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ORIGINAL ARTICLE

Medicine Science International Medical Journal

Medicine Science 2023;12(3):941-50

The effect of preoperative fasting time on physiological parameters in patients undergoing thyroid surgery

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Received 13 April 2023; Accepted 12 May 2023
Available online 01.09.2023 with doi: 10.5455/medscience.2023.04.051

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Abstract

The research was conducted between January 2022 and June 2022 in the Department of Surgery, Inonu University, Turkey. The sample of the study consisted of 40 consecutive patients who underwent thyroidectomy surgery. After obtaining the necessary permissions from the ethics committee, patients, and the chief physician of the medical faculty hospital, the research was conducted. Research data were collected using the patient diagnosis form, the form for assessing patients; vital signs, the form in which the laboratory values of the patients are determined, and the wound site evaluation form of patients three days after surgery. As a result of the research, it was determined that heart rate, body temperature, and HbA1c value may be affected as the fasting period gets longer. In surgeries performed in other patient groups and in patients with a higher population of thyroid surgery, it was suggested that new research should be done to examine the effect of fasting duration on vital signs, wound site, and blood laboratory values.

Keywords: Thyroidectomy, fasting duration, symptoms, nursing

Introduction

Thyroid nodules are frequently encountered in population. They are defined as a separate structure within the thyroid tissue [1,2]. Generally, the risk of malignancy detection in thyroid nodules is 5% [3]. The fact that thyroid pathologies are quite common in society and that the life expectancy in well-differentiated thyroid cancers is over 90% for 20 years [4,5] are the main reasons for numerous studies on thyroid diseases. Generally, thyroid surgery is considered a minor surgery. Therefore, the patient's psychological status and quality of life after surgery have not received sufficient attention.

However, considering the high long-term life expectancy, it becomes even more striking how important it is to improve patient's quality of life during the postoperative period [6]. The thyroid gland is a hormonal organ, and the hormones it secret affect all organs and mechanisms in the body physiologically. In addition, thyroid hormones are vital for proper brain development. Thyroid hormones have an essential role in the functionality of the mature brain. Especially depression and cognitive dysfunction are the most common psychiatric disorders associated with thyroid diseases. Hypothyroidism is the most common pathology associated with these psychiatric disorders [7]. After total thyroidectomy, the patient becomes permanently hypothyroid and depends on hormone replacement therapy for life. The long survival time of the disease, the need for lifelong follow-up due to hormone therapy, and the importance of patients' physical and psychiatric quality of life after surgery make this

CITATION
Aslantas C Tuna A. The effect of preoperative fasting time on physiological parameters in patients undergoing thyroid surgery. Med Science. 2023;12(3):941-50.

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issue significant. Although there has been an increase in interest in this topic in recent years, it still has not received sufficient attention [5].

Approximately 5% of the global population, or one in every 20 people, undergo elective surgery at some point in their lives [8]. The surgical procedure of fasting patients after midnight prior to elective surgery has been implemented for many years. The reason for this procedure is to ensure that the stomach is empty to prevent aspiration, one of the most significant complications of general anesthesia, which was identified in the 1840s. For approximately ten years, the fasting protocol for surgical preparation after midnight has been revised by many countries worldwide [9]. Traditionally, patients are instructed to be "Nil Per Os" (NPO) before planned surgery, meaning they must refrain from consuming oral food or fluids after midnight. The NPO practice began in the 1800s after a patient died due to aspiration [10]. The purpose of the NPO practice is to reduce the risk of vomiting and aspiration during anesthesia and surgery. However, fasting before surgery can cause patients metabolic, physiological, and psychological discomfort [11,12]. It has been reported that prolonged fasting before surgery can cause stress, dehydration, anxiety, restlessness, hunger, thirst, dry mouth, fatigue, headache, hypovolemia, and insulin resistance in patients [13,14].

The American Society of Anesthesiologists (ASA) reported that for patients undergoing elective surgery, stopping solid foods 6 hours before and liquids 2 hours before the surgery was sufficient for surgery compared to fasting after midnight [15]. In recent years, recommendations regarding the intake of clear liquids (water, coffee, non-dairy tea, and clear fruit juices) have changed, following studies reporting that abstinence from oral foods or liquids from midnight before NPO-planned surgery in elective surgery does not affect the risk of aspiration. Randomized controlled studies and meta-analyses showed that taking water or other clear liquids 2 hours before anesthesia did not increase the volume and acidity of gastric juices and did not pose a risk for aspiration [14,16,17]. It was also reported that this practice reduced feelings of thirst and anxiety before surgery and gave comfort to patients without increasing stomach content during nighttime fasting but had no effect on metabolism or carbohydrate reserves [12,18]. It was determined that fasting between certain hours eliminated risks and led to rapid recovery in patient psychology after surgery [9].

In recent years, carbohydrate-rich drinks (CRD) have been used as a safe fasting procedure before surgery [19,20]. It was reported that these solutions did not pose a risk of aspiration and did not reduce insulin resistance when gastric emptying time and fluid intake were controlled. Oral carbohydrate solutions take approximately 90 minutes to pass through the stomach; therefore, these solutions can be taken up to two hours before surgery [11,12]. In addition, studies showed that the administration of CRD (carbohydrate-rich drinks) was effective in reducing dehydration, headache, nausea, vomiting, feelings of thirst and hunger, anxiety, and insulin resistance. At the same time, studies reported that it increased patient comfort before surgery, suppressed the catabolic response, and reduced the length of hospital stay [13,14,18,21]. In line with all the reviewed literature, this study was conducted to determine the effect of the preoperative fasting time on the postoperative physiological parameters of patients undergoing thyroid surgery.

Research hypotheses:

Hypothesis 1: Does the preoperative fasting time of patients undergoing thyroid surgery have an effect on their laboratory values?

Hypothesis 2: Does the preoperative fasting time of patients undergoing thyroid surgery have an effect on postoperative hunger, thirst, dry mouth, nausea, vomiting, headache, shivering, wound pain, and fatigue?

Hypothesis 3: Does the preoperative fasting time of patients undergoing thyroid surgery have an effect on their vital signs?

Hypothesis 4: Does the preoperative fasting time of patients undergoing thyroid surgery have an effect on wound infection?

Material and Methods

Type of research

This research was carried out as a prospective descriptive cohort study.

Place and time of the research

The research was conducted between January 2022 and June 2022 in the Surgical Service of Turgut Özal Medical Center at Malatya İnönü University and completed in a total of 6 months. A total of thirteen nurses, one of whom is the responsible nurse, work in the Turgut Özal Medical Center service where the research was conducted. Thyroid, breast, stomach, colon, liver, spleen, and pancreas surgeries are performed, and patients receive treatment and care before and after surgery. Nurses provide patient care between the hours of 08-16, 16-24, and 16-08.

Population and sample of the research

A total 40 consecutive patients who met the inclusion criteria and who underwent thyroid surgery in the Department of General Surgery, Faculty of Medicine, İnönü University, Turkey, constituted the study population. The study sample included patients who underwent thyroidectomy in the surgical service. They were conscious, could speak and hear, had no psychological problems, could speak and understand Turkish, agreed to participate in the study voluntarily, and were conscious of making their own decisions. All patients were informed, and their consent for the study was obtained with a consent form.

Inclusion and exclusion criteria

Those patients, who were conscious, could speak and hear and had no psychological problems requiring medical treatment were included in the study, while those patients, who had a Glasgow

 DOI: 10.5455/medscience.2023.04.051

Coma Scale (GCS) score below 13, were unable to speak Turkish, and could not make their own decisions, were excluded from the study.

Data collection

We determined some information we needed to obtain from the patients through the designated forms. The informed consent form, which indicated patients' participation in the study; the patient diagnosis form, which was used to obtain information about the patients; and the Patients' Physiological Status Evaluation Form, were used.

Informed consent form: A written consent form was obtained from patients for the research. It was explained that this study was conducted to determine the changes in some clinical parameters that would change before and after surgery. It was explained to the volunteers that all information shared by the patients would not be shared with anyone, that no fee would be charged, and that no payment would be made.

Patient diagnosis form: It is a form prepared to identify patients who will undergo thyroid surgery and are admitted to the surgical ward. The form includes questions about patients' age, gender, marital status, education level, occupation, whether they have any chronic illnesses or regularly take medication, any history of illness/surgery, whether they have allergies to food/medications/other substances, the reason for the surgery, the type of the intervention, whether a biopsy has been performed previously, whether they use anticoagulants, how they cope with stress, their level of knowledge about the surgery, and preoperative questions such as how many hours they have been fasting, when they last consumed solid food and liquids, the type of antibiotic used, and the type of analgesic used after the surgery.

Patients' Physiological Status Evaluation Form: It is a form prepared to monitor changes in some symptoms and laboratory findings before and after surgery.

Physiological parameters to be evaluated before surgery, 8 hours after surgery, 24 hours after surgery (POD1), and three days after surgery (POD3):

• Mean arterial pressure (MAP) measurement was conducted by the formula of 2 Diastole+Systole/3, pulse count, body temperature, respiratory rate, and oxygen saturation measurement with a pulse oximeter.

• Symptoms such as hunger, thirst, dry mouth, nausea, vomiting, headache, shivering, pain at the surgical site, and fatigue were evaluated.

• Laboratory findings include erythrocytes, hemoglobin, hematocrit, leukocytes, lymphocytes, neutrophils, platelets, total protein, albumin, HgA1C (only preoperative), glucose, iron, CRP (C-reactive protein), sedimentation, and blood pH were observed.

• The patients were scheduled to be evaluated for signs of redness, increased temperature, edema, and discharge at the surgical site three days after surgery.

Statistical analysis

The SPSS 24.0 (Statistical Packet for Social Sciences for Windows) statistical package program was used. In the evaluation of the research data, descriptive statistical methods (frequency, percentage, mean, and standard deviation) were used, and the Kolmogorov-Smirnov test was used to examine normal distribution. The dependent t-test was used for the data that showed normal distribution in the dependent groups, The Wilcoxon test was used for the data that did not show the normal distribution in the dependent groups, and the Friedman test was used for repeated measurements. The Spearman correlation was used to determine the relationships between numerical variables, and the multiple regression analysis was used to determine the effects between numerical variables. The significance level was taken as $p<0.05$.

Ethics committee approval

Prior to starting the research, permission was obtained from the patients through informed consent forms, and approval was obtained from the SANKO University Non-Interventional Research Ethics Committee with the number 2021/06 on 02.06.2021 and from the Turgut Özal Medical Center of Malatya Inonu University with the number 108880 on 15.11.2021.

Results

The socio-demographic characteristics of the patients are shown in Table 1. The disease status characteristics of the individuals who were to undergo thyroid surgery are presented in Table 2. Of the individuals included in the study, 17.5% had hypertension, 50% were on continuous medication, 7.5% had allergies, 62.5% had a previous history of illness/surgery, 80% had hyperthyroidism as the reason for surgery, 90% had undergone biopsy before, 25% were taking anticoagulant medication, 25% slept to control stress, and 60% had obtained information about the surgery.

The fasting and medication usage status of the patients are presented in Table 1. The patients' mean fasting time was 21.22±4.50 hours, with a mean fasting time of 22.40±4.89 hours for solid food intake and 19.85±4.86 hours for liquid food intake.

The postoperative symptom status of the patients is shown in Table 2. After the surgery, it was found that 27.5% of the patients experienced excessive hunger, 42.5% experienced excessive thirst, 57.5% experienced excessive dry mouth, 57.5% experienced mild nausea, 75% experienced mild vomiting, 27.5% experienced moderate headache, 30% felt slightly cold, 65% experienced pain at the incision site, and 42.5% felt tired.

The distribution of incision site findings on the POD3 is shown in Table 3. It was found that all patients did not experience discharge and odor at the wound site on the POD3; 42.5% had edema, 35.7% had redness, and 32.5% had an increase in temperature.

DOI: 10.5455/medscience.2023.04.051

Table 1. Distribution of patients by sociodemographic and clinical (fasting and medication use) characteristics

		n	%
Age	21-30 years	8	20.0
	31-40 years	12	30.0
	41-50 years	12	30.0
	51-60 years	8	20.0
Gender	Woman	28	70.0
	Male	12	30.0
Marital status	Married	33	82.5
	Single	7	17.5
Educational Status	Primary school graduate	14	35.0
	High school graduate	11	27.5
	≥University graduate	15	37.5
Occupation	Housewife	20	50.0
	Worker	1	2.5
	Civil servant	2	5.0
	Retired	1	2.5
	Self-employment	5	12.5
	Student	3	7.5
	Other	8	20.0
Solid food intake status	Yes	40	100.0
	No	0	0.0
Liquid food intake status	Yes	40	100.0
	No	0	0.0
Antibiotic use status	Yes	36	90.0
	No	4	10.0
Analgesic administration/intake status	Paracetamol	13	32.5
	Anti-inflammatory	11	27.5
	Opioid	16	40.0
		Mean±SD	**Median (Min-Max)**
Fasting time (hours)		21.22±4.50	22 (11-28)
Time since last solid food intake time		21.22±4.50	22 (11-28)
Time since last liquid food intake		19.85±4.86	20 (9-28)

SD: standard deviation. On the day of surgery, all patients started oral solid and liquid food

Table 2. Distribution of symptom status of patients 8 hours after surgery

Symptom status	Presence	n	%
Hunger	Very mild	4	10.0
	Mild	8	20.0
	Moderate	11	27.5
	Severe	6	15.0
	Very severe	11	27.5
Thirst	Very mild	4	10.0
	Mild	5	12.5
	Moderate	4	10.0
	Severe	10	25.0
	Very severe	17	42.5
Dry mouth	Very mild	1	2.5
	Mild	4	10.0
	Moderate	4	10.0
	Severe	8	20.0
	Very severe	23	57.5
Nausea	Very mild	21	52.5
	Mild	10	25.0
	Moderate	3	7.5
	Severe	3	7.5
	Very severe	3	7.5
Vomiting	Very mild	30	75.0
	Mild	4	10.0
	Moderate	2	5.0
	Severe	3	7.5
	Very severe	1	2.5
Headache	Very mild	10	25.0
	Mild	6	15.0
	Moderate	11	27.5
	Severe	7	17.5
	Very severe	6	15.0
Shivering	Very mild	9	22.5
	Mild	12	30.0
	Moderate	10	25.0
	Severe	6	15.0
	Very severe	3	7.5
Incision site pain	Very mild	1	2.5
	Mild	0	
	Moderate	5	12.5
	Severe	8	20.0
	Very severe	26	65.0
Fatigue	Very mild	3	7.5
	Mild	3	7.5
	Moderate	5	12.5
	Severe	12	30.0
	Very severe	17	42.5

DOI: 10.5455/medscience.2023.04.051

Table 3. Distribution of Incision Site Findings on POD3 in patients undergoing thyroid surgery

Incision site findings	Presence	N	%
Discharge	Yes	0	
	No	40	100.0
Odor	Yes	0	
	No	40	100.0
Edema	Yes	17	42.5
	No	23	57.5
Redness	Yes	15	37.5
	No	25	62.5
Increased body temperature	Yes	13	32.5
	No	27	67.5

The comparison of laboratory findings on POD1 and POD3 for the patients is given in Table 4. There was a statistically significant difference (p<0.05) in the mean values of CRP, sedimentation, protein, albumin, leukocyte, neutrophil, erythrocyte, Lymphocyte, HGB, HCT, and HgA1C laboratory results between POD1 and POD3. There was no statistically significant difference in the mean values of platelet, iron, and glucose between POD1 and POD3.

The comparison of the patient's vital signs before surgery, during surgery, postoperative 8th hour, and on the POD1 and POD3 are presented in Table 5. There was a statistically significant difference in the mean pulse rate, temperature, oxygen saturation, and respiration rate among these time points (p<0.05). However, there was no statistically significant difference in mean blood pressure values among these time points.

Table 4. Comparison of laboratory findings on POD1 and POD3 in patients undergoing thyroid surgery

	POD1		POD3		
	Mean±SD	**Median (Min-Max)**	**Mean±SD**	**Median (Min-Max)**	**P**
CRP	2.06±2.14	1.18 (0.33-8.48)	5.06±9.27	1.77 (0.33-42.50)	**0.004***
Sedimentation	8.65±11.07	6.50 (1-70)	17.42±12.54	15.00 (1-65)	**<0.001***
Total Protein	6.36±0.95	6.50 (3.10-7.90)	9.31±12.86	7.45 (4.50-88.40)	**<0.001***
Albumin	4.00±0.42	4.00 (2.60-4.70)	4.39±0.57	4.50 (7.90-45.90)	**<0.001***
Leukocyte	15.97±8.75	13.60 (5.50-44.90)	24.21±7.37	23.75 (7.90-45.90)	**<0.001***
Neutrophil	77.10±11.80	79.10(42.70-93.70)	65.59±8.93	65.15 (46-90.80)	**<0.001***
Erythrocyte	4.47±0.47	4.47 (3.43-5.46)	4.73±0.55	4.86 (2.99-5.77)	**0.018****
Lymphocyte	15.97±8.75	13.65 (5.50-44.90)	24.21±7.37	23.75 (7.90-45.90)	**<0.001***
Platelets	253.12±64.99	257.50 (110-426)	275.27±78.42	277 (60-434)	0.063**
Iron	56.97±28.56	49.5 (23-137)	50.62±29.71	41 (13-128)	0.310*
HGB	12.71±1.48	12.75 (7.20-16.20)	13.26±1.54	13.10 (8.60-16.10)	**0.003***
HCT	38.77±3.99	38.2 (24-48.70)	40.71±4.28	40.65 (27.1047.70)	**0.001***
Glucose	104.70±26.41	98.5 (56-174)	100.75±23.87	94.50 (47-200)	0.183*
HgA1C	5.47±0.43	5.5 (4.5-6.6)	5.58±0.33	5.60 (4.60-6.30)	**0.049****

SD: standard deviation. *Wilcoxon test. **T-test in dependent groups

Table 5. Comparison of vital signs in patients undergoing thyroid surgery before surgery. during surgery. 8 hours after surgery. and on the POD1 and POD3 of surgery

	PreOP (Mean±SD)	IntraOP (Mean±SD)	POD0(12h) (Mean±SD)	POD1 (Mean±SD)	POD3 (Mean±SD)	p
Blood pressure (mmHg)	87.77±8.67	87.09±13.09	88.18±9.60	88.09±6.60	89.29±6.79	0.916
Heart rate (min)	92.62±11.86	78.85±10.83	83.62±11.09	86.60±9.07	89.10±9.18	**<0.001**
Fever (0C)	36.26±0.28	36.13±0.22	36.49±0.18	36.62±0.19	36.58±0.25	**<0.001**
Saturation (%)	98.32±0.85	95.27±1.48	97.07±1.75	97.95±1.35	98.35±0.92	**<0.001**
Respiration (min)	25.77±17.06	20.67±1.26	20.00±3.38	21.65±1.00	21.70±0.85	**<0.001**

*Friedman test

 DOI: 10.5455/medscience.2023.04.051

The relationship between fasting time and POD1 and POD3 is shown in Table 6. A positive and moderate correlation was found between the fasting time and HgA1C values on POD1 (r=0.430, p=0.006). No correlation was found between the fasting time and CRP, sedimentation, protein, albumin, leukocyte, neutrophil, erythrocyte, lymphocyte, platelet, Iron, HGB, HCT, and glucose on POD1 and POD3.

A moderate positive correlation was found between the fasting time and the values of erythrocyte (r=-0.330, p=0.037) and HGB (r=-0.351, p=0.026) on the POD3. No correlation was found between the fasting time and the values of CRP, sedimentation, protein, albumin, leukocyte, neutrophil, lymphocyte, platelet, iron, HCT, glucose, and HgA1C on the POD3 (Table 6).

Table 6. The Relationship between fasting time and laboratory values on the POD1 and POD3 of thyroid surgery

		POD1	POD3
CRP	r	0.162	0.256
	p*	0.319	0.111
Sedimentation	r	0.227	0.219
	p	0.158	0.175
Total Protein	r	0.281	0.005
	p	0.079	0.976
Albumin	r	-0.025	-0.173
	p	0.877	0.286
Leukocyte	r	-0.224	0.035
	p	0.165	0.831
Neutrophil	r	-0.100	0.021
	p	0.539	0.898
Erythrocyte	r	0.031	-0.330
	p	0.848	**0.037**
Lymphocyte	r	0.228	-0.121
	p	0.157	0.456
Platelets	r	-0.174	-0.109
	p	0.282	0.505
Iron	r	0.130	-0.300
	p	0.424	0.060
HGB	r	-0.300	-0.351
	p	0.060	**0.026**
HCT	r	-0.242	-0.305
	p	0.133	0.056
Glucose	r	-0.016	-0.020
	p	0.920	0.901
HgA1C	r	0.430	0.273
	p	**0.006**	0.088

* Spearman correlation test

The relationship between the fasting time and the findings before surgery, during surgery, at 8 hours after surgery, and on the POD1 and POD3 are shown in Table 7. There was no correlation between the fasting time and blood pressure, pulse, temperature, saturation, and respiration before surgery and on the POD3. A moderate positive correlation was found between the fasting time and the pulse value (r=0.333, p=0.036) during surgery, and a moderate negative correlation was found between the fasting time and the saturation value (r=-0.500, p=0.001) during surgery. A moderate positive correlation was found between the fasting time and the pulse value (r=0.301, p=0.049) at 8 hours after surgery, and a moderate negative correlation was found between the fasting time and the saturation (r=-0.489, p=0.001) at 8 hours after surgery.

There was no correlation between the fasting time and the blood pressure, temperature, and respiration at 8 hours after surgery. A moderate negative correlation was found between the fasting time and the blood pressure (r=-0.329, p=0.038); a moderate positive correlation was found between the fasting time and the pulse (r=0.328, p=0.039); and a moderate negative correlation was found between the fasting time and the saturation (r=-0.324, p=0.042) on the POD1. No correlation was found between the fasting time and the temperature and respiration on the POD1.

The results of the regression analysis between the fasting time and the laboratory values on the POD1 and POD3 for the patients are presented in Table 10. When analyzing the regression model conducted to demonstrate the effects of the fasting time on laboratory values on the POD1, the statistical estimates of the regression model indicated that the model was not significant (F=1.751, p=0.116). Similarly, when analyzing the regression model conducted to demonstrate the effects of the fasting time on laboratory values on the POD3, the statistical estimates of the regression model indicated that the model was not significant (F=0.956, p=0.494) (Table 8).

When the analysis results of the regression model were conducted to reveal the effects of fasting time on vital signs before surgery (F=0.814, p=0.548), at 8 hours after surgery (F=2.244, p=0.072), on the POD1 after surgery (F=2.433, p=0.055), and the POD3 (F=1.719, p=0.157) were examined, the statistical estimates of the regression model showed that the model was not significant. When the analysis results of the regression model conducted to reveal the effects of Fasting Time on perioperative vital signs were examined, the statistical estimates of the regression model showed that the model was significant and usable (F=4.830, p=0.002). The vital signs explained 32.9% of the total variance in Fasting Time. When the t-test results regarding the significance of the regression coefficient were examined in the regression model, it can be stated that the patients' increase in heart rate (t=2.702, p=0.011) and fever (t=-2.400, p=0.022) were statistically due to the increase in fasting time.

Table 7. The relationship between fasting time and preoperative. intraoperative. postoperative 8th hour and POD1 and POD3 vital signs of patients undergoing thyroid surgery

		Before surgery	During surgery	8 hours after the surgery	POD1	POD3
		Fasting time (hours)				
Blood pressure (mmHg)	r	-0.101	0.029	-0.096	-0.329	-0.002
	p*	0.535	0.859	0.555	**0.038**	0.988
Heart rate (min)	r	-0.003	0.333	0.301	0.328	0.196
	p	0.985	**0.036**	**0.049**	**0.039**	0.224
Fever (ºC)	r	-0.071	-0.252	-0.014	-0.115	0.204
	p	0.661	0.117	0.932	0.339	0.207
Saturation (%)	r	0.249	-0.500	-0.489	-0.324	0.140
	p	0.121	**0.001**	**0.001**	**0.042**	0.062
Respiration (min)	r	0.297	-0.090	0.023	-0.043	0.183
	p	0.063	0.581	0.886	0.792	0.259

* Spearman correlation test

Table 8. The results of regression analysis for the relationship between fasting time and POD1 and POD3 laboratory values in patients undergoing thyroid surgery

Dependent variable	Independent variable (POD1)	B	T	p*
Fasting time (hours)	(Constant variable)		-0.008	0.994
	CRP	0.297	1.441	0.160
	Sedimentation	-0.086	-0.375	0.710
	Total Protein	0.340	1.980	0.057
	Albumin	-0.098	-0.426	0.674
	Leukocyte	-0.276	-1.155	0.258
	Erythrocyte	0.162	0.948	0.351
	Platelets	-0.105	-0.404	0.689
	Iron	0.126	0.733	0.470
	Glucose	0.028	0.157	0.876
	HgA1C	0.198	0.913	0.369
	R=0.614, R2=0.376Adjusted, R2=0.161, F=1.751, p=0.116, Durbin-Watson=1.834 Neutrophil. Lymphocyte. HGB and HCT were removed from the model due to multicollinearity caused by Variance Inflation Factor (VIF)			
	Independent variable (POD3)	B	T	p*
Fasting time (hours)	(Constant variable)		1.285	0.208
	CRP	-0.209	-1.078	0.290
	Sedimentation	0.308	1.510	0.141
	Total Protein	0.003	0.016	0.987
	Albumin	0.318	1.454	0.156
	Leukocyte	-0.036	-0.195	0.847
	Erythrocyte	-0.404	-1.795	0.083
	Platelets	-0.270	-1.522	0.138
	Iron	-0.057	-0.334	0.741
	Glucose	0.079	0.468	0.643
	R=0.472, R2=0.223Adjusted, R2=0.010, F=0.956, p=0.494, Durbin-Watson=1.622 Neutrophil. Lymphocyte. HGB and HCT were removed from the model due to multicollinearity caused by Variance Inflation Factor (VIF)			

DOI: 10.5455/medscience.2023.04.051

Discussion

Fasting at midnight before surgery has been standard practice. However, there is no evidence that emptying the stomach is necessary to minimize the likelihood of the patient aspirating stomach contents in planned elective surgeries. Any scientific evidence shows that fasting after midnight does not decrease the volume or acidity of the stomach contents [21,22]. According to the latest developments in perioperative medicine, Enhanced Recovery After Surgery (ERAS) procedures have abandoned the practice of fasting at night and instead support the preoperative intake of oral carbohydrates. Mainly, these plans have been developed within the ERAS program to facilitate postoperative recovery by reducing stress [23]. Shortening the fasting time with ERAS in the preoperative period reduces postoperative metabolic stress and insulin resistance [24,25]. It also shortens the patient's length of stay in the hospital and increases their comfort level [13,26,27]. It is also essential to preserve the metabolically lean body mass and muscle strength of patients undergoing major abdominal, orthopedic, and cardiac surgeries [28].

Based on this information, this study aimed to determine how the preoperative fasting time affected the physiology of patients undergoing planned elective thyroid surgery and to evaluate the well-being of patients based on their physiological indicators during the fasting time. When comparing the average vital signs of the patients before surgery, during surgery, at 12 hours after surgery, and POD1 and POD3, statistically significant differences were found in the averages of pulse rate, temperature, oxygen saturation, and respiration rate. However, there was no statistically significant difference in blood pressure between the patients. When the regression analysis was performed on the relationship between the fasting time and the vital signs before surgery, during surgery, at 12 hours after surgery, and on POD1 and POD3, the statistical estimates of the regression model showed that the model was not significant and did not have an effect on the patients' vital signs. The vital signs explained 32.9% of the total variance in fasting time. When examining the t-test results regarding the significance of the regression coefficient in the regression model, it was found that patients' heart rate ($t=2.702$, $p=0.011$) and body temperature increased. This increase can be attributed to the increase in fasting time. When examining the relationship between fasting time and the POD1 and POD3 in the patients who underwent thyroid surgery, there was a positive and moderately strong correlation between the fasting time and the HgA1C laboratory value on the POD1. No relationship was found among the patients' CRP, sedimentation, protein, albumin, leukocyte, neutrophil, erythrocyte, lymphocyte, platelet, iron, HGB, HCT, and glucose laboratory values. The analysis results of the regression model conducted to reveal the effects of fasting duration on POD1 and POD3 laboratory values showed that the statistical estimates related to the regression model indicated that the model was not significant. According to these results, parameters such as patients' pulse, saturation, and HbA1C values that evaluate blood glucose levels may change as the fasting duration increases. In total or subtotal thyroidectomy surgeries, where the body's metabolic rate is affected, and protein-carbohydrate and fat metabolism are affected by blood loss and general anesthesia, the extension of fasting time did not affect the patients' laboratory values on the surgery day, POD1 and POD3. This may indicate that the patients' fluid support and oral intake of fluids or solids after surgery were well managed.

As the fasting time increases, blood pressure and heart rate, body temperature, saturation, and blood glucose levels can change. These findings can negatively affect wound healing with changes in oxygenation and the inability of cells to be nourished with glucose. De Vries et al. [29] shared information in their meta-analysis that confirmed this study and used the statement, "The stress response to surgical trauma causes the release of catabolic hormones and inhibits insulin function." According to De Vries et al. [29], surgical stress affects pancreatic β-cell function and leads to lower plasma insulin levels. This relative hypoinsulinemia, combined with the effects of insulin resistance and counterregulatory hormones, usually leads to hyperglycemia. The aim is not to raise the blood glucose levels of diabetic patients above 150 mg/dl or to lower the patient's blood glucose level to 40 mg/dl [29]. Perioperative glucose control is determined by a number of factors, such as glucose control level before hospitalization, etiology of glucose irregularity (e.g., type 2 diabetes and type 1 diabetes), nutritional status, type of anesthesia, and surgery. The surgical procedure triggers a metabolic stress response characterized by an increase in sympathetic stimulation and, subsequently, in catecholamines, cortisol, glucagon and growth hormone levels.

This apparent stimulation of counter-regulatory hormones increases endogenous glucose production, both of which contribute to hyperglycemia. Excessive levels of proinflammatory cytokines (e.g., TNF-alpha, IL-1, IL-6) may further perpetuate this insulin resistance state. Insulin resistance features are most evident on the POD1 but may persist for days or weeks following the entire surgical procedure [30]. Therefore, prolonged fasting time may adversely affect blood glucose. As a result of this research, this information can be emphasized.

Limitations and generalizability of the research

This study has a limited sample size due to the inclusion of those patients admitted to the Surgical Department of Turgut Özal Medical Center at Malatya Inonu University. It was conducted in a single center, and all patients included had undergone thyroid surgery.

Conclusion

After the surgery, it was determined that 27.5% of the patients experienced significant hunger, 42.5% experienced significant thirst, 57.5% experienced significant dry mouth, 57.5% experienced very little nausea, 75% experienced very little vomiting, 27.5% experienced moderate headaches, 30% felt slightly cold, 65% experienced pain at the site of the incision, and 42.5% experienced postoperative fatigue. All patients were found to have no discharge or odor at the incision site on the third day after surgery. It was determined that 42.5% experienced edema, 35.7% experienced redness, and 32.5% experienced increased body temperature. Statistically significant differences were found in the average laboratory results of CRP, sedimentation, Total Protein, Albumin, Leukocyte, Neutrophil, Erythrocyte, Lymphocyte, HGB, HCT, and HgA1C between the 1st and 3rd day after surgery in the patients. There was no statistically significant difference between the patients' mean platelet, iron, glucose and laboratory results on the POD1 and POD3. The relationship between the fasting time and the preoperative, intraoperative, postoperative 12-hour, and postoperative POD1 and POD3 findings was demonstrated in the patients who underwent thyroid surgery. No correlation was found between the fasting time and the blood pressure, pulse, temperature, saturation, or respiration before surgery and on POD3. When the analysis results of the regression model conducted to reveal the effects of fasting time on vital signs during surgery were examined, the statistical estimates related to the regression model showed that the model was significant and usable. The vital signs explained 32.9% of the total variance in fasting time. When the t-test results regarding the significance of the regression coefficient in the regression model are examined, it can be stated that the increase in the patients' pulse and fever was statistically due to the increase in fasting time. In conclusion, according to the research hypotheses, it was determined that as fasting time increased, it could affect laboratory values such as glucose, HbA1C, and erythrocyte values. It was also observed that it could alter metabolism, pulse, and body temperature.

Recommendations

The study determined significant statistical effects of fasting time on HbA1c, pulse rate, and body temperature in patients undergoing thyroidectomy. The impact of fasting time on metabolism, blood laboratory values, wound site, and vital signs should be investigated in a larger population of patients undergoing thyroidectomy surgery. In addition, the effects of fasting time can also be examined in other surgeries, not just in thyroidectomy surgeries.

Conflict of Interests
The authors declare that there is no conflict of interest in the study.

Financial Disclosure
The authors declare that they have received no financial support for the study.

Ethical Approval
Ethics committee approval was obtained from Sanko University institutional review board (IRB) for non-interventional studies (Approval No:2021/06) and performed according to the ethical (Declaration of Helsinki) and legal standards in Türkiye.

References

1. Kim E, Pudhucode R, Chen H, Lindeman B. Discordance between the American thyroid association and the american college of radiology guideline systems for thyroid nodule biopsy. J Surg Res. 2020;255:469-74.
2. Popoveniuc G, Jonklaas J. Thyroid nodules. Med Clin North Am. 2012;96:329-49.
3. Iyer NG, Shaha AR. Management of thyroid nodules and surgery for differentiated thyroid cancer. Clin Oncol (R Coll Radiol). 2010;22:405-12.
4. Dogan S, Sahbaz NA, Aksakal N, et al. Quality of life after thyroid surgery. J Endocrinol Invest. 2017;40:1085-90.
5. Randolph GW, Thompson GB, Branovan DI, Tuttle RM. Treatment of thyroid cancer: 2007--a basic review. Int J Radiat Oncol Biol Phys. 2007;69:S92-7.
6. Cooper DS, Doherty GM, Haugen BR, et al. Revised American Thyroid Association management guidelines for patients with thyroid nodules and differentiated thyroid cancer. Thyroid. 2009;19:1167-214. Erratum in: Thyroid. 2010;20:942.
7. Mei J, Leung NL, Kwok RT, et al. Aggregation-induced emission: together we shine, united we soar!. Chem Rev. 2015;115:11718-940.
8. Ljungqvist O, Nygren J, Thorell A, et al. Preoperative nutrition—elective surgery in the fed or the over night fasted state. Clin Nutri. 2001;20:167-71.
9. Yılmaz E. New approaches durıng preoperative fasting process in surgical patients. Ege Üniversitesi Hemsirelik Yüksek Okulu Dergisi. 2009;25:105-18.
10. Ljungqvist O, Søreide E. Preoperative fasting. Br J Surg. 2003;90:400-6.
11. Zhang Z, Wang RK, Duan B, et al. Effects of a preoperative carbohydrate-rich drink before ambulatory surgery: a randomized controlled, double-blinded study. Med Sci Monit. 2020;26:e922837.
12. Pogatschnik C, Steiger E. Review of preoperative carbohydrate loading. Nutr Clin Pract. 2015;30:660-4.
13. Hausel J, Nygren J, Lagerkranser M, et al. A carbohydrate-rich drink reduces preoperative discomfort in elective surgery patients. Anesth Analg. 2001;93:1344-50.
14. Nygren J, Thorell A, Ljungqvist O. Preoperative oral carbohydrate therapy. Curr Opin Anaesthesiol. 2015;28:364-9.
15. Dolgun E, Taşdemir N, Ter N, Yavuz M. Cerrahi hastalarının ameliyat öncesi aç kalma sürelerinin incelenmesi. F.Ü. Sağ. Bil. Tıp Derg. 2011;25:11-5.
16. American Society of Anesthesiologists Committee. Practice guidelines for preoperative fasting and the use of pharmacologic agents to reduce the risk of pulmonary aspiration: application to healthy patients undergoing elective procedures: an updated report by the American Society of Anesthesiologists Committee on Standards and Practice Parameters. Anesthesiology. 2011;114:495-511.
17. Practice guidelines for preoperative fasting and the use of pharmacologic agents to reduce the risk of pulmonary aspiration: application to healthy patients undergoing elective procedures: an updated report by the American Society of Anesthesiologists task force on preoperative fasting and the use of pharmacologic agents to reduce the risk of pulmonary aspiration. Anesthesiology. 2017;126:376-93.
18. Ljungqvist O. Modulating postoperative insulin resistance by preoperative carbohydrate loading. Best Pract Res Clin Anaesthesiol. 2009;23:401-9.
19. Bilku DK, Dennison AR, Hall TC, et al. Role of preoperative carbohydrate loading: a systematic review. Ann R Coll Surg Engl. 2014;96:15-22.
20. Mathur S, Plank LD, McCall JL, et al. Randomized controlled trial of preoperative oral carbohydrate treatment in major abdominal surgery. Br J Surg. 2010;97:485-94.

21. Brady M, Kinn S, Stuart P. Preoperative fasting for adults to prevent perioperative complications. Cochrane Database Syst Rev. 2003;4:CD004423.

22. Li L, Wang Z, Ying X, et al. Preoperative carbohydrate loading for elective surgery: a systematic review and meta-analysis. Surg Today. 2012;42:613-24.

23. Gustafsson UO, Scott MJ, Schwenk W, et al; Enhanced Recovery After Surgery (ERAS) Society, for perioperative care; European Society for Clinical Nutrition and Metabolism (ESPEN); International Association for Surgical Metabolism and Nutrition (IASMEN). Guidelines for perioperative care in elective colonic surgery: Enhanced Recovery After Surgery (ERAS(®)) society recommendations. World J Surg. 2013;37:259-84.

24. Tamura T, Yatabe T, Kitagawa H, et al. Oral carbohydrate loading with 18% carbohydrate beverage alleviates insulin resistance. Asia Pac J Clin Nutr. 2013;22:48-53.

25. Wang ZG, Wang Q, Wang WJ, Qin HL. Randomized clinical trial to compare the effects of preoperative oral carbohydrate versus placebo on insulin resistance after colorectal surgery. Br J Surg. 2010;97:317-27.

26. Smith MD, McCall J, Plank L, et al. Preoperative carbohydrate treatment for enhancing recovery after elective surgery. Cochrane Database Syst Rev. 2014;8:CD009161.

27. Amer MA, Smith MD, Herbison GP, et al. Network meta-analysis of the effect of preoperative carbohydrate loading on recovery after elective surgery. Br J Surg. 2017;104:187-97.

28. Yuill KA, Richardson RA, Davidson HI, et al. The administration of an oral carbohydrate-containing fluid prior to major elective upper-gastrointestinal surgery preserves skeletal muscle mass postoperatively--a randomised clinical trial. Clin Nutr. 2005;24:32-7.

29. De Vries FE, Gans SL, Solomkin JS, et al. Meta-analysis of lower perioperative blood glucose target levels for reduction of surgical-site infection. Br J Surg. 2017;104:e95-e105.

30. Vogt AP, Bally L. Perioperative glucose management: current status and future directions. Best Pract Res Clin Anaesthesiol. 2020;34:213-24.