

# Coronary Artery Bypass with Myxedema

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## Abstract

**Introduction** Hypothyroidism increases the risk of cardiovascular complications in patients scheduled for coronary artery bypass grafting. Atrial fibrillation is one of its cardiac complications. **Case Report** Our 45-year-old male patient was admitted to the Emergency Medicine Clinic of our hospital with chest pain that started in the left arm and extended to the chin 2 days ago. It was noted that the patient had hypothyroidism, but did not have any medication for the disease. On physical examination, dry and pale skin, sparse coarse hair, non-pitting edema were diagnosed with acute coronary artery disease. No signs of ischemia were observed on the ECG at the time of admission, but bradycardic sinus rhythm was recorded. The patient was started to be followed up with the diagnosis of NON-ST myocardial infarction. Nitroglycerin 0.25 - 2 mcgr/h and morphine 2 mg were administered intravenously to the patient whose anginal complaints continued after admission. Anginal complaint continued was operated in 1:1 mode by attaching an intraaortic balloon pump (Maquet Sensation 7Fr 40 cc, Datascope CS300 console) via the left femoral artery. **Surgery procedure:** The patient was performed with median sternotomy (aortic, two-stage cannulation). While the patient was cooled to 32 degrees and given blood cardioplegia (St. Thomas II) and applied topical cold. After distal anastomoses were performed with saphenous vein graft. Total cross-clamp time was 60 min. Epinephrine was given for bradycardia sinus rhythm. No cardiovascular complications were encountered while being followed in the intensive care unit. The patient was discharged on the 6th postoperative day. **Conclusion:** Our case, who was taken to emergency CABG operation with myxedema, was discharged without any cardiovascular, respiratory or metabolic complications both in the perioperative and postoperative periods. In this case, the major stress caused by cardiovascular surgery was successfully overcome by both the cardiovascular surgery team and the anesthesiology team.

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## Keywords

Hypothyroidism, Cabg, Myxedema, Atrial Fibrillation

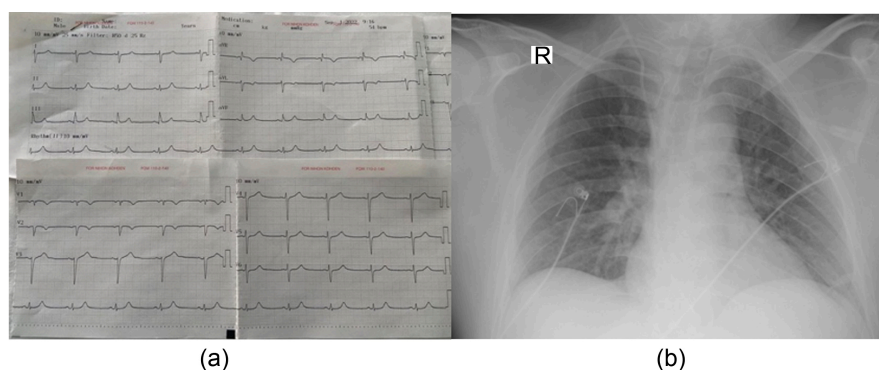
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### 1. Introduction

Thyroid hormones have a complementary role in cardiac and peripheral vascular functions. They show a positive inotropic effect, especially by increasing the heart rate through  $\beta_1$  adrenergic receptors. In addition, increased preload causes an increase in stroke volume as a result of decreased afterload. Increased stroke volume leads to increased cardiac output [1] [2] [3] [4]. Atrial fibrillation is an expected cardiac complication in hypothyroid patients. In these patients, a picture similar to decompensated heart failure can be seen due to the imbalance in thyroid hormones arising from the hypothalamic-pituitary axis [5]. Hypothyroidism increases the risk of cardiovascular complications in patients scheduled for coronary artery bypass grafting. Especially postoperative atrial fibrillation is one of its known complications [6].

### 2. Case Report

Our 45-year-old male patient was admitted to the Emergency Medicine Clinic of our hospital with chest pain that started in the left arm and extended to the chin 2 days ago. It was noted that the patient had hypothyroidism, but did not have any medication for the disease. In recent months, it has been reported that weight gain and excessive dryness of the skin have developed. On physical examination, dry and pale skin, sparse coarse hair, non-pitting edema were diagnosed with acute coronary artery disease, and electrocardiography (ECG) (Picture 1) was taken and a sample was sent to the laboratory to evaluate biochemical parameters. No signs of ischemia were observed on the ECG at the time of admission, but bradycardic sinus rhythm was recorded (**Figure 1(a)**). Changes in cardiac enzymes in laboratory parameters (Troponin T: 1294 ng/l (reference range: 0 - 12) Creatinine Kinase (CK): 412 U/L (reference range: 0 - 171) Lactate Dehydrogenase (LDH): 346 U/L (reference range: 135 - 225)) accompanying Thyroid Stimulating Hormone (TSH) elevation (>100 IU/ml reference range: 0.27 - 4.2) Free T3 (1.42 ng/dL reference range: 2 - 4.2)-Free T4 (0.26 ng/dL reference range: 0.93 - 1.7) was recorded. The laboratory data of the case are shown in **Table 1**. The patient was started to be followed up in the coronary intensive care unit with the diagnosis of NON-ST myocardial infarction. In transthoracic echocardiography, LV EF: 60%, LVES: 31 mm LVED: 44 mm IVS: 10 mm Posterior wall: 9 mm Left atrium: 30 mm Aortic root: 19 mm. Coronary artery angiography showed LMCA 90% stenosis, LAD ostial 80% stenosis, LAD mid 80% stenosis, thin plaque in LAD after D1, CX with plaque, RCA with nondominant plaque. Coronary artery bypass grafting (CABG) operation was decided due to the critical left main coronary artery lesion of the case and the presence of



**Figure 1.** (a) Electrocardiogram 1. (b) Chest X-ray on admission.

**Table 1.** Laboratory parameters of the case.

|                     | Admission   | Preoperative | Before Discharge |
|---------------------|-------------|--------------|------------------|
| TSH                 | >100 µIU/ml | >100 µIU/ml  | >100 µIU/ml      |
| Free T <sub>3</sub> | 1.42 ng/dL  | 1.29 ng/dL   | 1.59 ng/dL       |
| Free T <sub>4</sub> | 0.26 ng/dL  | 0.24 ng/dL   | 1.21 ng/dL       |
| TpnT                | 758.3 ng/dL | 927 ng/dL    | 250 ng/dL        |
| CK                  | 255 UI/L    | 246 UI/L     | 146 UI/L         |
| LDH                 | 336 UI/L    | 334 UI/L     | 200 UI/L         |
| Glucose             | 100.2 mg/dL | 107.7 mg/dL  | 116.3 mg/dL      |
| Creatinin           | 1.03 mg/dL  | 0.8 mg/dL    | 0.82 mg/dL       |
| BUN                 | 87          | 108          | 107              |
| AST                 | 90 U/L      | 61.1 U/L     | 30.8 U/L         |

consecutive lesions that cause severe stenosis in the LAD. CABG preparation was started for the patient who was taken to the cardiovascular surgery intensive care unit. Nitroglycerin 0.25 - 2 mcgr/h and morphine 2 mg was administered intravenously to the patient whose anginal complaints continued after he was admitted to the intensive care unit, and the angina pectoris of the patient was tried to be controlled. However, the patient whose anginal complaint continued was operated in 1:1 mode by attaching an intraaortic balloon pump (Maquet Sensation® 7Fr 40 cc – Datascope CS300 console) via the left femoral artery. Due to the high TSH level in the preoperative preparation, LT4 was added to the treatment with endocrinologist consultation. The laboratory values of the case are shown in **Table 1**. Urgent CABG decision was taken when angina pectoris and Troponin T had a decreasing trend (758 ng/dl) and increased again (927 ng/dl), and systolic arterial pressure decreased below 90 mmHg.

In the preoperative anesthesia examination, angina pectoris continued, coarse brittle hair, dry skin, edema around the mouth, swelling in the tongue, and non-pitting edema were observed on the skin. It has been evaluated for difficult intubation but, difficult intubation has not been predicted. No pathology was detected in lung sounds and X-ray (**Figure 1(b)**). No pericardial or pleural effusion was found on chest X-ray. However, in the preoperative ECG, it was ob-

served that the patient was bradycardic (**Figure 1(a)**). During the surgical procedure: Hydrocortisol 50 mg every 8 hours was added to LT4 treatment in preoperative edema in order to prevent relative hypocortisolemia due to major stress that may occur during the surgical procedure. No hypoglycemia was observed in the case. American Society of Anesthesiology (ASA) 3E was given until emergency operation. The patient was operated on the 3rd day of hospitalization and induction was performed with midazolam 10 mg, fentanyl 350 mcgr, and rocuronium 40 mg. The patient whose airway was secured by orotracheal intubation (Dräger Perseus ®A 500 anesthesia workstations) was administered remifentanyl 0.01 mcgr/kg/min, Deflurane 4% for maintenance of anesthesia. Standard monitoring was applied in the CABG procedure. In the pre-induction hemodynamic monitoring, peak heart rate 60/min arterial pressure was recorded as 105/60 mmHg CVP: 4 mmHg. Follow-up arterial blood gas of the case is shown in **Table 2**. In the perioperative period, anesthesia was maintained with a CVP of 4 - 6 mmHg and a mean arterial pressure of 65 - 75 mmHg.

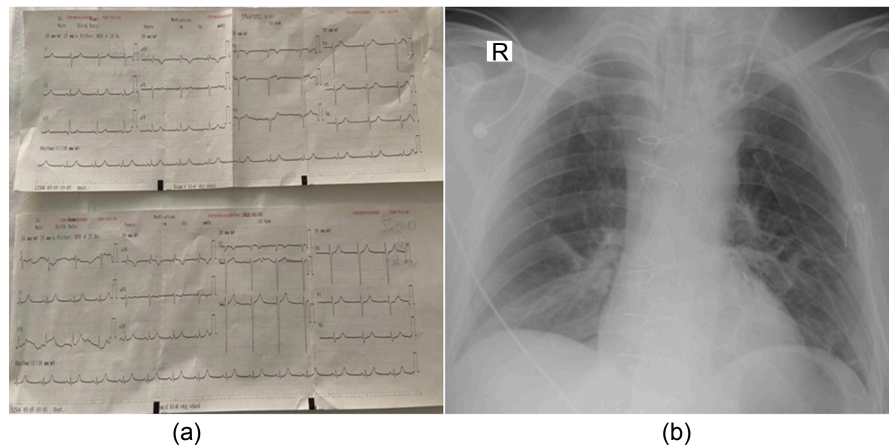
#### Surgical Procedure:

After median sternotomy under general anesthesia, left internal mammarian artery and saphenous vein were prepared as grafts. After the pericardium was opened, it was suspended and aortic arterial and right atrial two-stage venous cannulation followed by cardiopulmonary bypass (CPB). While the patient was cooled to 32 degrees, cannulation was completed by placing a root cannula in the ascending aorta. When the cooling was completed, the heart was arrested in diastole by placing a cross-clamp on the aorta, giving blood cardioplegia (St. Thomas II) through the aortic root cannula and applying topical cold. After RCA and CX distal anastomoses were performed with saphenous vein graft, the patient was started to be warmed while performing the LIMA-LAD anastomosis. After the distal anastomoses were completed, the cross clamp was removed. Total cross-clamp time was 60 min. Cross started to work with sinus rhythm after clamping. After the proximal anastomoses of the saphenous vein grafts were completed by placing a side clamp on the ascending aorta, the patient was removed from the pump and decannulated. Epinephrine 0.01 mcg/kg/min infusion

**Table 2.** Perioperative arterial blood gas samples.

|                    | pH   | PCO <sub>2</sub> | PO <sub>2</sub> | %Hct | Hgb  | P   | Na  | Ca   | Gl  | Lac | BE   |
|--------------------|------|------------------|-----------------|------|------|-----|-----|------|-----|-----|------|
| After induction    | 7.42 | 35.2             | 173             | 40.9 | 13.3 | 3.6 | 139 | 1.11 | 98  | 0.5 | -0.9 |
| Before pump        | 7.44 | 32.1             | 129             | 36.4 | 11.8 | 4.1 | 138 | 1.24 | 96  | 0.6 | -1.0 |
| After cross klempe | 7.40 | 38.1             | 277             | 24.2 | 7.8  | 4.5 | 139 | 1.16 | 119 | 1.1 | -0.7 |
| After pump         | 7.38 | 38.4             | 303             | 25.1 | 8.0  | 4.6 | 138 | 1.26 | 138 | 1.2 | -1.8 |
| End of surgery     | 7.36 | 37.5             | 111             | 26.9 | 8.7  | 3.9 | 142 | 1.21 | 156 | 1.7 | -3.8 |

Abbreviations: Hct: Hematocrit Hgb: Hemoglobin P: Potassium Na: Sodium Ca: Calcium Gl: Glucose Lac: Lactat BE: Base Deficit.



**Figure 2.** (a) Electrocardiogram; (b) Postoperative chest X-ray.

was added in order to have a positive chronotropic-inotropic effect in bradycardia sinus rhythm that continued after pump discharge. CABG procedure was performed by 3 cardiovascular surgeons (Dr. ST, Dr. YK, Dr. HT). The patient, who was extubated in the 5th postoperative hour without any problems, was taken to the service on the 2nd day of follow-up and treatment in the intensive care unit. LT4 and hydrocortisone were continued in the postoperative treatment. Hydrocortisone was discontinued on the 2nd postoperative day. No cardiovascular complications were encountered while being followed in the intensive care unit. The patient was discharged to his healthy home on the 6th postoperative day. Postoperative ECG and X-ray were shown in **Figure 2**.

### 3. Discussion and Conclusions

The effects of thyroid hormones on the cardiovascular system are known. Especially in hypothyroid cases, myocardial ischemia and vascular pathologies are more common due to endothelial dysfunction [7]-[11]. Endothelial dysfunction may cause bleeding during hemostasis. However, in our case, no problem was observed in bleeding diathesis during the whole process. Increased vascular resistance may cause difficulties in hemodynamic stability in CABG surgery. After a surgery performed for hypothyroidism, atrial fibrillation is one of the known comorbidities [12]. Lack of adequate T3 hormone concentration in the plasma, results in a decrease in the level of calcium ions in the intracellular environment [13]. The decrease in Free T3 in the postoperative period has been reported as an independent risk factor for atrial fibrillation after CABG surgery was performed [14]. On the contrary, our case was bradycardic and required positive chronotropic agent support in the perioperative period. Contrary to the literature, the dominance of bradycardic sinus rhythm was noted in the postoperative period. In the literature, no clear results can be obtained in studies on hypothyroid cases. In a randomized prospective study of 142 people, it was observed that T3 hormone replacement increased cardiac output while systemic vascular resistance was decreasing. A prospective randomized study of 170 people used high cardiac index

and low inotropic support after CABG [15]. In another randomized controlled study, the use of dopamine, saline, and T3 did not have any effect on hemodynamics or inotropic support [16]. In our case, low-dose adrenaline infusion was needed due to bradycardia and hypotension. The bradycardic picture supports myxedema. The inability to perform invasive hemodynamic monitoring is a limitation of the study. While hypertension is expected in severe hypothyroidism, hypotension secondary to myocardial ischemia and labile hemodynamics were observed in our case. While emergency CABG was planned due to anginal pain being unresponsive to medical treatment and increased myocardial ischemia, hemodynamic stability was provided with an intra-aortic balloon pump. Although there was edema around the mouth and tongue in our case, no problems were encountered during orotracheal intubation. No pleural fluid or pulmonary edema was observed. No respiratory pathology was encountered in the oxygenation of the patient. In the emergency operation, grafting was applied to three coronary arteries, and the perioperative process was completed without any problems.

Postoperative hypothyroidism processes vary due to co-morbidities and possible complications. Values ranging from 9 to 13 days have been reported [17]. Our case was discharged on the 5th postoperative day with recovery.

In summary, Our case, who was taken to emergency CABG operation with myxedema, was discharged without any cardiovascular, respiratory or metabolic complications both in the perioperative and postoperative periods. In this case, the major stress caused by cardiovascular surgery was successfully overcome by both the cardiovascular surgery team and the anesthesiology team.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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## **Abbreviations**

TSH: Thyroid Stimulating

ECG: Electrocardiography

CABG: Coroner Artery Bypass Grafting

CPB: Cardiopulmonary Bypass

AO: Aort

LAD: Left Anterior Desending

LMCA: Left Mean Coronary Artery

LIMA: Leftinternal Mammarian Artery

CX: Circumflex Artery

CVP: Central Venous Pressure

ASA: American Society of Anaesthesia

CK: Creatinin Creatinin

LDH: Lactate Dehydrogenase