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"Harmonized Healing: A Case Report on Combined Surgical Intervention cardiac and thyroid disorders; Open-Heart Coronary Artery Bypass Grafting 4 vessel graft and Total Thyroidectomy in a 67-year-old patient with 3 vessel Cardiac disease and Papillary Thyroid Carcinoma

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Disclosure of Interest

In accordance with the principles of transparency and accountability in research, I disclose that I have no potential conflict of interest related to this study

INTRODUCTION

Coronary artery disease may be complicated with presence of thyroid enlargement. Both necessitating surgery in the same operation is rare. Although not related in terms of the pathogenesis, the latter carries risk of cancer prognosis. Thus, the consideration whether to perform concurrent thyroidectomy during coronary artery bypass grafting (CABG) is a valid decision to be made. Some case reports are published in literature about successful combined surgery. This is a case report of successful combined surgery, including total thyroidectomy and coronary bypass grafting on pump technique.

OBJECTIVES

1.) To present a detailed case study of a 67-year-old patient undergoing combined surgical intervention for coexisting cardiac and thyroid disorders. And describe the surgical techniques and perioperative management involved in Open-Heart Coronary Artery Bypass Grafting (CABG) with 4 vessel graft and Total Thyroidectomy.
2.) To assess the feasibility and safety of performing simultaneous CABG and Total Thyroidectomy in a single surgical session.
3.) To evaluate the short-term and long-term outcomes, including cardiac function and thyroid function, following the combined surgical intervention.
4.) To highlight the importance of a multidisciplinary approach involving cardiologists, cardiothoracic surgeons, and endocrinologists in the management of patients with complex cardiac and thyroid disorders.

CASE PRESENTATION

A 67-year-old Filipino male presented to the outpatient department with a nine-year history of exertional dyspnea, which eased with rest after physical activity. Approximately one year before the visit, he developed a progressively enlarging mass on the left side of his neck. He reported no additional symptoms associated with the mass.

The patient's medical history includes hypertension, which is currently controlled with medication. He has no known food or drug allergies and denies any past hospitalizations or surgeries. Additionally, he reports no use of illicit drugs and has a notable family history of medical conditions.

Regarding personal and social history, the patient is employed as an office staff member, does not smoke, and does not consume alcoholic beverages.

Upon admission, the patient was awake, alert, and not exhibiting respiratory distress. Initial vital signs were: blood pressure 120/70 mmHg, axillary temperature 37.3°C, respiratory rate 18 breaths per minute, pulse rate 63 beats per minute, and oxygen saturation 98%. A firm, well-defined, non-movable circular mass measuring 5x6x5 cm *(Figure 1)* was observed in the anterior left lateral neck. Jugular venous pressure was 7 cm H_2O, and no carotid bruits were present.

Chest examination revealed symmetrical chest expansion with clear breath sounds. The precordium was smooth with no scars, heaves, or thrills. The point of maximal impulse was located at the 6th intercostal space along the left midclavicular line. Heart sounds included distinct S1 and S2 with a regular rhythm, no S3, and no murmurs. Examination of other systems was within normal limits, except for benign prostatic enlargement noted on rectal examination.

Figure 1. 5x6x5cm non-movable firm well-defined circular mass, movable, nontender

Subsequent work-up with echocardiography revealed mild to moderate left ventricular dysfunction (estimated ejection fraction=70%) and eccentric left ventricular hypertrophy, segmental wall motion abnormality, *Figure 2*. Neck CT scan showed heterogeneously enhancing mass in the left thyroid lobe measuring 4.2 x 3.5 x 5.9 cm (AP x T x CC) and no evidence of intrathoracic extension.

Figure 2. Coronary Angiogram

The patient underwent extensive preoperative preparation, including evaluations by multiple subspecialties. Pulmonary clearance was secured, with a low risk of postoperative complications, and the patient was also cleared by the Infectious Disease Specialty. Following these preparations and achieving a euthyroid state, the patient was approved as a candidate for the combined coronary artery bypass grafting (CABG) and total thyroidectomy surgery.

The patient was brought to the operating room, and the coronary artery bypass grafting (CABG) procedure was initiated with the patient in the supine position and a median sternotomy. Harvesting of left internal mammary artery (LIMA) with the great saphenous vein graft (SVG) was completed. After administering heparin, cardiopulmonary bypass was established. The aorta was cross-clamped, and cardioplegia was delivered to protect the myocardium. Following adequate myocardial protection, coronary arteriotomies were made, and distal anastomoses were performed using polypropylene sutures. Proximal anastomoses were then completed either directly onto the ascending aorta or onto pre-existing grafts. Once all grafts were in place, the patient was weaned from bypass, with close monitoring of the heart through direct visual inspection. Bypass grafting was performed first in order to minimize risk of perioperative myocardial infarction from the stress of major surgery and its general anesthesia. Another major consideration is the use of heparinization during cardiac surgery and the bleeding it can cause. Although the heparinization can readily be reversed by protamine sulphate, some residual effect and oozing from raw tissues should be expected. (see Figure 3).

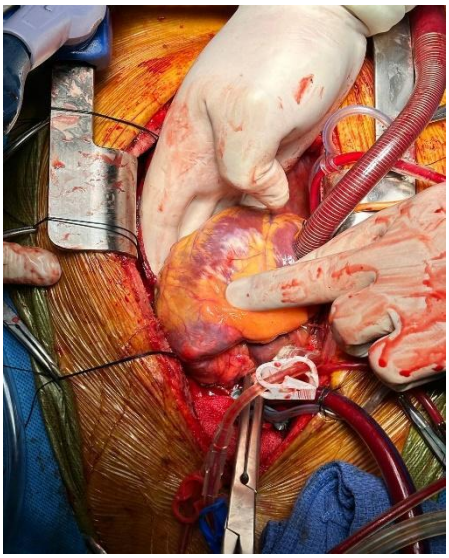

Figure 3. Intraoperative Coronary Artery Bypass Grafting; 4 Vessel Graft (LIMA - LAD; SVG - RPDA; SVG - OM; SVG - Diagonal) under Cardiopulmonary Bypass

Subsequently, a total thyroidectomy was then performed through a single-step approach, starting with a transverse collar incision. Subplatysmal flaps were developed, and the strap muscles were divided to access the thyroid gland. During the procedure, it was observed that the thyroid mass was densely adherent to the strap muscles (see Figure 4). Careful dissection was carried out to separate the mass from the strap muscles, and the surrounding vessels and nerves were meticulously isolated and preserved. Hemostasis was maintained throughout the surgery. A Jackson-Pratt (JP) drain was inserted to manage postoperative fluid accumulation, and the wound was closed in layers.

After total thyroidectomy, cardiovascular surgeons confirmed hemostasis, chest tubes were inserted, the sternum was approximated with sternal wires, and the incisions were closed.

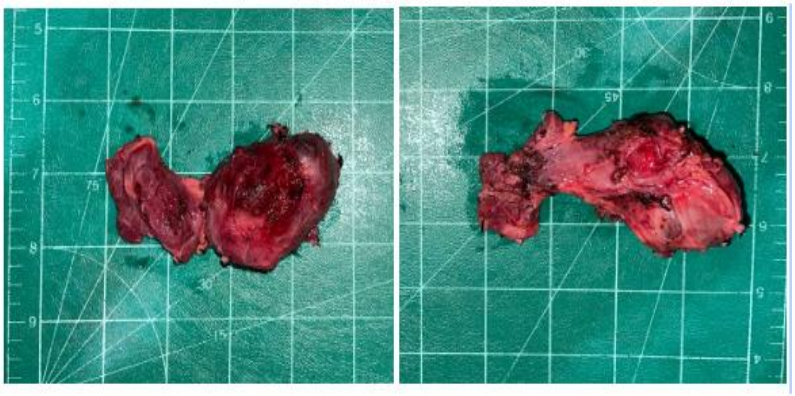

Figure 4. Resected right and left Thyroid gland

The patient showed significant improvement postoperatively, with stable vital signs and a good tolerance to the procedure. He was medically managed throughout his hospital stay and was discharged on the twelfth hospital day, and seventh postoperative day.

During his follow-up visits, the patient showed significant signs of recovery. He reported no new symptoms or complaints, which suggests that his postoperative course has been stable and without complications. The clinical examination revealed that the surgical site was healing well, with no signs of infection or other issues.

DISCUSSION

The cardiovascular signs and symptoms of thyroid disease are some of the most profound and clinically relevant findings that accompany both hyperthyroidism and hypothyroidism. On the basis of the understanding of the cellular mechanisms of thyroid hormone action on the heart and cardiovascular system, it is possible to explain the changes in cardiac output, cardiac contractility, blood pressure, vascular resistance, and rhythm disturbances that result from thyroid dysfunction. The importance of the recognition of the effects of thyroid disease on the heart also derives from the observation that restoration of normal thyroid function most often reverses the abnormal cardiovascular hemodynamics. [1]

Thyroid hormone effects on the heart and peripheral vasculature include decreased SVR and increased resting heart rate, left ventricular contractility, and blood volume. Thyroid hormone causes decreased resistance in peripheral arterioles through a direct effect on VSM and decreased mean arterial pressure, which, when sensed in the kidneys, activates the renin-angiotensin-aldosterone system and increases renal sodium absorption. T3 also increases erythropoietin synthesis, which leads to an increase in red cell mass. These changes combine to promote an increase in blood volume and preload. In hyperthyroidism, these combined effects increase cardiac output 50% to 300% higher than in normal individuals. In hypothyroidism, the cardiovascular effects are diametrically opposite and cardiac output may decrease by 30% to 50%. It is important to recognize, however, that the restoration of normal cardiovascular hemodynamics can occur without a significant increase in resting heart rate in the treatment of hypothyroidism. [2]

Open-Heart Coronary Artery Bypass Surgery entails establishing new pathways, known as bypasses, for blood to reach the heart muscle by utilizing blood vessels harvested from elsewhere in the body. This procedure is commonly employed to address coronary artery disease, a condition characterized by the narrowing or blockage of the blood vessels responsible for supplying blood to the heart.

Conversely, Total Thyroidectomy involves the complete surgical removal of the thyroid gland, situated in the front of the neck. The thyroid gland plays a crucial role in producing hormones that regulate metabolism, making total thyroidectomy a significant intervention for Papillary Thyroid Carcinoma.

Coexisting diseases are typically managed using a two-stage approach, with cardiac surgery preceding thyroid gland operation (thyroidectomy). However, this approach is plagued by heightened perioperative risks. If a thyroidectomy precedes cardiac surgery, careful consideration must be given to potential unstable cardiac function and myocardial infarction, particularly as the diseased heart has diminished reserves and is particularly vulnerable due to hormones released from the thyroid gland during resection.

Conversely, cardiac surgery prior to thyroidectomy poses a risk of thyrotoxicosis. Additionally, a staged approach inevitably extends the interval to the subsequent operation, a critical factor in certain circumstances. Moreover, serious side effects of cardiac surgery with cardio-pulmonary bypass in patients with malignant thyroid disease have been observed, as the immunosuppression following cardiac surgery may promote the growth and dissemination of malignant tumors. [3]

Regardless of the sequence of procedures, each anesthesia carries potential complications, and the cumulative risk of anesthesia during two operations exceeds that of a single anesthetic procedure. Consequently, there may be a need to perform both surgeries simultaneously under the same anesthesia, particularly when the patient presents with retrosternal mass. In such cases, the tumor could obstruct the cardiothoracic surgeon. Moreover, the resection of large mediastinal masses is facilitated by sternotomy, a procedure still required for most heart surgeries.

Combining surgeries may become necessary in cases where a patient presents significant heart disease necessitating bypass surgery alongside thyroid disease requiring the complete removal of the thyroid gland. However, opting for simultaneous procedures could escalate the complexity and associated risks. The patient's functional status holds critical significance not only for preoperative risk evaluation but also for aiming at enhancing quality of life and providing symptomatic relief through surgical intervention. Therefore, patients contemplating such interventions must engage in comprehensive discussions with their healthcare providers to grasp the potential risks, benefits, and alternative options. Moreover, the decision to merge surgeries should be tailored to the patient's holistic health condition and unique circumstances.

Nevertheless, many authorities still advocate more aggressive therapy for low-risk disease. The challenge in standardizing the surgical strategy to papillary thyroid carcinoma is mainly related to a major tumor characteristic: the high frequency of occult cancerous foci whether within the

thyroid gland itself or within loco-regional lymph nodes as this tumor characteristic has been incriminated for a higher risk of recurrent disease and its adverse sequelae.

Recently, a systematic review by De Silva and Dignan (2015) aimed to answer the clinical question as to whether thyroidectomy of a large retrosternal mass in an adult patient requiring cardiac surgery can be performed with an acceptable outcome. They included and analyzed three retrospective case series (level of evidence: 4) and 13 case reports (level 5) that provided the best answer to the question and found that existing subject literature supports the use of combined surgery, as it is a ‘safe, efficient and effective procedure with good outcomes’. A direct comparison with the staged approach was, however, not possible due to the lack of reported outcome data and we also have failed to identify such reports. Their study also confirmed that the application of hybrid procedures (thyroidectomy + cardiac surgery) is safe, efficient and effective.

CONCLUSION

Combined operations were feasible, with no significant adverse events linked to the procedure or anesthesia. The rationale behind merging these two surgeries revolves around the synergistic benefits of addressing both conditions simultaneously, potentially streamlining the patient's recovery process and minimizing overall healthcare burden. [3]

In some cases, these procedures inherently poses risks due to the intricate nature and prolonged duration of the surgery, along with the potential for complications like bleeding, infection, and cardiac events. Consequently, this approach would solely be contemplated for patients with substantial cardiovascular and thyroid conditions necessitating concurrent intervention, and who are assessed as suitable candidates following comprehensive evaluation.

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