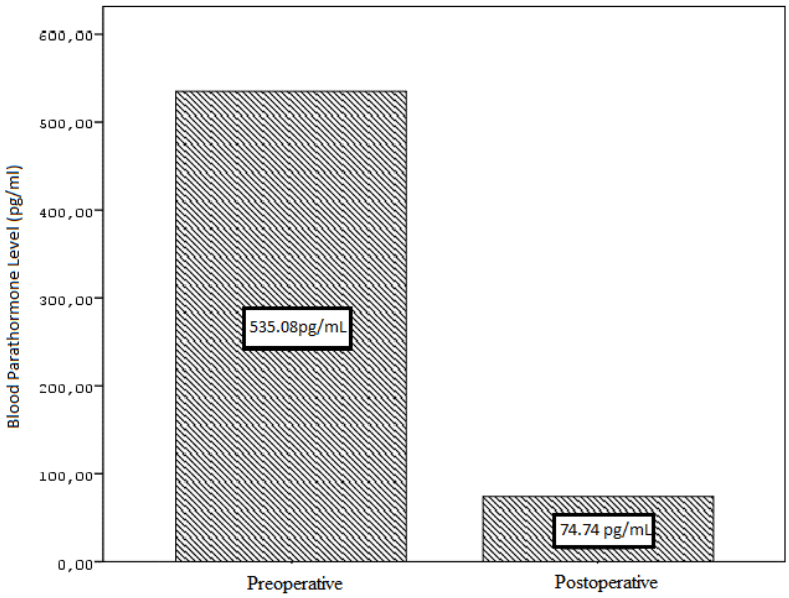
Graphic 1: Preoperative and postoperative mean blood calcium levels

The mean preoperative mean platelet volume of the patients was 26.1 ± 121.55 fL, minimum being 7.1 fL, and maximum being 29.6 fL. Postoperative mean platelet volume was 9.36 ± 1.26 fL, minimum being 6.7 fL, maximum being 12.7 fL (Graphic 2). When pre- and postoperative values were compared, the decrease in mean platelet volume was statistically significant (p = 0.046).



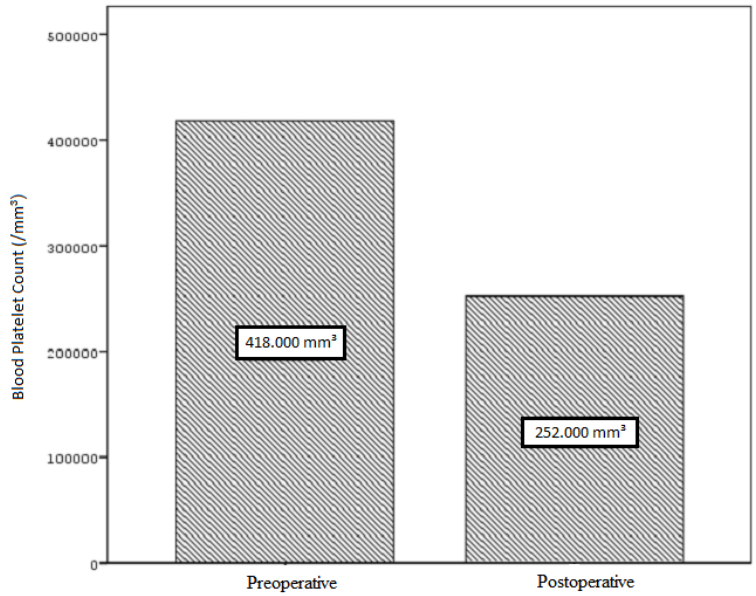
Graphic 2: Preoperative and postoperative mean platelet volume

The mean preoperative parathormone level was 535,08 ± 711,08, with a minimum of 55 pg / ml and a maximum of 2651 pg / ml. The mean postoperative parathyroid hormone level was 74.47 ± 128.02 pg / ml, the minimum was 5.2 pg / mg, and the maximum was 859 pg / mg (Graphic 3). When the preoperative and postoperative values were compared, the decrease in blood parathyroid hormone levels was statistically significant (p <0.05).



Graphic 3: Preoperative and postoperative blood parathormone level

The mean preoperative blood platelet count of the patients included in the study was 418000 ± 8000 / mm³, with a minimum of 405000 / mm³, and a maximum of 435000 / mm³. The mean postoperative blood platelet count was 252000 ± 7000 / mm³, the minimum was 238000 / mm³, the maximum was 264000 / mm³ (Graphic 4). When the preoperative and postoperative values were compared, the decrease in blood platelet count was statistically significant ($p < 0.05$).



Graphic 4: Preoperative and postoperative blood platelet count

DISCUSSION

Atherosclerosis is a systemic arterial disease that affects blood vessels of all sizes, mostly in the midline elastic arteries [19-20]. Atherosclerotic plaques that develop over the years cause clinical signs with atherothrombosis due to either stenosis or rupture, fissure or erosion of plaques. In recent years, coronary artery disease has been the main cause of mortality and morbidity in Turkey as well as in the world, and its prevalence is increasing. According to the Turkish Adult Heart Disease and Risk Factors study, approximately 230 thousand new coronary events occur annually in our people, it is estimated that 160 thousand men and 120 thousand women die each year, and approximately 66.000 men and 61.000 women die from coronary origin [21].

In the Tromso study of 3570 patients with no primary and secondary hyperparathyroidism and in the normal reference range of serum calcium levels, the frequency of coronary artery disease was found to be higher in patients with higher serum PTH (> 6.8 pmol / l) than in patients with normal or low PTH levels (22). These results suggest that serum PTH level may be an independent risk factor for coronary artery disease. In a recent study, it was reported that higher serum PTH levels were an independent prognostic factor in patients with stable coronary heart disease [23]. In another study, high PTH level was shown to be an independent risk factor for cardiovascular diseases and death [24]. In our study, we found that the decrease in serum parathormone level after parathyroidectomy was statistically significant.

Abnormal growth of platelets is believed to be one of the earliest steps in the development of atherosclerosis. The earliest change during thrombus formation is the adhesion of platelets to subendothelial collagen an activation, following plaque rupture. Damage of endothelial cells in the atherosclerotic plaques causes aggregation of platelets. The substances released from the accumulated platelets affect endothelium, intima, macrophages and smooth muscle cells. In a study in which the relation of platelet function and age was evaluated in healthy individuals, no difference was found in terms of aggregation and secretion [25]. In the same study, no correlation was found between cholesterol value and platelet function. In our study, we found that the decrease in serum platelet level after parathyroidectomy was statistically significant.

Platelet volume is a parameter that determines platelet function. Larger volume platelets are hemostatically more active. Changes in platelet diameter and activity are effective in intracoronary thrombus formation and in the development of acute myocardial infarction [26]. In patients with acute myocardial infarction with increased mean platelet volume, mortality and the need for revascularization is higher and attention should be paid to the follow-up and treatment of these patients [4].

After acute ischemic events, platelet volume increase was shown to be normalized in the following days in a study. In their study, Deniz et al concluded that the elevation of MPV in ischemic stroke patients was normalized in time and that the persisting height was associated with poor prognosis [9]. Similarly, increased MPV after myocardial infarction is normalized with time. Higher values are associated with complications [27].

In a study evaluating 377 patients' coronary angiograms, MPVs of patients with no coronary artery disease and patients with 1 and 2 vascular diseases were compared and no significant difference was found [28]. There was no significant difference in studies comparing MPV of individuals with and without coronary artery disease risk factors [29-30]. In a meta-analysis of 40 different studies investigating the effects of MPV on coronary artery disease, patients with higher MPV values were shown to have a 2.38-fold higher risk of coronary artery disease than those with lower MPV values.

Patients with diabetes mellitus, hypertension, smoking, inflammation, obesity, and dyslipidemia have been shown to have a significantly higher MPV, which proves that many cardiovascular risk factors that cause coronary artery disease are associated with MPV [1]. In our study, we found that the decrease in mean platelet volume after parathyroidectomy was statistically significant. Mean platelet volume and platelet count were decreased after parathyroidectomy, which are indicators of atherosclerosis and coronary artery disease; Parathyroidectomy reduces the risk of atherosclerosis and coronary artery disease. Additional clinical and laboratory studies are needed to support the risk of atherosclerosis and coronary artery disease after parathyroidectomy.

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