Case Report

Follicular Carcinoma of the Thyroid With Massive Invasion Into the Cervical and Mediastinum Great Veins: Our Own Experience and Literature Review

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Thyroid carcinomas with massive intralumen invasion of the great veins are extremely rare and reported to have poor prognosis. We report a case of a poorly differentiated follicular carcinoma of the thyroid with extensive invasion into the bilateral internal jugular veins, brachiocephalic vein, and superior vena cava. All of the seven major drainage veins from the thyroid were involved by tumor thrombus. The patient was successfully treated by surgical resection including removal of the tumor thrombus and repair of the great veins. The importance of preoperative radiological findings, treatment, and outcome are discussed along with a literature review.

Key Words: Thyroid cancer, tumor thrombus, mediastinum great veins.


INTRODUCTION

Microscopic vascular invasion is a histological characteristic of follicular carcinoma of the thyroid that can cause lung or bone metastasis. However, cases with massive angio-invasion are rare. The possibility of sudden death due to pulmonary embolism must be recognized, and treatment strategies should be discussed among head and neck surgeons, cardiothoracic surgeons, and radiation oncologists. We report a case of poorly differentiated follicular thyroid carcinoma with extensive invasion into the bilateral internal jugular veins, left brachiocephalic vein, and superior vena cava (SVC). We describe the clinical findings and the surgical management of the case along with a review of the literature.

CASE REPORT

A 54-year-old female was referred to our hospital with a 5-month history of enlarged anterior cervical mass. Physical examination revealed a large, firm, anterior neck mass with no fixation of the vocal cords. The serum thyroglobulin level was elevated to 11,500 ng/mL. Fine-needle aspiration cytology revealed poorly differentiated carcinoma. Computed tomography (CT) and magnetic resonance imaging showed a grossly enlarged thyroid mass occupying the left lobe extending to the right lobe (Fig. 1). Left cervical lymph node metastasis was observed, but there was no distant metastasis. The trachea was circumferentially surrounded by the tumor, but there was no direct invasion into the trachea or the esophagus. Enhanced CT revealed tumor thrombi in bilateral internal jugular veins extending directly from the tumor via superior, medial, and inferior thyroid veins. Tumor thrombus was also noted in the left subclavian vein and brachiocephalic vein (Fig. 2). The patient had no symptoms of SVC syndrome.

Surgery was considered to reduce the risk of sudden death from pulmonary embolism. Total thyroidectomy combined with left neck dissection and upper mediastinal dissection was performed with an extended collar incision and median sternotomy. Her left recurrent laryngeal nerve was sacrificed due to tumor invasion. Preparation was made to place the patient on venous reconstruction using an autologous graft if necessary. After preparation of a shunt circuit between the bilateral internal jugular veins and right atrium (RA) appendage, the SVC was clamped. Thus, all SVC blood flow was drained through the shunt circuit to the RA after infusion of 2 mg/kg of heparin sodium to avoid the intraoperative tumor embolus to the pulmonary circuit. There were seven massive tumor invasions into all of the major drainage veins from the thyroid (Figs. 3 and 4).
4). The tumor thrombi had no adhesion/invasion to the endothelium. Each vein was occluded, and all of the tumor thrombi were able to be pulled out, one by one, from an incision in the venous walls. The veins were repaired using 5-0 Prolene. The entire tumor and the thrombi were resected en bloc (Fig. 4).

Tracheostomy was performed. The postoperative course was uneventful, and after dysphagia rehabilitation, the patient was able to eat orally on postoperative day 35. Pathology of the tumor was follicular carcinoma, poorly differentiated type, pT4bN1b. The patient received postoperative radiation (50 Gy) followed by radioactive iodine (RI) ablation treatment. Her serum thyroglobulin level decreased to the normal level (15 ng/mL), and she is doing well without recurrence at 12 months after the surgery.

**DISCUSSION**

Thyroid carcinoma causing tumor thrombus in the great veins is a rare situation and has been reported to have poor prognosis. It can cause sudden death due to pulmonary embolism, and the management requires...
exclusive care. Solitary internal jugular vein invasion of thyroid cancer has been occasionally reported, but tumor thrombi extending to the mediastinum great veins is extremely rare. In the past, cases receiving palliative management have been reported due to the difficulty of surgical approach resulting in poor outcome. In general, patients can eventually come down with symptoms of SVC syndrome, which would be critical. Surgical treatment is necessary in collaboration with head and neck surgeons and cardiothoracic surgeons.

Thompson et al. reported the first case of follicular thyroid carcinoma with extended tumor thrombus in the mediastinum great veins that was operated successfully. Thrombectomy is the most effective surgical treatment if possible. In the English language literature, 11 cases of differentiated thyroid cancer invasion in the mediastinum great veins have been reported that were treated by thrombectomy. Most of the previously reported cases revealed angio-invasion into a single vein. In our case, all of the seven major drainage veins from the thyroid were involved with tumor thrombus; however, there was no SVC syndrome.

Reconstruction of the vessels is necessary for cases with massive invasion and adhesion to the great veins. Cases utilizing expanded polytetrafluoroethylene grafts or autologous tissue for reconstruction of mediastinum great veins are reported.

Appropriate preoperative vascular imaging is important whenever angio-invasion is suspected. Enhanced CT and ultrasonography is reported to be useful for detecting tumor thrombi of thyroid malignancies. Taib and Hisham described the importance of the positive ring sign, which is a rim of contrast around the tumor thrombus on enhanced CT examination. This sign indicates the possibility of removing the thrombus by thrombectomy (without reconstruction) and is useful in deciding the surgical strategy. In our presented case, this sign was positive. Kobayashi et al. reported the importance of ultrasonography for preoperative detection of tumor thrombus of thyroid malignancies, which was also useful in our presented case (data not shown).

Multimodality treatment is recommended including surgery, external beam radiotherapy (EBRT), and RI therapy for aggressive thyroid cancer with great vein involvement. In our case, both EBRT and RI therapy was given. High preoperative serum thyroglobulin levels (11,500 ng/mL) supported the indication of RI therapy. The patient’s serum thyroglobulin level decreased to the normal range (15 ng/mL) and has been well controlled.

CONCLUSION
We report a rare case of poorly differentiated follicular carcinoma of the thyroid with extensive invasion into the bilateral internal jugular veins, brachiocephalic vein, and superior vena cava. The patient was treated with surgery followed by radiation therapy. Preoperative evaluation by appropriate imaging is important for planning the treatment strategy. Multimodality treatment, including surgery, is recommended whenever possible.

BIBLIOGRAPHY