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ARAŞTIRMA / RESEARCH

Preoperative hemogram and biochemistry values of patients undergoing oral and dental surgical operations under local anesthesia

Lokal anestezi altında oral ve dental cerrahi operasyon geçiren hastaların preoperatif hemogram ve biyokimya değerleri

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Abstract

Purpose: The purpose of this study is to investigate the preoperative hemogram and biochemistry values of patients who undergo oral and dental surgical operations under local anesthesia.

Materials and Methods: The study included 1598 patients who visited the Faculty of Dentistry at Adıyaman University. The patients' demographic information as age and sex and biochemistry values as blood glucose level (BGL), Aspartate Aminotransferase (AST), Alanine Aminotransferase (ALT), Gama-Glutamyl Transpeptidase (GGT), sodium (Na), potassium (K) and calcium (Ca) and hemogram values as white blood cell count (WBC), Hemoglobin (HGB), Hematocrit (HCT) and Platelet count (PLT) were recorded and statistically analyzed.

Results: There were abnormal values outside the normal limits in all hemogram and biochemical values that were examined. Among these, high values of BGL, AST, ALT, GGT and WBC and low values of Na, Ca, HGB and HCT were more frequent. When the values measured outside the reference ranges were examined in terms of sex, it was seen that the GGT values were significantly higher in the men, while the HGB and PLT values were significantly higher in the women. The abnormal values were distributed significantly more among the age group of 21-40.

Conclusion: In patients from whom detailed medical anamnesis is not collected, it is believed that taking hemogram and biochemical tests before oral surgical procedures is important in terms of elimination of negative issues that may arise.

Keywords:. Hemogram, biochemistry, preoperative test, oral surgery

Öz

Amaç: Bu çalışmanın amacı lokal anestezi altında oral cerrahi işlem geçiren hastaların preoperatif hemogram ve biyokimya değerlerinin araştırılmasıdır.

Gereç ve Yöntem: Çalışmaya Adıyaman Üniversitesi Diş Hekimliği Fakültesi'ne başvuran 1598 hasta dahil edildi. Hastalara ait yaş, cinsiyet gibi demografik bilgiler ile kan glukoz seviyesi (KGS), Aspartat Aminotransferaz (AST), Alanin Aminotransferaz (ALT), Gama-Glutamil Transpeptidaz (GGT), sodyum (Na), potasyum (K) ve kalsiyum (Ca) gibi biyokimya değerleri ve beyaz küre sayısı (WBC), Hemoglobin (HGB), Hemotaktit (HCT), Trombosit sayısı (PLT) gibi hemogram değerleri kaydedildi ve istatistiksel olarak analiz edildi.

Bulgular: İncelenen tüm hemogram ve biyokimyasal değerlerin hepsinde normal sınırların dışında seyreden anormal değerler görüldü. Bunlardan KGS, AST, ALT, GGT, WBC değerlerinde yüksek değerler; Na, Ca, HGB, HCT değerlerinde ise düşük değerler sayıca daha fazla bulundu. Referans aralığının dışında ölçülen anormal değerler cinsiyet bakımından değerlendirildiğinde istatistiksel olarak GGT'nin anlamlı şekilde erkeklerde; HGB ve PLT'nin ise anlamlı şekilde kadınlarda daha fazla sayıda görüldüğü bulundu. Anormal değerlerin yaş grupları bakımından ise istatistiksel olarak anlamlı şeklide 21-40 yaş arasında dağılım gösterdiği görüldü.

Sonuç: Detaylı tıbbi anamnez alınamayan hastalarda oral cerrahi işlemler öncesinde hemogram ve biyokimyasal testlerin alınmasının oluşabilecek olumsuz durumların eliminasyonu açısından önem arz ettiğini düşünmekteyiz.

Anahtar kelimeler: Hemogram, biyokimya, preoperatif tetkik, oral cerrahi

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INTRODUCTION

To define a disease, it is needed to take a detailed medical anamnesis from the patient and consider laboratory tests together when seen necessary based on the physical examination of the patient. These preoperative assessments and tests play an important role in detecting health problems that have not been defined yet, evaluating anesthesia and surgical approaches and preventing unwanted complications during or after surgical interventions. For this purpose, with the help of the developed technology and increased healthcare services of today, several laboratory tests and analyses are asked of patients in the preoperative period in many diseases and surgical interventions[1,2]. With the help of these analyses, health problems previously not detected in patients may be detected, anesthesia and surgical approaches are reevaluated, and unwanted situations in the intraoperative and postoperative period may be prevented. However, a sufficient level of information cannot usually be obtained from the patient by verbal anamnesis and physical examination. This situation poses a risk for both the patient and the physician.

With which tests patients who will receive surgical intervention need to be assessed is a controversial issue, and this issue varies from physician to physician[3]. The size of the surgical intervention that is planned is also effective on the necessity of tests to be applied preoperatively. This is because unnecessarily excessive testing leads the workload of the hospital and the society's healthcare service costs to increase[1-4]. Therefore, physicians should ask for the laboratory tests that they see necessary and have sufficient knowledge about their results.

Preoperative laboratory tests that are used the most prevalently in today's medicine and maxillofacial surgery clinics include complete blood count involving blood cells such as hemoglobin (HGB), hematocrit (HCT), leukocyte and platelets, liver function tests such as blood sugar level, aspartate transaminase (AST), alanine transaminase (ALT) and gamma glutamyl transferase (GGT) and various minerals and electrolytes[2-4]. HGB, among the complete blood count values, is an iron-containing protein that is found in red blood cells and carries oxygen from the lungs to other tissues. The hemoglobin concentration in the blood is expressed as the hemoglobin protein in grams in each liter of blood. HCT is the ratio of the red blood cells in the total blood volume, and it is generally expressed by percentage or the increase in the HGB concentration in the blood. In the clinical area, HGB concentration is used as the criterion of polycythemia and anemia, as well as an alternative marker to erythrocyte count made by the hematocrit value. If it is found by 10 g/100 ml or lower in the patient, medical examination is recommended. Another marker to be examined is the white blood cell count (WBC). WBC usually increases as a response to infection or in diffuse tissue necrosis. A study reported an increase in the WBC values in infections that are seen in the oral region and in oral cancers[5].

The liver, which is the largest internal organ in the human body, is also an important metabolic organ. The liver, which constantly cleans the blood off chemical substances and alcohol, also regulates the coagulation of blood. The liver not only has an important role in the body's acquisition of immunity against diseases but also has properties such as aminoacid production and storage of excess sugar as glycogen. Additionally, the liver is also responsible for production of lipoproteins that are needed for transferring proteins and lipids that have several uses for the body. A damage or dysfunction of the liver leads to the emergence of various diseases. In such cases, to assess the liver damage or an existing disease, significant biochemical liver function markers such as AST and ALT are frequently examined in routine blood tests[6]. Sodium (Na), potassium (K) and calcium (Ca) concentrations are also among the important electrolytes that are examined. Hypokalemia, namely potassium deficiency, leads to structural and functional changes in the kidneys, myocardium, skeletal muscles, central nervous system and gastrointestinal system[7].

Another condition where preoperative tests are considered to be important is Diabetes Mellitus (DM). DM, which is a chronic metabolic disease involving hyperglycemia that occurs in relation to the absolute or relative lowness of insulin hormone secretion or insulin's effect, and as a result of this, disruption of the carbohydrate, protein and fat metabolism, is significant due to the complications it causes[8,9]. These complications include retinopathy, neuropathy, nephropathy, coronary artery disease, peripheral artery disease, cerebrovascular disease and diabetic foot[8,9]. This is why it is recommended to determine the blood glucose value (BGL) in the preoperative period in cases diagnosed with DM and are receiving long-term corticosteroid treatment[10].

In dentistry, oral surgical procedures that are carried

out under local anesthesia are frequently utilized dental treatments. However, various medical problems are occasionally encountered during or after the surgical intervention. One of the most important reasons for this situation is failing to or not being able to take a detailed anamnesis from patients. Another important reason is that the necessary analyses and tests are not taken routinely from patients before especially oral surgical procedures. Therefore, it is believed that it is necessary in terms of both patient health and physician health for laboratory tests that are prevalently used in medicine to enter routine usage based on indications in the practice of dentistry. This is because while some changes in all these parameters may be within physiological limits, they may also occasionally be an indicator of some diseases.

For this purpose, this study aimed to retrospectively examine the preoperative hemogram and biochemistry values of patients who receive dental surgical procedures under local anesthesia due to various reasons after visiting the clinic where the study was conducted and determine the existing profiles and possible risks of the patients in terms of these values.

MATERIALS AND METHODS

This study included 1598 patients who visited the Oral and Maxillofacial Surgery Clinic of the Faculty of Dentistry at Adıyaman University in the years 2017-2018 and received surgical interventions after getting appointments due to various reasons (impacted tooth extraction, dental implant, odontogenic cyst surgery, etc.) after appointment. Before starting the study, approval was received from the Ethics Committee of Adıyaman University (Decision date: 17/12/2019; Approval number: 2019/9-32), and afterwards, hemogram and biochemistry values and clinical demographic data collected from the patients routinely in the preoperative period were retrospectively analyzed. Patients whose analysis results could not be reached and patient records in which all parameters were not examined were excluded from the study.

The tests that were requested before surgery were carried out at the Central Research Laboratory of the Adıyaman University Research and Training Hospital. The existing biochemistry values of blood glucose level (BGL), Aspartate Aminotransferase (AST), Alanine Aminotransferase (ALT), Gamma-Glutamyl Transpeptidase (GGT), sodium (Na), potassium (K) and calcium (Ca) parameters and hemogram values of white blood cell count (WBC), Hemoglobin (HGB), Hematocrit (HCT) and platelets (PLT) were included in the analyses. For these analyses, before the procedure, 1/9 venous blood was collected in an atraumatic manner from patients into blue-capped tubes containing 3.2% sodium citrate. It was ensured that the specimen was not left to wait and did not have coagulation inside. After centrifugation for 10 minutes at 2500 g, the samples were studied without waiting by separating their serum.

The specimens collected during the analysis were used based on the recommendations of the manufacturing firm and using the standard methods specified by the firm. Based on the kit prospectus of the manufacturing firm, the normal values were taken for the biochemistry analysis as blood glucose level: 75-110 mg/dl, AST: 5-40 U/L, ALT: 5-40 U/L, GGT: 7-49 U/L, Na: 135-145 mmol/l, K: 3.5-5.5 mmol/l and Ca: 8.4-10.8 mg/dL and for the hemogram analysis as WBC: 4.3-10.3 K/uL, HGB: 12.9-18.1 g/dL, HCT: 35-53.7% and PLT: 142-424 10^3/uL. In the analyses that followed, the distributions of the hemogram and biochemistry values based on age and sex were examined in all patients.

Statistical analysis

The normal distribution of the data was tested by Shapiro Wilk and Kolmogorov Smirnov analyses. In the comparison of two independent groups for the non-normally distributed data, Mann-Whitney U test was utilized, and the results are presented as median (min-max) and arithmetic mean. The relationships among the categorical variables were examined by Chi-Squared test, and the results are presented as frequency and percentage. The sub-group differences in the categorical variables were tested by post-hoc Chi-Squared analysis, and residual values were calculated. Bonferroni correction was applied on the obtained results. $p<0.05$ was accepted to be statistically significant.

RESULTS

This study included the test data of a total of 1598 patients at the ages of 11-92 including 591 males and 1007 females. The mean age of the patients was 30.51±11.09. Based on the age groups, there were

statistically significant differences between the numbers of the male and female patients in all groups (0-20, 21-40, >41). The numbers of the female patients were significantly higher than the male patients in all three age groups. For both sexes, the highest number of patients was in the age group of 21-40, while the lowest number was in the age group of 0-20 (Table 1).

Table 1. Distribution of the patients according to age, age groups and sex

Variables	Mean	SD	Min	Max
Age*	30.51	11.09	11.00	92.00
Sex /Age groups	**Male (n)**	**Female (n)**	**Total (n)**	P
0-20	66	133	199	**0.001**
21-40	419	743	1162	**0.001**
>41	106	131	237	**0.001**
Total	591	1007	1598	**0.022**

+: Chi-Squared test was used. * Mann-Whitney U test was used.; Max: Maximum, Min: Minimum, SD: Standard deviation

The reference ranges of the examined parameters, mean values and the minimum and maximum values of measurements are given in Table 2 separately for each parameter. The values that were found to be high or low outside the normal reference range are shown in Table 3. Among the biochemistry parameters, the fasting BGL value was higher than normal in 155 (9.7%) and lower than normal in 52 (3.3%) patients. AST and ALT were higher than normal in 19 (1.2%) and 72 (4.6%) patients, respectively. No lower than normal value was measured for these parameters. The GGT value was higher than normal in 40 (2.5%) and lower than normal in 3 (0.2%) patients. The potassium value was higher than normal in 5 (0.3%) and lower than normal in 3 (0.2%) patients, while the sodium and calcium values were higher than normal in 2 (0.1%) and 4 (0.3%) patients and lower than normal in 29 (1.8%) and 12 (0.8%) patients, respectively. Among the hemogram values, WBC was higher in 141 (8.8%) and lower in 9 (0.6%) patients. HGB and HCT were higher in 10 (0.6%) and 12 (0.8%) patients and lower in 248 (15.5%) and 67 (4.2%) patients, respectively. Finally, PLT was higher in 12 (0.8%) and lower in 11 (0.7%) patients (Table 3).

In the quantitative comparison of the values outside the normal limits (high or low) for the hemogram and biochemistry parameters, higher values of BGL, AST, ALT, GGT, Potassium, WBC and PLT were significantly more abundant than lower values, while lower values of Sodium, Calcium, HGB and HCT were significantly more abundant than higher values (Table 4). For each parameter, the mean, minimum and maximum values of the high and low measurements are given separately in Table 5.

Table 2. The range of the examined values

Variables	Reference range	Mean	Max	Min	SD
BGL (mg/dl)	75-110	130.25	321.00	57.00	51.28
AST (U/L)	5-40	59.68	150.00	41.80	25.79
ALT (U/L)	5-40	58.28	113.00	41.00	16.35
GGT (U/L)	7-49	70.05	152.00	51.00	21.73
Na (mmol/l)	135-145	132.09	148.00	83.00	9.98
K (mmol/l)	3.5-5.5	5.04	6.60	3.40	1.41
Ca (mg/dL)	8.4-10.8	8.77	11.50	7.00	1.56
WBC (K/uL)	4.3-10.3	12.19	129.00	2.50	9.89
HGB (g/dL)	12.9-18.1	11.66	18.80	7.00	1.53
HCT (%)	35-53.7	40.66	365.10	25.20	37.74
PLT (10^3/uL)	142-424	317.35	625.10	118.40	189.18

Max: Maximum, Min: Minimum, SD: Standard deviation; BGL: Blood glucose level; AST: Aspartate aminotransferase, ALT: Alanine aminotransferase, GGT: Gama-Glutamyl Transpeptidase, Na: Sodium, K: Potassium, Ca: Calcium, WBC: White blood cell count, HGB: Hemoglobin, HCT: Hematocrit, PLT: Platelet count

Table 3. Normal, high and low values and percentile distributions of variables examined

	High		Low		Normal	
	n	%	n	%	n	%
BGL	155	9.7%	52	3.3%	1391	87.0%
AST	19	1.2%	0	0.0%	1579	98.8%
ALT	72	4.6%	0	0.0%	1526	95.4%
GGT	40	2.5%	3	0.2%	1555	97.3%
Na	2	0.1%	29	1.8%	1567	98.1%
K	5	0.3%	3	0.2%	1590	99.5%
Ca	4	0.3%	12	0.8%	1582	99.0%
WBC	141	8.8%	9	0.6%	1448	90.6%
HGB	10	0.6%	248	15.5%	1340	83.9%
HCT	12	0.8%	67	4.2%	1519	95.1%
PLT	12	0.8%	11	0.7%	1575	98.6%

BGL: Blood glucose level; AST: Aspartate aminotransferase, ALT: Alanine aminotransferase, GGT: Gama-Glutamyl Transpeptidase, Na: Sodium, K: Potassium, Ca: Calcium, WBC: White blood cell count, HGB: Hemoglobin, HCT: Hematocrit, PLT: Platelet count

Table 4. The abnormal range of the examined values in grouped cases

Variable		n	Mean	Max	Min	SD
BGL	High	155	150.94	321.00	110.00	42.37
	Low	52	68.55	74.00	57.00	4.32
AST	High	19	59.68	150.00	41.80	25.79
	Low	0	.	.	.	.
ALT	High	72	58.28	113.00	41.00	16.35
	Low	0	.	.	.	.
GGT	High	40	70.05	152.00	51.00	21.73
	Low	3	5.00	5.00	5.00	.00
Na	High	2	147.20	148.00	146.40	1.13
	Low	29	131.05	135.40	83.00	9.45
K	High	5	6.02	6.60	5.60	.49
	Low	3	3.40	3.40	3.40	.00
Ca	High	4	11.35	11.50	11.20	.17
	Low	12	7.92	8.20	7.00	.33
WBC	High	141	12.69	129.00	10.30	9.98
	Low	9	4.39	10.80	2.50	2.46
HGB	High	10	16.91	18.80	14.60	1.99
	Low	248	11.45	16.80	7.00	1.07
HCT	High	12	80.54	365.10	51.50	89.63
	Low	67	33.52	37.50	25.20	1.84
PLT	High	12	486.42	625.10	429.40	79.34
	Low	11	132.92	140.80	118.40	9.56

Max: Maximum, Min: Minimum, SD: Standard deviation; BGL: Blood glucose level; AST: Aspartate aminotransferase, ALT: Alanine aminotransferase, GGT: Gama-Glutamyl Transpeptidase, Na: Sodium, K: Potassium, Ca: Calcium, WBC: White blood cell count, HGB: Hemoglobin, HCT: Hematocrit, PLT: Platelet count

Considering the distribution of the hemogram and biochemistry variables outside the normal reference ranges (high or low) based on the sexes, the liver function test of GGT was significantly higher in the men, while the hemogram tests of HGB and PLT were significantly higher in the women. While there was no significant difference between the men and the women in terms of the other hemogram and biochemistry variables, in terms of the abnormal values, AST and ALT were quantitatively higher in the men, and BGL, Na, K, Ca, WBC and HCT were quantitatively higher in the women (Table 6).

Table 5. Distribution of values determined to be outside normal boundaries (high or low)

Variables	High (n)	Low (n)	Total (n)	PΦ
BGL	155	52	207	0.000
AST	19	0	19	0.000
ALT	72	0	72	0.024
GGT	40	3	43	0.000
Na	2	29	31	0.000
K	5	3	8	0.000
Ca	4	12	16	0.000
WBC	141	9	150	0.014
HGB	10	248	258	0.000
HCT	12	67	79	0.096
PLT	12	11	23	0.000
Total	472	434	906	0.000

Chi-Squared test was used; BGL: Blood glucose level; AST: Aspartate aminotransferase, ALT: Alanine aminotransferase, GGT: Gama-Glutamyl Transpeptidase, Na: Sodium, K: Potassium, Ca: Calcium, WBC: White blood cell count, HGB: Hemoglobin, HCT: Hematocrit, PLT: Platelet count

Table 6. Distribution and significance levels of values determined to be outside normal boundaries (high or low) according to sex

	Total	Male		Female		
Variables	**n**	**T (H/L) n**	**Mean±SD**	**T (H/L) n**	**Mean±SD**	**P***
BGL	207	84 (63/21)	130.22+57.07	123 (92/31)	130.22+47.06	0.993
AST	19	14 (14/0)	53.05+14.03	5 (5/0)	78.24+39.63	0.082
ALT	72	61 (61/0)	57.29+15.91	11 (11/0)	62.20+18.43	0.240
GGT	43	32 (31/1)	70.00+26.15	11 (9/2)	52.45+24.87	0.017
Na	31	6 (0/6)	132.16+0.75	25 (2/23)	132.07+11.04	0.983
K	8	1 (1/0)	6.60	7 (4/3)	4.81+1.30	---
Ca	16	4 (2/2)	9.65+1.79	12 (2/10)	8.48+1.41	0.151
WBC	150	69 (66/3)	11.69+2.35	81 (75/6)	12.61+13.26	0.567
HGB	258	38 (7/31)	12.85+2.77	220 (3/217)	11.45+1.08	0.004
HCT	79	15 (9/6)	45.62+11.50	64 (3/61)	39.49+41.38	0.570
PLT	23	9 (2/7)	218.70+182.03	14 (10/4)	380.77+167.40	0.018

*Mann-Whitney U test was used; T: Total, M: Male, F: Female, H: High level, L: Low level, SD: Standard deviation
BGL: Blood glucose level; AST: Aspartate aminotransferase, ALT: Alanine aminotransferase, GGT: Gama-Glutamyl Transpeptidase, Na: Sodium, K: Potassium, Ca: Calcium, WBC: White blood cell count, HGB: Hemoglobin, HCT: Hematocrit, PLT: Platelet count

Table 7. Distributions and significance levels of values determined to be high and low according to age groups

Age groups	0-20		21-40		>41		
	n	**%**	**n**	**%**	**n**	**%**	**P$^{\phi}$**
BGL	12	5.8%	142	68.6%	53	25.6%	**0.001**
AST	1	5.3%	17	89.5%	1	5.3%	**0.035**
ALT	5	6.9%	58	80.6%	9	12.5%	0.073
GGT	1	2.5%	30	75.0%	9	22.5%	0.10
Na	4	12.9%	25	80.6%	2	6.5%	0.374
K	0	0.0%	5	62.5%	3	37.5%	**0.032**
Ca	1	6.3%	12	75.0%	3	18.8%	0.091
WBC	9	6.0%	115	76.7%	26	17.3%	0.632
HGB	25	9.7%	198	76.7%	35	13.6%	0.142
HCT	4	5.1%	61	77.2%	14	17.7%	0.226
PLT	4	17.4%	19	82.6%	0	0.0%	0.077

Chi-Squared test was used., n: the number of patients with high and low values; BGL: Blood glucose level; AST: Aspartate aminotransferase, ALT: Alanine aminotransferase, GGT: Gama-Glutamyl Transpeptidase, Na: Sodium, K: Potassium, Ca: Calcium, WBC: White blood cell count, HGB: Hemoglobin, HCT: Hematocrit, PLT: Platelet count

Considering the distribution of the hemogram and biochemistry variables outside the normal reference ranges (high or low) based on the age groups, all hemogram and biochemistry variables were higher in the age group of 21-40 in comparison to the other age groups, while this difference was significant only in terms of the BGL, AST and Potassium values (Table 7).

DISCUSSION

The patient population included in this study was selected from a broad range of ages. This shows that the sample size was not selected from a narrow range. However, looking at the age and sex distribution of the patients, it was seen that the number of the female patients in the sample of this study was almost two times the number of the male patients. This situation might have led the individuals in our study to not show a balanced distribution. Nevertheless, as this study was a retrospective study on archive examination, no intervention could be made on the groups, and a balanced distribution could not be achieved. On the other hand, conducting more comprehensive prospective studies involving the patient anamnesis and postoperative complication information based on the results of this study will make it clearer to understand the extent to which usage of preoperative tests in oral surgery is necessary. Considering that there has been no study in dentistry on this topic before, it is believed that the results of this study have significance.

Laboratory tests such as hemogram, coagulation, hormone, biochemistry and urine tests in preoperative assessment of patients for whom surgical operations are planned are used frequently to determine the complications that may occur in the intraoperative and postoperative periods and take the necessary precautions. As it is not possible to separately request tests on values such as HGB, WBC, leukocytes and platelets for patients who will receive oral surgical interventions, these are studied under multiple parameters such as complete blood count at many centers. However, in addition to the necessity and usefulness of these tests and analyses, they have become a significant issue of debate in terms of the additional costs they induce[2-4]. For example, although the risk of anemia is higher in female patients, it was reported that HGB determination is unnecessary as long as there is no problem as a result of anamnesis and physical examination before interventions that would not lead to severe blood loss[6]. Dzankic et al.[6] determined the incidence of anemia in cases in the ASA I-II group as 6.9% and argued that complete blood count is not always necessary. However, it is known that the prevalence of anemia is high especially in women in Turkey[11]. Likewise, in this study, the HGB values were found to be higher than normal in a total of 10 (0.6%) patients and lower than normal in 248 (15.5%) patients. 220 of these patients were female, including 217 (13.6%) with lower than normal HGB values, which indicated that the female patient population carries the risk of anemia. As female patients visit more in the age group of 21-40, it is thought that it would be appropriate to check hemoglobin levels in especially women of all ages, and in the 3rd and 4th decades of life in particular. This way, the diagnosis of the blood diseases that have not been diagnosed yet could be made, and patients could be helped in contacting hematology departments at an earlier stage.

It was stated that the rate of encountering asymptomatic anomalies in the leukocyte and platelet numbers in preoperative tests is very low[12,13]. For this reason, it is argued that these tests are unnecessary for patients other than chemotherapy and radiotherapy patients, other than those with history of leukemia and abnormal bleeding and in patients without physical examination findings[4,12]. However, there were differences in the leukocyte values of 150 (9.4%) patients among the 1598 patients in this study. While higher values were seen in 141 (8.8%) of these patients, lower than normal values were seen in 9 (0.6%). As opposed to the literature, in this study, it was determined that WBC abnormally varied at a rate close to 10%. There was no significant difference in the abnormally distributed leukocyte values between the men and women, while among these patients, 81 were female, and 69 were male. Based on these results, especially in dental surgical operations on the patients with high WBC values, it may be considered that the risk of infection development in the mouth will increase the existing infection picture even more. For this reason, it is believed that it would be meaningful to see the preoperative WBC findings of the patients. In comparison to the leukocyte values, it was seen that there was a less abnormal distribution in the platelet counts (1.5%). Here, higher than normal values were seen in 12 (0.8%) patients, while lower than normal values were seen in 11 (0.7%) patients. As opposed to WBC, these abnormally distributed platelet values were found significantly higher among the women. Based on these results, it

is considered that routine requests of these tests before procedures will be useful especially in female patients. However, in order to more clearly understand the reasons why these are seen more in women, there is a need for advanced studies that include more patients.

In cases diagnosed with diabetes mellitus who are receiving long-term corticosteroid treatment, it is recommended to determine the BGL value in the preoperative period[10]. Although it was reported that BGL determination is not necessary in minor surgical interventions[14], there are researchers who recommended checking BGL in patients over the age of 60[6]. Dzankic et al.[6] determined high BGL values in asymptomatic cases. However, their cases were over the age of 70, and no relationship was found between high BGL in the preoperative period and the postoperative outcomes. For this reason, the authors proposed that age should not be a criterion by itself to request checking BGL. In this study, BGL was abnormal in 207 (13%) patients. Among these, 155 (9.7%) patients had high, 52 (33%) had low levels. 123 of these patients were female. Among the 207 patients, 142 (68.6%) were in the age group of 21-40, and 53 (25.6%) were over 41, while the difference was significant. While the literature recommends measuring BGL in the preoperative period among patients over the age of 60, according to the results of this study, it may be useful to reduce this age limit. Considering that the regular health checkups in Turkey are not yet on a desired level, these preoperative checks may provide effective results in early diagnosis of some diseases such as diabetes.

Cases with severe dysfunctions in their liver function tests may easily be detected by their history and physical examination. While determining the AST, ALT and GGT levels is necessary in such cases, it was stated that usage of these tests as preoperative tests is unnecessary in cases where liver dysfunction is not considered[10]. In their study on the necessity of liver function tests in the preoperative period, while Turnbull et al. determined that the abnormal result rate was lower than 0.5% in these tests, this rate could reach up to 3.3% in older cases[15]. In this study, the AST values were higher than normal in 19 (1.2%) patients, while no patients had lower than normal values. The ALT values were also higher than normal in 72 (4.6%) patients, while, similarly, no patients had lower than normal values. The GGT values were higher than normal in 40 (2.5%) patients and lower than normal in 3 patients. As opposed to the study by Turnbull et al.[15], the abnormal values in all three liver function tests in this study were seen more frequently in the age group of 21-40 rather than the older age group. While liver function tests are definitely requested before major surgical interventions, for more clearly understanding whether or not liver function tests such as AST, ALT and GGT are necessary before routine oral surgery procedures, it is thought that the systemic statuses of the patients need to be evaluated together with the postoperatively experienced complications.

The most frequently requested biochemical tests in preoperative assessment include sodium (Na), calcium (Ca) and potassium (K) concentrations[7,16]. K is considered to be a more important electrolyte than Na. This is because hyperkalemia may lead to cardiac arrest in patients that require general anesthesia when a depolarizing agent such as succinylcholine is used[14]. Hypokalemia may also lead to cardiac arrythmia, and this situation becomes more noticeable with anesthetic agents such as halothane[10]. However, Hirsch et al.[17] determined that arrythmias are associated with the severity of the heart disease and situations such as digoxin treatment but not associated with hypopotassemia presence in the preoperative period or diuretic treatment. Researchers have stated that conducting these tests in the preoperative period in minor surgical interventions that do not require general anesthesia and routine dentistry practices is unnecessary, and in cases that require general anesthesia, these need to be conducted in cases other than the ASA I and II groups of patients[14]. In this study, abnormal values were seen in a very small group of patients for Na in 31 patients (29 high, 2 low), for K in 8 patients (5 high, 3 low) and for Ca in 16 patients (4 high, 12 low). According to these results, it is also not thought that examination of these tests preoperatively as a routine practice is necessary before procedures under local anesthesia as opposed to procedures that require general anesthesia.

The number of tests that are requested in the preoperative period is also affected by the professional experience of the physician who examines the patient before the procedure. This is because the tests to be requested for each case can only be decided upon this way. In the literature, it is proposed that working this way is an approach that considerably reduces costs in comparison to requesting tests by using a readily available protocol[1,3]. Additionally, the cost increases

substantially considering repetition of these tests in cases of false positives, the labor and employment levels necessary for conducting the tests, as well as the lifespan of devices. In the literature, it is stated that some tests will not be necessary for all patients with a good anamnesis taken from the patient before the procedure and physical examination. This study is also supportive of the opinion that it is not necessary to perform all tests in asymptomatic cases without anamnesis and physical examination by considering the costs. These tests should definitely be requested in major oral and maxillofacial surgery practices that require general anesthesia. However, it is believed that tests with higher significance values such as WBC, HGB, PLT and BGL before oral surgical procedures may be useful in terms of preventing postoperative complications, detecting some diseases that were not diagnosed before the procedure and preparing a safer working environment for the physician.

In conclusion, there is no guidebook in Turkey that shows the necessary tests that need to be requested for preoperative purposes in dentistry, especially in oral and maxillofacial surgery. In the light of this information, although the systemic health statuses, anamneses and postoperative complication information of the patients in this study were not collected, it is considered that the results that were obtained here will be useful for researchers and further studies that are planned on this topic.

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