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Effect of Subclinical Hyperthyroidism on the Outcome of Coronary Artery Graft Bypass Surgery

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Öz

Giriş ve Amaç: Subklinik hipertiroidizmin kardiovasküler sistem üzerine olumsuz etkileri bilinmektedir. Bu çalışmada, koroner arter by-pass (KABG) cerrahisi uygulanan hastalarda cerrahi öncesi subklinik hipertiroidizm durumu olanlar ile cerrahi sonrası dönemde mortalite ve komplikasyonlar arasındaki ilişkiyi değerlendirmeyi amaçladık.

Yöntem ve Gereçler: Çalışmaya izole KABG cerrahisi uygulanan 189 hasta alındı. Hastaların klinik karakteristikleri, cerrahi detayları ve cerrahi sonrası gelişen mortalite ve komplikasyonlara ait veriler kaydedildi.

Bulgular: Çalışmaya dahil edilen 189 hastanın 16 sında pre-operatif dönemde subklinik hipertiroidizm durumu mevcutken 173 hastada normal tiroid fonksiyonları mevcuttu. Post-operatif dönemde subklinik hipertiroid öyküsü olan hastalarda yeni gelişen aritmi, böbrek yetmezliği ve inotropi ihtiyacı anlamlı olarak daha fazla olduğu gözlemlendi ($p<,0001$, $p: 0,0002$ ve $p<,0001$ sırasıyla). Her iki grupta mortalite açısından anlamlı fark bulunmadı ancak subklinik hipertiroidizm olan hastalarda hastanede ve yoğun bakımda kalış sürelerinde artış izlendi ($p: 0,0102$ ve $p: 0,0004$ sırasıyla).

Tartışma ve Sonuç: İzole kabg cerrahisi uygulanan hastalarda cerrahi öncesi subklinik hipertiroid durumu olan hastalarda mortalite etkilenmese de post-operatif komplikasyonlarda artış bulunmuştur.

Anahtar kelimeler: Subklinik Hipertiroidizm, Kardiyovasküler Hastalık, Koroner Arter By-Pass Greft Cerrahisi.

Abstract

Introduction: Subclinical hyperthyroidism is associated with negative effects on cardiovascular system. We aimed to evaluate the association between pre-operative thyroid hormones and post-operative outcome in patients undergoing coronary artery by-pass graft (CABG) surgery.

Methods: A hundred and eighty nine patients with isolated CABG surgery were included into the study. Patient's clinical characteristics, surgical details and post-operative mortality and morbidities were recorded. Patients were divided into two groups according to their TSH level with cut-off point of 0,35 was assumed.

Results: The first group consists of 16 patients (9%) with subclinical hyperthyroid (SH) and the second group includes 173 euthyroid patients. In post-operative period; the incidence of arrhythmia, renal failure and inotropy requirement were significantly higher in SH group ($p<,0001$, $p: 0,0002$ and $p<.0001$ respectively). The incidence of peri-operative mortality was similar between groups. ($p: 0,0860$).

Length of stay in intensive care unit and overall were significantly higher in patients with SH ($p: 0,0102$ and $p: 0,0004$ respectively).

Discussion and Conclusion: Pre-operative subclinical hyperthyroidism didn't effect peri-operative mortality but may lead to higher postoperative complications such as arrhythmia, renal failure and low cardiacoutput syndrome in patients undergoing CABG surgery.

Key words: Subclinical Hyperthyroidism, Cardio-Vascular Disease, Coronary Artery By-Pass Graft Surgery.

1. Introduction

Subclinical hyperthyroidism (SH) is defined as a low serum thyroid stimulating hormone (TSH) level with a normal free T4 and total T3 levels due to thyroid disease or exogenous excess thyroid hormone administration and patients with subclinical hyperthyroidism are often

asymptomatic and the prevalence of SH is approximately 1% [1]. Thyroid hormones has important effects on the cardiovascular system [2]. Subclinical hyperthyroidism is associated with increased risks of atrial fibrillation and mortality in patients with coronary artery disease due to systemic effects of thyroid

hormones, such as a change in cardiac function [3]. On the other hand, Irregular thyroid function can influence the post-operative course after cardiac surgery [4]. The aim of this study was to assess the association between subclinical hyperthyroidism and postoperative outcome in patients undergoing coronary artery bypass graft (CABG) surgery.

2. Patients and Methods

A hundred and eighty nine patients who underwent isolated CABG from August 2017 to July 2018 were included in this study. The study was approved by the ethical committee and informed consent was obtained from all patients. All patients charts were reviewed retrospectively. Clinical characteristics, surgical details and post-operative outcome were obtained from the patient's charts. Patients who underwent additional cardiovascular surgeries (valvular surgery, aorta surgery, peripheral vascular surgery) and patients with reduced or increased level of free T3 and T4, chronic kidney disease and cardiac rhythm problem were excluded.

All CABG surgeries were performed under general anesthesia with standart median sternotomy and on-pump fashion. Blood samples were obtained from the patients before surgery for analysis of routine biochemistry and thyroid hormones as TSH, free T3 and free T4. Reference value for TSH in our laboratory was 0,35 to 4,95 mIU/L. Patients were divided in two groups based on serum TSH level as normal (normal TSH level) and subclinical hyperthyroidism (TSH ≤0,35 mIU/L). The patient's clinical characteristics including age, gender, body mass index, pre-operative TSH, creatinine and blood urea nitrogen (BUN) levels; patients co-morbidities including diabetes mellitus, hypertension, smoking, chronic pulmonary obstructive disease (COPD), peripheral arterial disease (PAD); and surgical details including cardiopulmonary bypass (CPB) time and cross clamp (X-Clamp) time were collected.

Post-operative following outcomes were extracted: low cardiac output syndrome (LCOS) which is post-operative requirement of inotropic agents or intra-aortic balloon pump, renal failure which is requiring dialysis, neurologic deficits (stroke), surgical wound infections, deep venous thrombosis or pulmonary embolism, new-onset cardiac arrhythmias and peri-operative mortality including intra- and post-operative period. Post-operative length of stay (LOS) in intensive care units (ICU) and overall, and length of post-operative mechanical ventilation times were also calculated.

The primary endpoint of our study was association between pre-operative TSH level and post-operative outcomes.

Statistical analysis

Statistical analysis was performed using JMP 13.0.0 software (SAS Institute, Cary, NC, USA). software. Summary statistics are expressed as mean ±standard deviation, or counts and proportions for categorical data. Normality was tested by Kolmogorov-Smirnov and Shapiro-Wilk W test. Student t test for normally

distributed continuous variables between two groups. The Chi-square test or Fisher's exact test was used for categorical variables. A p-value of <0,05 was considered statistically significant for all analyses.

3. Results

A total of 189 patients at Balikesir Ataturk State Hospital, including 16 patients (9%) with SH and 173 patients with normal thyroid function were enrolled. Age, gender, BMI, pre-operative co-morbid variables (DM, HT, PAD, COPD, smoking) and operative characteristics such as CPB and X-Clamp times were similar between groups (Table 1 and Table 2). In post-operative period arrhythmia, renal failure and inotropy requirement were significantly higher in SH group (p<.0001, p: 0.0002 and p<.0001 respectively) (Table 2).

Table 1 (Clinical Characteristic, Surgical detail, Outcome-Continuous Variable)

	TSH group		p		
	≤0,35 (n:16)	>0,35 (n:173)	Mean	SD	
Age	63.88	9.68	64.47	8.22	0.813
TSH	0.26	0.07	1.57	1.00	<.0001
BMI	24.73	3.08	24.84	3.84	0.8924
Creatinin	0.97	0.29	0.87	0.25	0.2326
CPB time	72.13	21.73	74.95	23.53	0.6268
X Clamp Time	47.63	12.09	47.28	13.93	0.9148
LOS-ICU	3.25	2.02	1.76	0.97	0.0102
LOS-Overall	9.38	2.36	6.73	1.39	0.0004
MV time	19.00	23.24	8.58	11.98	0.0959

Table 2 (Clinical Characteristic, Outcome-Categorical Variable)

	TSH group		p
	≤0,35 n (%)	>0,35 n (%)	
Gender/Female	6 (38)	42 (24)	0.2450
DM	5 (31)	58 (33)	0.8534
HT	3 (19)	30 (17)	0.8871
COPD	4 (25)	21 (12)	0.1463
Smoking	6 (38)	65 (38)	0.9954
PAD	4 (25)	17 (10)	0.0646
Mortality-Peri-operative	2 (13)	6 (3)	0.0860
Inotrophy	10 (63)	20 (12)	<.0001
Stroke	1 (6)	2 (1)	0.1188
Renal Failure	3 (19)	3 (2)	0.0002
wound infection	1 (6)	9 (5)	0.8579
Arrhythmia	12 (75)	21 (12)	<.0001
pulm-venous thrombosis	1 (6)	6 (3)	0.5730
bleeding	0 (0)	7 (4)	0.4123

Total number of 8 patients died in peri-operative period and there were no significant difference in both groups according to peri-operative mortality (p: 0.0860). LOS in ICU and overall were significantly higher in patients with SH (p: 0.0102 and p: 0.0004 respectively).

4. Discussion

Our aim was to investigate the correlation between pre-operative TSH level and post-operative prognosis in patients undergoing CABG.

Our findings revealed that patients with SH were associated with post-operative increase morbidity such as arrhythmia, renal failure requiring dialysis and inotropy requirement. Although peri-operative mortality were similar, this study showed us that patients with SH had longer ICU and hospital stay.

Thyroid hormones have effect on cardiac contractility, cardiac output and vascular resistance. SH has been associated with several effects on cardiovascular system, such as increased heart rate, left ventricular mass, carotid intima-media thickness, and plasma fibrinogen levels [5].

Some studies have reported that there is an association between subclinical hyperthyroidism and coronary heart disease, atrial fibrillation and cardiac dysfunction [6].

Sawin et al have reported that atrial fibrillation occurs in 10% to 15% of patients with subclinical hyperthyroidism and the prevalence of atrial fibrillation increases with age [7]. Similarly, we found that patients with SH have significantly higher incidence of post-operative arrhythmia than normal population.

Thyroid hormones affect renal development and physiology. Especially Hypothyroidism is associated with reduced GFR and hyperthyroidism results in increased GFR as well as increased renin – angiotensin – aldosterone activation. In our study we have also found that patient with preoperative SH status have higher incidence of renal failure in postoperative period [8].

Hyperthyroidism decreases myocardial contractile reserve and, hemodynamic changes caused by excess thyroid hormone predispose the patient to heart failure. Hyperthyroid patients can suffer from congestive heart failure without prior cardiac injury [9].

Similarly, our study showed us patients with SH had more common low cardiac output syndrome after CABG operation.

With all these findings we can conclude that patients with preoperative SH may have higher incidence of post-operative complications such as arrhythmia, renal failure and low cardiac output syndrome after CABG surgery. We found some postoperative complications more common such as arrhythmia, renal failure and low cardiac output syndrome and these complications may

potentially cause longer ICU and hospital stay for these patients. Higher incidence of postoperative complications with similar incidence of postoperative mortality in SH patients might be explained proper management of these complications during hospital stay. Although SH patients seem clinically normal, further precaution needs to be taken care before CABG operations due to worse post-operative outcome. Medications can be used to fix thyroid function before surgery if surgery is elective. We may also suggest using β -blockers pre-operative to help the control of post-operative arrhythmia.

The study had some limitations. This is a single-center study with small sample size. CPB is also associated with some changes in serum thyroid hormone levels such as reducing total and free T3 levels [10]. Reducing of free T3 level may reflect same postoperative outcome with ours, therefore, it may be recommended that the thyroid hormones be measured before and after the operation.

5. Conclusion

In conclusion, preoperative subclinical hyperthyroidism didn't effect perioperative mortality but may lead to higher incidence of postoperative complications such as arrhythmia, renal failure and low cardiac output syndrome in patients undergoing CABG surgery.

6. References

1. Parle JV, Maisonneuve P, Sheppard MC, Boyle P, Franklyn JA. Prediction of all-cause and cardiovascular mortality in elderly people from one low serum thyrotropin result: a 10-year cohort study. *Lancet*. 2001; 358(9285):861–865.
2. Iervasi G, Pingitore A, Landi P et al. Low-T3 syndrome: a strong prognostic predictor of death in patients with heart disease. *Circulation*. 2003; 11;107(5):708–13.
3. Biondi B, Cooper DS. The clinical significance of subclinical thyroid dysfunction. *Endocr Rev*. 2008; 29(1):76–131
4. Park YJ, Yoon JW, Kim KI et al. Subclinical hypothyroidism might increase the risk of transient atrial fibrillation after coronary artery bypass grafting. *Ann Thorac Surg*. 2009; 87: 1846–1852
5. Surks MI, Ortiz E, Daniels GH, et al. Subclinical thyroid disease: scientific review and guidelines for diagnosis and management. *JAMA*. 2004; 291(2):228–238.
6. Parle JV, Maisonneuve P, Sheppard MC, Boyle P, Franklyn JA. Prediction of all-cause and cardiovascular mortality in elderly people from one low serum thyrotropin result: a 10-year cohort study. *Lancet*. 2001; 358(9285):861–865.
7. Sawin CT, Geller A, Wolf PA, et al. Low serum thyrotropin concentrations as a risk factor for atrial fibrillation in older persons. *N Engl J Med*. 1994; 331(19):1249–1252.
8. Kaptein EM. Thyroid function in renal failure. *Contrib Nephrol*. 1986;50:64–72
9. Klein I, Ojamaa K. Thyroid hormone and the cardiovascular system. *N Engl J Med*. 2001. February 15; 344 7: 501–9
10. Chu SH, Huang TS, Wang SS, Wang CJ. Thyroid hormone changes after cardiovascular surgery and clinical implications. *Ann Thorac Surg* 1991;52:791-6

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