

Is Thyroid Surgery A Risk for Myocardial Injury?

Tiroid Cerrahisi Miyokard Hasarı için Risk Taşır Mı?

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Abstract

Objective: Thyroid surgery is a widely performed non-cardiac surgical procedure. However, peri-operative myocardial injury (PMI) is the most common vascular complication associated with poor peri-operative outcomes. We aimed to investigate the effect of thyroid surgery on myocardial biomarkers during the peri-operative period.

Materials and Methods: A total of 98 patients (82.6% female, mean age=51.1±15.8 years) were prospectively included in the study. Patients with a previous history of cardiac diseases were excluded. Cardiac Troponin-I, creatine kinase (CK)-MB and CK levels were measured in the pre-operative period and at the 6th and 24th hours of the post-operative period. Furthermore, electrocardiography (ECG) was performed on each patient. Subsequently, the data collected at these three time points were compared.

Results: Troponin-I, CK-MB, CK levels and ECG analysis of the patients who underwent thyroid surgery. The CK levels significantly increased in the post-operative 6th hour and slightly decreased in the post-operative 24th hour (p<0.001) when compared to that in the pre-operative period. The CK-MB and troponin-I levels were not significantly different in the peri-operative period (p=0.108 and p=0.557, respectively). Moreover, no ischaemic ECG changes were observed during the peri-operative period.

Conclusion: PMI does not occur in patients undergoing thyroid surgery. We also showed that thyroid tissue is not a non-cardiac origin of troponin and CK-MB. Physicians should be aware of coronary events in the peri-operative period of thyroid surgery, when elevated cardiac biomarkers are detected.

Öz

Amaç: Tiroid cerrahisi yaygın olarak yapılan non-kardiyak cerrahi bir prosedürdür. Perioperatif miyokard hasarı (PMI), perioperatif morbidite ve mortalite ile ilişkili en sık görülen vasküler komplikasyondur. Çalışmamızda perioperatif dönemde tiroid cerrahisinin miyokard biyobelirteçleri üzerindeki etkisini araştırmayı amaçladık.

Gereç ve Yöntemler: Çalışmamız prospektif olarak planlandı. Çalışmaya 98 hasta (%82,6 kadın, ortalama yaş =51,1±15,8 yıl) dahil edildi. Daha önce kalp hastalığı öyküsü olan hastalar çalışma dışı bırakıldı. Preoperatif, postoperatif 6. saat ve 24. saat kardiyak troponin-I, kreatin kinaz (CK)-MB ve CK düzeyleri belirlendi, her hasta için elektrokardiyografi (EKG) yapıldı. Bu üç ayrı zamandaki veriler birbirleri ile karşılaştırıldı.

Bulgular: Tiroid cerrahisi uygulanan hastaların troponin-I, CK-MB, CK düzeyleri ve EKG incelemeleri yapıldı. Ameliyat sonrası 6. saatte CK düzeyleri preoperatif

dönemle karşılaştırıldığında anlamlı olarak artarken, ameliyat sonrası 24. saatte hafif düştü ($p<0.001$). CK-MB ve troponin-I düzeyleri perioperatif dönemde anlamlı farklılık göstermedi (sırasıyla, $p=0,108$, $p=0,557$). Perioperatif dönemde herhangi bir iskemik EKG değişikliği görülmedi.

Sonuç: PMI tiroid cerrahisi geçiren hastalarda saptanmadı. Ayrıca tiroid dokusunun, troponin ve CK-MB için non-kardiyak olmayan bir kökeni olmadığını gösterdik. Klinisyenler, perioperatif tiroid cerrahisi döneminde, yüksek kardiyak biyobelirteçler tespit edildiğinde, koroner olaylar konusunda dikkatli olmaları gerekir.

Introduction

Perioperative myocardial injury (PMI) is the most common vascular complication associated with perioperative poor outcomes (1). It is estimated that of the over 300 million annual surgery around the world (2). Approximately 8% of patient involve PMI and more than 750.000 patients annually die within 30 days after non-cardiac surgery from myocardial ischemia (3). PMI does not exhibit typical symptoms of myocardial ischemia (chest pain, dyspnea, angina pectoris). Chest pain is usually the major symptoms of the myocardial ischemia. However, it may be challenging to diagnose myocardial injury in most patients those with are receiving analgesic medication that can mask ischemic symptoms (4).

Thyroid surgery is a widely performed non-cardiac surgical procedure in almost every secondary and tertiary hospital (5). There are many known complications of thyroid surgery (6). To the best of our knowledge, however, relation of thyroid surgery to PMI is still unknown. In the present study, we aimed to investigate the effect of thyroid surgery on myocardial biomarkers during the perioperative period.

Materials and Methods

Totally, 146 patients who were undergoing to total thyroidectomy at Aydın Adnan Menderes University Training and Research Hospital were prospectively included in to the study. 48 patients were excluded according to the exclusion criteria. Finally, 98 patients who underwent thyroid surgery due to thyroid cancer (in 25 patients), multinodular goiter (in 52 patients) and graves diseases (in 21 patients) between 01/July/2017 and 01/April/2019 were enrolled in to the study. The study methods were submitted to and approved by the Institutional Review Board of Aydın Adnan Menderes University the Local Ethics Committee. The need for informed consent was waived (Institutional Review Board research protocol 2017-1175). The study was conducted in accordance

with the Declaration of Helsinki. Informed consent was obtained from all patients. For patients under 18 years of age, informed consent was obtained from the patients and their parents.

Patients with a previous history of cardiac diseases including; pericarditis, myocarditis, coronary heart disease, heart failure and severe valvular heart disease were not included in the study. Other exclusion criteria were cerebrovascular disease, liver failure, cronic muscle disease and renal failure. Following the baseline measurements of cardiac Troponin-I, creatine kinase (CK)-MB and CK levels in preoperative patients, a second blood sample was obtained from patients at 6th hours after surgery and a third blood sample was obtained at 24th hours after surgery. The electrocardiography (ECG) was performed for each patients at preoperative period, 6th and 24th hours after surgery.

In our clinic, generally all blood samples are collected from antecubital vein. The glucose, blood urea nitrogen, creatinine, serum triiodothyronine, serum thyroxine, thyroid-stimulating hormone TSH, CK, CK-MB and Troponin-I levels were measured in blood samples. CK was measured by using chemiluminescent microparticle immunoassay (CMIA) methods with an auto-analyzer (C8000 Architect, Abbott, AbbottPark, IL, U.S.A.) CK-MB and Troponin-I levels were measured by Chemiluminescent Microparticle Enzyme Immunological Assay (CMIA) methods with an auto-analyzer (C8000 Architect, Abbott, Abbott Park, IL, U.S.A.).

Statistical Analysis

Continuous variables were tested for normal distribution by the Kolmogorov-Smirnov test. Since CK, CK-MB and troponin-I levels did not show normal distribution, descriptive statistics were shown as median (25th-75th percentiles) and categorical data as percentage. We compared CK, CK-MB and troponin-I levels using Friedman's Two-way Analysis of Variance test at preoperative period, 6th hours and 24th hours. A

two sided p value <0.05 was considered as significant. Dunn-Bonferroni post-hoc test was used.

Results

Baseline demographical and clinical characteristics are shown in Table 1. A total of 98 patients (82.6% female, mean age= 51.1±15.8 years) were enrolled to the study. Sixteen patients had type 2 diabetes mellitus, nineteen patients had hypertension. Five of patients were smoker. With respect to laboratory findings, blood urea nitrogen hemoglobin and creatinin were in normal limits (Table 1). Changes of cardiac biomarkers were shown in Table 2. CK levels significantly increased in post op 6th hour when compared to preoperative period and slightly decrease in post operative 24th hour ($p<0.001$) (Figure 1). CK-MB and Troponin-I levels were not significantly different in perioperative period ($p=0.108$, $p=0.557$, respectively) (Figure 2,3). None of ischemic ECG changing was seen in the perioperative period.

Table 1. Demographic characteristics of patients

Variables (n=98)	
Age	51.1±15.8
Gender (M/F)	17/81 (17.4%/82.6%)
DM n (%)	16, 16.3%
HT n (%)	19, 19.3%
Smoking n (%)	5, 5.1%
Blood ureanitrogen, mg/dL	13.9±4.7
Hemoglobin, gr/L	12.9±1.5
Creatinin, mg/dL	0.74±0.11
M: Male, F: Female, DM: Diabetes mellitus, HT: Hypertension	

Discussion

This study evaluated whether the cardiac biomarkers elevate or not in a consecutive patient cohort undergoing thyroid surgery. There are two

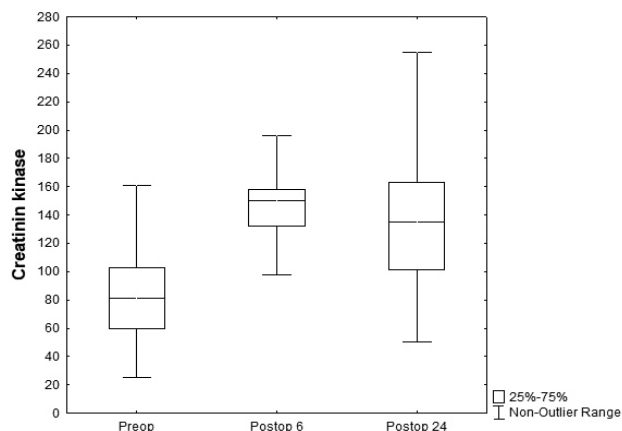


Figure 1. CK levels within 24th hour period (significant increase $p<0.001$).

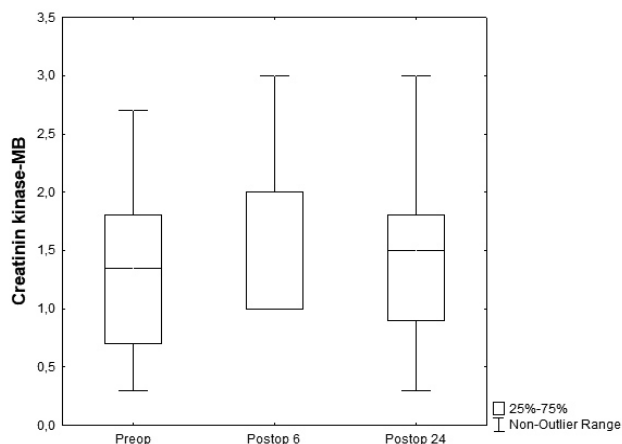


Figure 2. CK-MB levels within 24th hour period (insignificant difference $p=0.108$).

Table 2. Serum biomarker levels of patients

Variables (n=98)	Preop	Post op 6 th hour	Postop 24 th hour	p value
Creatininkinase, U/l	81.0 (59.5-103.0)	150.0 (131.5-158.8)	135.0 (100.8-164.2)	<0.001*
Creatininkinase MB, ng/mL	1.4 (0.7-1.8)	1.5 (0.9-2.1)	1.5 (0.9-1.8)	0.108
Troponin-I, pg/mL	4.0 (3.0-5.0)	4.0 (3.0-7.0)	4.0 (3.0-5.5)	0.557
Ischemic ECG changes	0	0	0	-
*Difference for CK levels between Preop and Post op 6 th hour was statistically significant ($p<0.001$). Also difference for CK levels between Preop and Post op 24 th hour was statistically significant ($p<0.001$). ECG: Electrocardiography				

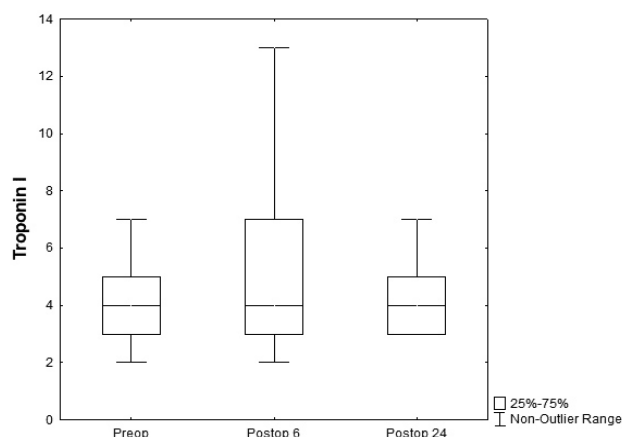


Figure 3. Troponin-I levels within 24th hour period (insignificant difference $p=0.557$).

major findings of the present study. Cardiac biomarkers did not elevate during the perioperative period in patients undergoing thyroid surgery. Therefore, PMI does not occur in thyroid surgery. Secondly, thyroid tissue is not a non-cardiac origin of troponin.

It is well known that cardiovascular events remain to be the most common cause of morbidity and mortality around the world. A large spectrum of clinical conditions could be occur ranging from silent ischemia to myocardial infarction with ST segment elevation (7,8). It may be challenging to diagnose correctly of cardiovascular events in some conditions particularly perioperative period due to being under anesthetic and analgesic drugs. Recently, PMI has been defined as an important, silent complication after noncardiac surgery and associated with 30-day mortality (9,10). Considering that more than 250 million surgeries are performed annually, strategies to improve the early detection, treatment, and outcome of PMI may provide major medical benefits (1). Therefore, rapid and reliable diagnosis of PMI is important to improve outcomes in perioperative period. The detection and quantification of PMI by measuring cardiac biomarkers including CK, CK-MB and Troponin is critical.

Thyroid surgery is a widely performed non-cardiac surgical procedure in almost every secondary and tertiary hospital. With the present study, we aimed the determined the whether thyroid surgery is associated with PMI. According to results of our study, CK significantly increased in 6th hour of post operative

period and remained higher in 24th hour. We think that increase of CK is due to dissection of skeletal muscles in the operation area. CK-MB and Troponin-T levels did not significantly increase neither in 6th nor 24th hour of post operative period. In addition to cardiac biomarkers, no electrocardiographic changes and symptoms related with cardiac ischemia (chest pain, dyspnea, and hemodynamic instability) were detected in post operative period. Therefore, according to results of our study PMI is not thought to be develop in thyroid surgery.

Cardiac biomarkers in particular cardiac troponins are specific and sensitive biomarkers used in the diagnosis of myocardial infarction (11). Troponin is released into the bloodstream when myocardial injury is occurred by various mechanisms. They indicate the presence of the myocardial damage but not the underlying mechanism and provide important data for the diagnosis, risk assessment and prognosis (12). There are many clinical conditions other than myocardial infarction that cause troponin elevation; thus, the physicians should be aware of the wide spectrum of clinical conditions that may result in troponin elevation and have a clear understanding of the related pathophysiology to effectively make a differential diagnosis. So, in various clinical condition due to various underlying mechanism, troponin levels could be elevated such as cerebrovascular events, kidney failure, Chronic obstructive pulmonary disease, etc. (13). False positive troponin levels may lead the misdiagnosed acute coronary events and performing unneeded coronary interventions. With the present study, we showed that thyroid tissue is not a non-cardiac origin of troponin and CK-MB and undergoing thyroid surgery is not leading the elevation in the cardiac biomarkers.

Study Limitations

The limitations of the present study are a single center experience and small number of patients. However, our population contains unselected consecutive patients undergoing thyroid surgery, therefore mirroring a real world scenario.

Conclusion

PMI does not occur in patients who undergoing thyroid surgery. Thus, we suggest that thyroid surgery is in relatively low risk group for cardiovascular events. Additionally, we also showed that thyroid tissue is not

an non-cardiac origin of troponin and CK-MB. Clinical implication of this result, physicians should be aware of coronary events in the perioperative period of thyroid surgery when elevated cardiac biomarkers are detected.

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Ethics

Ethics Committee Approval: The study methods were submitted to and approved by the Institutional Review Board of Aydın Adnan Menderes University the Local Ethics Committee (protocol no: 2017/1175).

Informed Consent: An informed consent was obtained from all patients.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Concept: M.D., A.S., Design: M.D., A.S., Data Collection or Processing: M.D., A.S., Analysis or Interpretation: M.D., A.S., Literature Search: M.D., A.S., Writing: M.D., A.S.

Conflict of Interest: No conflict of interest was declared by the authors.

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