A CASE OF SUCCESSFUL CORONARY ARTERY BYPASS GRAFTING IN A PATIENT WITH ANGINA PECTORIS AND HYPOTHYROIDISM

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There is a clinical dilemma in the treatment of patients with hypothyroidism and coronary artery disease; excess thyroid hormone administration may exacerbate anginal symptoms, and yet inadequate thyroid replacement may induce congestive heart failure. A case of successful coronary artery bypass grafting in a patient with angina pectoris and hypothyroidism is described in this paper.

A 55 year-old woman with this complication initially received thyroid replacement therapy under strict monitoring. Forty days after the start of the thyroid replacement therapy, serum levels of thyroid hormone had reached the normal range, and then coronary artery bypass grafting was successfully performed. She recovered without any complications, and is now free from chest pain in spite of thyroid replacement therapy.

The coexistence of myxoedema and angina pectoris has been observed for many decades. However there is a clinical dilemma because thyroid hormone replacement therapy in hypothyroid patients aggravates coronary artery disease by increasing myocardial oxygen consumption. On the other hand, in cases of inappropriate thyroid management, congestive heart failure may occur due to decreases in both heart rate and myocardial contractility. Coronary artery revascularization, therefore, has been considered to be the therapy of choice in these patients.

In this paper, we describe a patient with severe coronary artery disease and hypothyroidism who was successfully treated by coronary artery revascularization and thyroid therapy.

CASE REPORT

A 55 year-old woman was admitted to Kitano Hospital because of frequent chest oppressive sensations when at rest during the preceding 3 months. She also complained of having had skin dryness, cold intolerance, and hoarseness for the preceding 2 years.

Physical examination revealed obesity (147 cm, 75 kg), puffy eyelids, delayed movements, and delayed deep tendon reflexes. Goiter was palpable in her neck.

Laboratory data showed anemia and hypercholesterolemia: her red blood cell count was $3.07 \times 10^{6}/\mu l$; hemoglobin level was 9.9 g/dl;

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and serum total cholesterol was 332 mg/dl.

Examination of the thyroid gland revealed primary hypothyroidism, with the following data: the triiodothyronine (T3) levels was 0.3 ng/ml (normal range 0.8–1.8); her thyroxine (T4) level was 0.8 μg/dl (normal range 4.6–12.6); the T3 uptake ratio was 22.8% (normal range 21.5–38.1); and her thyroid stimulating hormone (TSH) concentration was 75.0 μU/ml (normal range 0.6–5.1). Chest roentgenograms showed cardiomegaly (cardiothoracic ratio, 60%) without pulmonary congestion, and an electrocardiogram showed left ventricular hypertrophy by voltage criteria, with inverted T wave and the presence of a U wave in chest leads from V4 to V6.

Coronary angiograms showed 99% stenosis in the proximal portions of both the left anterior descending and the first diagonal branches. Peripheral run-off of these coronary arteries was

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acceptably good (Fig. 1). There was also 75% stenosis of the right coronary artery and posterior descending branch. The left ventricular ejection fraction was 63%.

Severe coronary artery disease with hypothyroidism was diagnosed and coronary artery revascularization was indicated.

Thyroid hormone replacement therapy (levothyroxine 25 µg daily at first, but gradually increased to 50 µg daily) was initiated prior to surgery as shown in Figs. 2-4. Fortunately, there was no exacerbation of angina pectoris with a calcium blocker and nitrates. After administration of thyroid hormone, T3 and T4 gradually increased and reached normal ranges. The coronary surgery was performed at the Osaka Medical College Hospital after 40 days' thyroid replacement therapy. Coronary artery bypass grafting (the left internal mammary artery to the left anterior descending artery and the saphenous vein graft to the first diagonal branch) was carried out under hypothermic cardioplegic arrest with an extracorporeal circulation.

The tracheal tube was removed 12 hours after operation and daily administration of levothyroxine (50 µg) was initiated. Heart rate, cardiac output, urine volume and body temperature were adequately maintained after surgery.
She recovered well without any complications. She was discharged 27 days after the operation free from angina.

**DISCUSSION**

The coexistence of hypothyroidism and coronary artery disease has been noticed for a long time, and complications occur with a relatively high incidence. They include hypercholesterolemia, hypertension and atherosclerosis resulting from hypofunction of the thyroid gland, as has been reported by Vanhaelst et al.

Interstitial and intracellular edema relating to the increase in size and weight of the heart may exacerbate myocardial oxygen consumption. Ellyin et al. reported that plasma norepinephrine (predominantly an alpha stimulator) can induce alpha-mediated coronary artery spams, especially when beta-adrenergic responses are blunted in hypothyroidism.

There are certain problems in the management of patients with concomitant hypothyroidism and angina pectoris. In patients receiving nitrates, hypotension and syncopal episodes may develop. Beta-blocking agents also precipitate congestive heart failure and sinus bradycardia and induce vasospastic angina, owing to increased norepinephrine secretion and enhanced alpha-mediated responsiveness caused by the hypothyroid state. Excessive thyroid therapy possibly exacerbates anginal symptoms by increasing the heart rate, myocardial contractility and myocardial oxygen consumption. On the contrary, inappropriate thyroid management in hypothyroid patient may induce congestive heart failure by decreasing the cardiac output.

In this situation, coronary artery bypass grafting provides a more rational therapeutic approach, because the patient may be well tolerant to moderate doses of thyroid hormone after successful coronary artery revascularization.

Surgery for hypothyroid patients, however, is usually hazardous because of the increased risks of infection, hemodynamic instability, cardiovascular collapse, respiratory depression, paralytic ileus, and the development of an inappropriate antidiuretic hormone-like syndrome. In addition, body tissue is more friable. Therefore, when surgery is scheduled, preoperative thyroid hormone replacement therapy is desirable, and optimal serum concentrations of thyroid hormone should be maintained during the acute stage of surgery. Preoperative thyroid replacement therapy should be carried out under strict patient monitoring, with emergency operations possibly being performed in the event of chest pain developing.

Fortunately, in the case reported here, preoperative administration of levothyroxine from 25 to 50 μg daily, given in combination with nitrates and a calcium blocker, did not exacerbate the angina pectoris or did not induce congestive heart failure. Favorable serum concentrations of T3 and T4 were obtained before and
after the operations as shown in Figs. 2–4.

From our experience, we believe that coronary artery bypass grafting can be performed safely for in hypothyroid patients with coronary artery disease. The most appropriate management of patients with this complication is first to improve the myocardial blood flow and then to treat the thyroid deficiency.

ADDENDUM

On November 9, 1988 (3 months after the operation), angiographic follow-up studies were performed (Fig. 5). The left internal mammary artery to the left anterior descending artery and the saphenous vein graft to the first diagonal branch were well patent. The patient remains completely asymptomatic in her usual daily life.

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