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Journal of Clinical Case Reports and Studies

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Case Report

Hypothyroidism Can be Hinder in Surgical Intervention of Patient with Acute Coronary Syndrome: Case Study

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Received date: September 14, 2024; **Accepted date:** October 14, 2024; **Published date:** October 29, 2024

Citation: Nabila Anwer and Abdus Sattar, (2024), Hypothyroidism Can be Hinder in Surgical Intervention of Patient with Acute Coronary Syndrome: Case Study, *J, Clinical Case Reports and Studies*, 5(8); **DOI:10.31579/2690-8808/222**

Abstract

Introduction: Thyroid hormone has numerous effects on the cardiovascular system. It has electrophysiological and pro-angiogenic effects. It also improves cardiac output, contractility, and reduce systemic vascular resistance. Hypothyroidism has a negative impact on the recovery of patients with coronary artery disease following post Coronary Artery Bypass Graft CABG.

Case: A 55-year-old female admitted to the cardiac care unit with acute coronary artery disease (CAD). She had past history of hypothyroidism for last six years. This case study explored the available literature on the pathogenesis, clinical manifestation and treatment of CAD in patients with hypothyroidism.

Conclusion: Hypothyroidism enhanced the relative morbidity and mortality rate in coronary artery disease. CABG is the primary option for TVCAD, but PCI is relatively preferred option for revascularization in such cases. It improves survival and quality of life. There was poor prognosis of CABG due to thyroid dysfunction and multiple comorbidities.

Further research work is needed that PCI vs CABG which will benefit the patients in these cases.

Key Words: coronary artery disease; thyroid dysfunction; hypothyroidism; percutaneous coronary arte disease; and CABG

Introduction

Thyroidhormone receptors are found in myocardial and vascular endothelial tissues, which make the cardiovascular system susceptible to variations in thyroid hormone concentrations [1]. Thyroid hormones play a major role in maintaining cardiovascular system and cardio hemodynamic. Alteration in thyroid function can impact on, cardiovascular function, serum cholesterol, cardiac conduction system, increase risk of coronary artery diseases and cardiovascular mortality [1]

The prevalence of thyroid disorders is about 5–10% globally, and in Pakistan, the ratio of subclinical hyperthyroidism and hypothyroidism is about 5.8% [2]. It is also observed that prevalence is more in female as compared to male, not only in Pakistan but also in many other countries like India, Nepal, China, and US [1-3].

Aim of study

This study aims whether thyroid dysfunction is hinder for cardiac surgery or not?

Pathogenesis

There is a direct correlation between thyroid stimulating hormone (TSH) and coronary artery disease (CAD). The hypothyroidism increases the risk for CAD [4]. The Nitric Oxide synthesis is hindered in hypothyroidism, it reduces cardiac output and raises systemic vascular resistance; thus, pose negative effect on cardio vascular system [5]. Hypothyroidism also leads to atherosclerosis, lipid abnormalities, the development of atherosclerotic plaque, hypertension, endothelial dysfunction, increase the mean platelet volume, and contribute to myocardial infarction. However, age-related MI occurs more frequently in women than in men [4]. Moreover, the thyroid hormone plays a crucial part in controlling heart function through the regulation of several genes that code for both structural and functional proteins in the myocardium [6].

This case study discussed the management of a 55-year-old female of triple vessel coronary artery disease (TVCAD) with a positive history of hypothyroidism.

Case presentation

A 55-year-old woman presented to the emergency room with complaints of shortness of breath, chest pain, and orthopnea. She had past history of Diabetes Melitis (DM), Hypertension (HTN) for 12 years and Hypothyroidism for 5 years. At home, she was taking levothyroxine 50 mcg, Sita-met 50/500 mg, allopurinol, and fenofibrate 67 mg tablets. Her family history was positive for hypertension. She was on a low-salt, low-cholesterol, and low-sugar diet. During physical examination, the lungs were bilaterally normal with no abnormal sounds. The heart sounds and neurological status were both normal. The skin was warm to the touch, smooth, and dry. She had Puffy eyes. Her BMI was 28.

Medical Investigation

TSH	>150 uIU/ml
Free T4	0.46 ng/dl
Free T3	1.17 ng/dl
Trop-I	1456 ng/dL
HBA1c	13.7%
Vitamin-D	7.8 ng/dl
Cholesterol	312 mg/dl
Triglyceride	543 mg/dl
Serum Creatinine	1.3 mg/dl
Hemoglobin	9.9 g/dl
Ionized Calcium	5.23 mg/dl

The ECG showed ST depression in leads AVL, V3 and V4. Ejection Fraction was 40 to 45% and mild to moderate pericardial effusion on Echo cardiography. Troponin I was 1456 ng/dL. Creatinine was 1.3, TSH was >150, free T4, and FT3 were normal. Her HBA1c was 13.7%, and her lipid profile showed 312 cholesterol and 543 triglycerides. Vitamin D: 7.83 which showed vitamin D deficiency.

Coronary angiogram was performed that revealed 90 to 95% occlusion in the left descending artery (LAD), 50% occlusion in left circumflex (LCX), and 90% diseased right coronary artery (RCA). This showed triple-vessel coronary artery disease.

Coronary artery bypass graft (CABG) was an option. Cardiothoracic surgery team evaluated the patient. The TSH level was more than 150 mIU/L (normal range 0.5 to 5.0 mIU/L). They held CABG surgery and increased the dose of the tablet levothyroxine 150 mcg along with other medications. Endocrinology team was involved to evaluate and manage the patient further for hypothyroidism. Dual antiplatelet therapy; tablet Loprin 75 mg and tablet low-plate 75 mg once daily was started. Afterwards, the patient, family, and cardiologist decided to undergo percutaneous coronary intervention (PCI). Percutaneous coronary intervention was performed to the left ascending artery, left circumflex artery, and right coronary artery. Patient was discharged from the hospital in stable condition on the third day. The patient showed a positive recovery response after one week of follow-up.

Treatment

According to ACS protocol, the patient was loaded with tablet Loprin 300mg and tablet low plate 300mg in ER. Injection Humolog 10 IU in the morning and injection Lantus 34 IU at night subcutaneously and tabled sita-met 50/500mg were started to manage hyperglycemia. Metoprolol 12.5mg tablets began to protect patients from heart failure and angina, and to manage HTN. Patient vitamin D level was 7.8 for this injection indrop-D 20000IU Intramuscular given and patient was encouraged to take calcium rich diet. Patient TSH >150, as per endocrinology consultation tablet levothyroxine dose was increased to 150mg.

It is significant to select intervention with better prognosis for TVCAD in patients with hypothyroidism. What is the best decision for patient safety and survivals?

Discussion

The thyroid gland produces thyroid hormone from free iodide found in serum. The healthy thyroid gland has the capacity to adjust to an increase iodine level. However, a sudden rise in serum iodine may inhibit the regular adaptive response and result in either hypothyroidism or hyperthyroidism. Iodine excess may suppress the production of thyroid hormone. Both of these occurrences can result in the development of hypothyroidism. Iodine may also prevent the production of thyroid hormone. It negatively affect the long-term survival and cardiovascular status [9].

According to retrospectively reviewed study (2020), ischemic heart disease (IHD) and subclinical hypothyroidism increases the risk of long-term mortality in patients following CABG [7]. Another study revealed that Patients with subclinical hypothyroidism have compromised left ventricular diastolic function, which raises the risk of morbidity and mortality [8].

Many studies disclose that hypothyroidism may impact cardiac contractility, decrease stroke volume and rate, alter the vascular endothelium, and ultimately increase the risk of atherosclerosis, systemic vascular resistance, and hypertension. Levothyroxine therapy before surgery could enhance patient's recuperation following surgery [10-12]. Thyroid dysfunction also causes respiratory muscle depression Therefore, after CABG, ventilatory support is necessary for patient management and safety.

Levothyroxine has demonstrated hypolipidemic and antioxidant effects, which improve cardiovascular function and lipid profile [8,13]. Patient of mentioned case had hypothyroidism for five to six years, and long-term hypothyroidism can lead to serious cardiac issues like reduced intravascular volume and increased systemic vascular resistance and hypertension.

A higher Mean Platelet Volume (MPV), a risk factor for infarction, was found to be related with subclinical hypothyroidism. Homocysteine, and hyperlipidemia levels are all markedly larger in hypothyroid patients [6]. Patient lipid profile cholesterol 312 and triglyceride 543 is also one of the causes of hypothyroidism. Other than dyslipidemia, metabolic changes, and insulin resistant also leading factor of coronary artery disease. Hyperinsulinemia is an excellent indicator for insulin resistance, which is commonly linked to other risk factors in hypothyroidism [14].

It is significant to notice that despite adequate level of thyroid hormones, higher TSH level remained a marker for mortality after CABG, Because Patients need more time for ventilatory support, inotropic support, IABP, and there is also risk for developing atrial fibrillation [15]. Presence of hypothyroidism has been associated with complications after surgical procedures, especially wound healing and increase in mortality. It is thus advised to treat hypothyroid state before any surgical procedure [15]

TSH is a basic biomarker that can be used to routinely screen individuals and help identify those who are more likely to experience cardiovascular events whether they have sub-clinical hypothyroidism or overt hypothyroidism but have not yet been recognized. This is crucial because thyroid replacement therapy may help these people lower their risk of cardiovascular disease and other unfavorable health consequences [12].

Moreover, Thyroid hormone replacement therapy has been suggested to lower heart failure rates and cardiac events, increase left ventricular systolic and diastolic function, and lower LDL cholesterol levels. Patients with raised TSH levels who received sufficient THR therapy experienced rates of adverse cardiac events that were comparable to those of patients with normal TSH levels, whereas patients with higher TSH levels who received inadequate THR therapy showed higher adverse cardiac event rates than patients with a normal TSH level [16].

While hypothyroidism is very common in females, sometimes patients do not have signs and symptoms during the initial phase. Meanwhile, coronary artery disease is a leading cause of death if not treated properly on time. Thyroid hormones play an important role in body mechanisms, so they must be considered on a regular basis when dealing with cardiac patients. Patients with thyroid dysfunction needs proper lab investigations and management.

In this case, the first priority was CABG, but it was a major procedure that required more time for recovery. PCI, a non-surgical procedure, was advantageous in conjunction with THR therapy because it has fewer complications and faster recovery.

Role of APN

As a nurse practitioner, it is important to check the thyroid levels of all cardiac patients. Further, if it could not be done during an emergency cardiac intervention, it needs to be done after one day and one month of intervention. Because elevated level TSH were associated with poor clinical outcome.

Summary

Hypothyroidism enhanced the relative morbidity and mortality rate in coronary artery disease. CABG is the primary option for TVCAD, but PCI is relatively preferred option for revascularization in such cases. It improves survival and quality of life. There was poor prognosis of CABG due to thyroid dysfunction and multiple comorbidities. It's a life-threatening condition, without performing any intervention myocardial infraction could occur again. Therefore, the patient's history of thyroid needs to be evaluated, and these factors should be considered while making decision about revascularization.

Conflict of interest

Authors declare no conflict of interest

Funding for Project

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

Informed Consent

Informed consent was taken from the patient. Her name will not be mentioned as per patient approval.

Authors statement/contribution

Nabila anwer: Conception and design of the work; acquisition, analysis, and interpretation of data. Drafting the work

Abdus sattar: Editing and interpretation of data, reviewing it critically for important intellectual content.

Acknowledgments

Ms. Sehrish Sajjad; Assitant Professor, Aga Khan University School of Nursing and Midwifery (AKU-SONAM), Karachi, Pakistan.

Study participant for their participation in the study.

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DOI:10.31579/2690-8808/222