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CASE REPORT

Large Substernal Thyroid Goiter Associated with Saddle Pulmonary Embolism

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ABSTRACT

A 75-year-old woman with a longstanding history of a substernal thyroid goiter presented with acute shortness of breath, and she was intubated due to respiratory distress. Computed tomography (CT) scan revealed a compressive substernal goiter with associated vascular compression, axillosubclavian thrombosis, and saddle pulmonary embolism. Weight-based heparin was immediately administered, and the patient subsequently underwent successful thyroidectomy via a cervical incision. This case report of a rare saddle pulmonary embolism associated with a substernal thyroid goiter underscores the importance of early elective thyroidectomy. Successful management of these potentially devastating pulmonary emboli (PE) associated with large substernal goiters is possible.

Keywords: Cervical thyroidectomy, Saddle pulmonary embolism, Substernal goiter, Thromboemboilc disease.

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INTRODUCTION

Substernal thyroid goiters have been linked to the formation of deep vein thrombosis (DVT).[1-3] As a substernal thyroid goiter enlarges, its mass effect can compress surrounding structures in the thoracic outlet. More specifically, the axillosubclavian and internal jugular veins can become compressed against the first rib, sternum, strap muscles, and thyroid goiter. If the enlarging thyroid goiter with a substernal component impinges on surrounding vascular structures, collateral circulation will not be able to compensate, resulting in venous stasis.[4] Venous stasis, coupled with endothelial injury from the mass effect, results in a thrombogenic condition.[3] Postural changes can temporarily decompress veins, enabling a thrombus to dislodge and travel into the pulmonary circulation.[5] This case report demonstrates the association of a large substernal thyroid goiter with an acute saddle pulmonary embolus.

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CASE REPORT

A 75-year-old woman with a known history of a thyroid goiter initially discovered 40 years ago presented to an outside hospital with acute onset of shortness of breath. Visible neck enlargement with the lower border of the thyroid gland extending into the thoracic outlet was evident. No facial or arm swelling, or dilated upper extremity vessels were observed. The patient was intubated due to respiratory distress and transferred to the author's institution where an acute saddle pulmonary embolism was discovered on imaging studies. Full-dose heparin was started immediately according to a weight-based intensive care unit (ICU) protocol.

Thyroid studies showed normal free T4 and T3 and mildly depressed thyroid stimulating hormone. Chest computed tomography (CT) showed an enlarged thyroid gland extending from the angle of the mandible superiorly to the level of the carina inferiorly. The substernal component of the thyroid gland displaced adjacent structures including the carotid arteries and jugular veins. The left internal jugular vein was narrowed at the thoracic outlet by the thyroid gland medially and the first rib laterally (Fig. 1). Chest CT showed rightward deviation and narrowing of the upper trachea and a large central filling defect consistent with an acute pulmonary embolus involving the pulmonary artery bifurcation, left pulmonary artery, and multiple left lobar and segmental branches (Figs 2 and 3). Duplex ultrasound of the upper extremity showed slow flow and a clot in the left axillary vein. Echocardiogram showed no evidence of right ventricular strain.

After 3 days of heparinization, the patient was taken to the operating room. Transesophageal echocardiogram showed pulmonary artery enlargement, but no visualization of the embolus. The patient was prepared such that sternotomy, cardiopulmonary bypass, and embolectomy

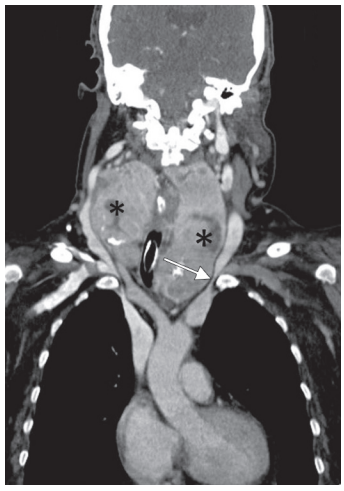

Fig. 1: Coronal CT of chest and neck with intravenous contrast shows large goiter (asterisks) with extension into superior mediastinum and compression of the left internal jugular vein (arrow)

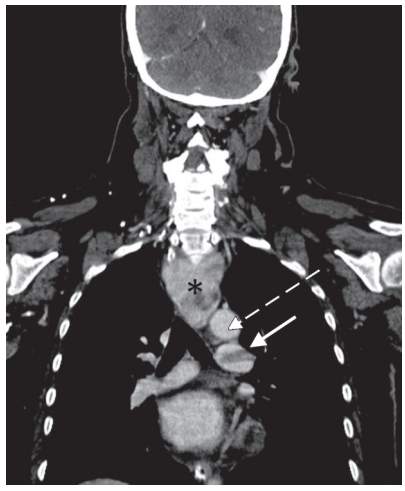

Fig. 2: Coronal CT (chest and neck) with IV contrast shows the inferior extent of the goiter (asterisk) into the superior mediastinum at the level of the aortic arch (dotted arrow). The filling defect in the left main pulmonary artery is consistent with PE (solid arrow)

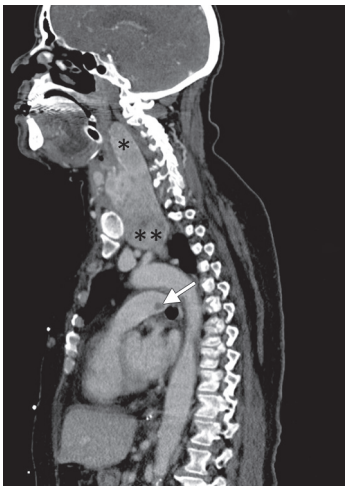

Fig. 3: Left para-sagittal CT of neck and chest with intravenous contrast. The goiter extends from the retropharyngeal region (asterisk) to the superior mediastinum (2 asterisks). Note the filling defect in left main pulmonary artery (arrow)

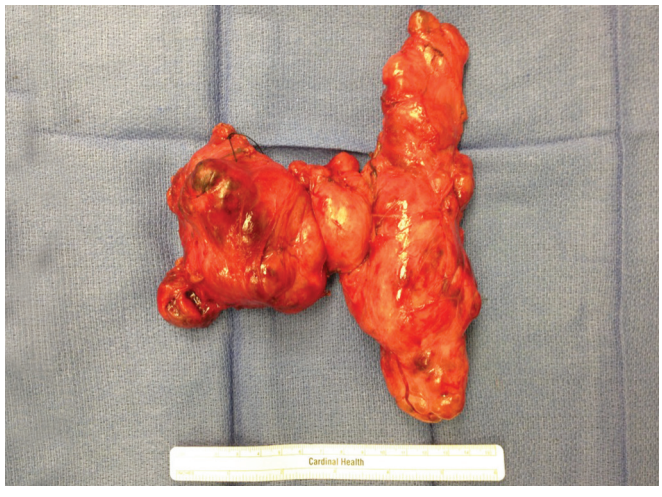

Fig. 4: Total thyroidectomy, gross specimen. Short black silk suture marks the right superior pole. White measuring tape denotes 15 cm

could be performed if necessary. A 12 cm collar incision was made in the lower portion of the neck 1.5 cm above the clavicular head. The enlarged thyroid was mobilized and removed via a cervical approach, without the need for median sternotomy. The gland weighed 410 gm and measured 16 × 13 × 6.5 cm (Fig. 4). Final pathology revealed multinodular thyroid hyperplasia. The patient was taken to the ICU and intravenous heparin was restarted 24 hours postoperatively.

The postoperative course was complicated by mild to moderate acute respiratory distress syndrome and expectantly managed. The remainder of her postoperative course was uneventful and she was discharged home on postoperative day 24. At 6-month follow-up, the patient is doing well with no complaints or physical deficits.

DISCUSSION

Upper extremity DVT and pulmonary emboli (PE) caused by substernal thyroid goiters are rare, with only a handful of reported cases in the literature.[1-3,5] One explanation for the infrequency of thyroid goiter-induced upper extremity DVT and PE is that their chronic and indolent growth pattern allows for the development of collateral circulation that helps prevent venous stasis, and thus, formation of DVT and pulmonary embolism.[2,4] Additionally, large substernal goiters are uncommon. One study showed that out of 3,233 thyroidectomies performed, only 220 patients had "large" substernal goiters defined as >100 gm.[6] Since they are infrequent in general, and inherently slow growing, the occurrence of DVT and PE from substernal thyroid goiters is rare.

In 2010, this patient was evaluated for total thyroidectomy. Due to the significant substernal extension she was counselled that sternotomy may be needed. The patient refused surgical treatment because she was asymptomatic and would not accept the possibility of sternotomy. Five years later, due to mass effect on the thoracic outlet, she developed DVT and acute PE leading to respiratory failure. Definitive total thyroidectomy for venous and airway decompression was therefore performed. This operation was successfully accomplished via a cervical incision. Elective thyroidectomy may have precluded this acute presentation by preventing the vascular compression, which resulted in the acute PE. Considering the chronic growth pattern of thyroid goiters, there should be ample time to intervene while patients are younger and better candidates for elective surgery. This management approach might prevent urgent interventions in older patients who are frequently less favorable surgical candidates. Elective removal of substernal thyroid goiters should be considered, early after detection, before surgery becomes emergent.[7]

Most substernal thyroid goiters can be resected through a cervical incision.[8] Patients who undergo median sternotomy, compared to the cervical approach, were more likely to have complications, including recurrent laryngeal nerve injury, postoperative bleeding, and longer hospital stay.[6,9] This patient had a 410 gm goiter measuring 16 × 13 × 6.5 cm resected via cervical incision, demonstrating that this surgical approach is feasible in the largest of thyroid goiters. Since the cervical approach decreases morbidity, patients with large substernal goiters should be referred to tertiary centers with high volume, skilled surgeons who perform this procedure routinely.

Finally, cardiac surgery should be involved and full heparin anticoagulation should be started promptly when a substernal thyroid goiter and saddle embolus present concurrently. Starting full heparin anticoagulation is vital because it may prevent the need for sternotomy and pulmonary embolectomy. Interdisciplinary support from cardiac surgeons, critical care intensivists, and anesthesiologists is paramount in the care of such patients from the time of diagnosis through discharge. In the case of hemodynamic instability, sternotomy followed by pulmonary embolectomy may be required to remove the saddle embolus.

CONCLUSION

This case illustrates that a large substernal thyroid goiter can be associated with a pulmonary saddle embolus in addition to axillosubclavian vein thrombosis. Substernal thyroid goiters should be removed electively, before surgery becomes urgent. When urgent cases arise, high volume and experienced surgeons at tertiary care centers are more likely to perform successful cervical thyroidectomies on the largest goiters, have the lowest complication rates, and have the strongest interdisciplinary support from cardiac surgeons, critical care intensivists, and anesthesiologists. Finally, in the case of substernal thyroid goiters with concomitant pulmonary saddle embolus, full heparin anticoagulation may help prevent the need for sternotomy and pulmonary embolectomy.

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