

## Cervical Approach for Retrosternal Struma: A Case Report

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**Abstract:** Retrosternal struma is the inclusion of the thyroid gland into the thoracic cavity. Combined access with a neck incision and chest incision or only a neck incision to free the tumor from the chest cavity and avoid damage to surrounding tissues, makes treatment of substernal struma a challenge both preoperatively and during surgery. Systematic technique minimizes the need for sternotomy, even in patients with significant intra thoracic components, and keeps severe complication rates at levels comparable to those of conventional thyroidectomy. We reported a 46-year-old woman complaining of lumps on the right and left neck for six years. The masses were found on the right side of the neck (10x6cm) and on the left side of the neck (4x3cm), which were hard consistency, well-defined, immobile, skin-colored, painless, and moving when swallowing. CT-scan showed a solid mass struma that had entered the superior thoracic aperture. Total thyroidectomy was performed through cervical approach with a good outcome. In conclusion, total thyroidectomy through a cervical approach is able to remove the entire thyroid gland tissue extending to the retrosternal region with a good outcome without performing a sternotomy.

**Keywords:** retrosternal struma; thyroidectomy; cervical approach

## INTRODUCTION

Retrosternal struma is thyroid enlargement with the largest mass along dermal sternum from the neck to the substernal part progressing below the thoracic inlet and is biologically inseparable from nodular struma. Although there are different definitions for retrosternal struma, the currently accepted definition is the presence of more than 50% of the thyroid gland mass below the thoracic inlet. Enlargement of the thyroid gland does not occur in the neck area only, but there can also be enlarged thyroid gland reaching the thoracic cavity called retrosternal struma.<sup>1</sup> Haller was the first one reporting a case of retrosternal struma in 1749. The incidence of retrosternal struma ranges from 1% to 20% of all thyroidectomy cases. Retrosternal struma is more common in males with a short and wide neck. The entry of the thyroid gland into the thoracic cavity is influenced by the swallowing process, intrathoracic negative pressure, gravity, and the anatomical structures around the thyroid gland. Retrosternal struma often has no symptoms if it does not crowd the surrounding organs or cause narrowing of the trachea.<sup>2</sup>

Retrosternal struma can be classified as primary or secondary, depending on the different blood supply. The primary retrosternal struma is rare, accounting for less than 1% of retrosternal struma. It arises from ectopic thyroid tissue in the mediastinum, having its blood supply directly from nonanatomic mediastinal vessel. The secondary retrosternal struma arises from an enlarged thyroid gland which has increased its volume and has extended below the thoracic inlet, having its blood supply drawn from the cervical vessels.<sup>3</sup>

Total thyroidectomy represents the most performed procedure in surgery. It is associated with low morbidity, mostly represented by recurrent laryngeal injury and post operative hypoparathyroidism, and virtually no mortality. It could be performed through a cervical or extracervical approach. In most cases, thyroidectomy can be easily conducted through cervical access, but a sternotomy or thoracotomy may be necessary for primary retrosternal struma and when the gland is predominantly intrathoracic, or when infiltration into surrounding structures is highly suspected at the preoperative assessment. However, when total thyroidectomy is performed for retrosternal struma, a higher risk of postoperative morbidity is variously reported in the literature, mainly represented by postoperative hypoparathyroidism and recurrent laryngeal nerve injury (RLNI).<sup>4</sup>

We reported a case of a woman with retrosternal struma who initially presented with complaints of enlargement of the neck. A CT-scan examination revealed extended thyroid gland to the superior thoracic aperture. Total thyroidectomy surgery was performed with a cervical approach with successful removal of the entire thyroid gland tissue and good postoperative result.

## CASE REPORT

A 46-year-old woman complained of lumps on the right and left sides of her neck that appeared six years ago. The lump was initially round and sized of a marble on the right side of the neck, but over time the lump enlarged and spread to the left side. On neck examination, lumps were found on the right and the left sides of neck, sized 10x6 cm and 4x3 cm, respectively, with hard consistency, well-defined, immobile, skin-colored, painless, and moving when swallowing (Figure 1). Other complaints such as difficulty in breathing, palpitations, difficulty in swallowing, and fatigue were denied. Drastic weight loss, history of previous illness, and history of similar illness in the family were denied.

Physical examination of the thorax, abdomen, and other extremities found no abnormalities. The thorax X-ray examination revealed bilateral soft tissue mass in regio coli that had entered the superior thoracic aperture.

Thyroid ultrasound on the right enlarged thyroid showed multiple nodules, heterogeny, relative solid, various sizes, and Doppler examination revealed vascularization at the periphery of the nodule. Meanwhile, thyroid ultrasound on the left thyroid showed enlarged size, appearing multiple nodules with heterogeny, relative solid, and various sizes.



**Figure 1.** Front and lateral side show enlargement lumps on the right and left neck (red arrows)

Doppler examination revealed vascularization on the periphery of the thickened isthmus nodule, hypoechoic oval lesion sized 1.2 cm in the left paracervical region, with conclusion of bilateral thyroid multinodular struma involving the isthmus (TIRADS US category 4) and left paracervical lymphadenopathy (Figure 2). The CT-scan showed bilateral multinodular struma especially the right side, solid nodule/mass structure with calcification, nodule with irregular surface and indistinct border that had entered the superior thoracic aperture. FNAB examination was performed with the result of benign follicular nodule.



**Figure 2.** Thyroid USG showed vascularization at the periphery of the nodule, lymphadenopathy of left paracervical region, and multiple nodules of the thyroid



**Figure 3.** The removed thyroid gland by total thyroidectomy surgery with a cervical approach, measuring 9x15.5 cm of the right lobe and 8x6 cm of the left lobe

Surgery was performed on patient in hyperextended head position with pillow under the shoulder. Collar incision two fingers above the jugulum was performed and deepened by cutting the m. platysma to the superficial collar fascia. A flap was made up to the thyroid cartilage emirensia and down to the jugulum, both flaps were teased up and down on linen. Superficial collar fascia was opened on the midline from the hyoid cartilage to the jugulum. The right and left pretrachealis (sternohyoid and sternothyroid) muscles were separated laterally by detaching them from the thyroid capsule. The right lobe thyroid bulge was fluxed, appearing 9 x 15.5 cm in size, firm spongy consistency, pyramidal lobe (+). Left lobe thyroid bulge was fluxed, 8 x 6 cm in size, firm spongy, and pyramidal lobe (+). Right superior and inferior parathyroid glands were identified and preserved. The upper pole of the thyroid gland was freed from the ligament of Berry and thyroid cartilage starting from superior posteriorly to inferior with identification of the external branch of the superior n. laryngicus. Then a. thyroidea superior and v. thyroidea superior were ligated and excised. Removal of the entire thyroid tissue was performed from upper pole of the thyroid gland was freed from the ligament of Berry and adhesion on the trachea starting from superior to inferior, further identification, retrosternal struma was seen, struma was freed from surrounding tissue, then the retrosternal struma tissue is lifted upward through the cervical approach. Bleeding was controlled, and further identification revealed that the entire struma had

been removed (Figure 3). Then the surgical wound was closed layer by layer by leaving a Redon drain. After performing the total thyroidectomy surgery with a cervical approach, the entire tissue was successful removed and the subsequent follow-up showed a good postoperative result.

## DISCUSSION

A 46-year-old woman complained of lumps on the right and left sides of her neck. The lump on the right neck measured approximately 10x6cm, and on the one on the left neck 4x3cm. The lump felt hard in palpation, painless, and no itching. X-ray examination revealed obtained bilateral soft tissue mass in regio coli that had entered the superior thoracic aperture.

Struma or goitre is an enlargement of the thyroid gland. A normal thyroid gland measures 4 to 4.8 cm in sagittal dimension, 1 to 1.8 cm in transverse dimension, and 0.8 to 1.6 cm in anteroposterior dimension, equivalent to a volume of 7 to 10 mL on ultrasound calculation and a weight of 10-20 grams. Retrosternal struma is the ingress of 50% or more of the thyroid gland into the thoracic cavity. Many terms are used to describe the entry of the thyroid gland into the thoracic cavity including substernal struma, intrathoracic struma, retrosternal struma, and mediastinal struma.<sup>5</sup>

Retrosternal struma is classified into primary and secondary. Primary retrosternal struma, also called aberrant struma, occurs in only about 1% of all retrosternal struma. It is formed from an accessory (ectopic) thyroid gland located in the chest cavity. Primary retrosternal struma has no connection with the thyroid gland in the neck and does not receive blood supply from the neck. Secondary retrosternal struma is the most common case of retrosternal struma. The thyroid gland descends down the neck into the thoracic cavity, so that, there is a connection between the thyroid gland in the neck and the thyroid gland in the thoracic cavity. The descension of thyroid gland to the thoracic cavity is influenced by various factors such as increasing weight of the thyroid gland, intrathoracic negative pressure, breath movement, swallowing process, and short neck shape coupled with the absence of anatomical structures as a barrier between the lower neck and the thoracic inlet.<sup>5</sup>

The patient's complaints such as difficulty of breathing, palpitations, difficulty in swallowing, fatigue, and drastic weight loss were denied. History of previous illness and history of similar illness in the family were also denied. Symptoms in patients with multinodular struma depend on the size and function of the nodules or the total volume and location of the thyroid gland. This can vary from asymptomatic patients detected through physical examination or imaging methods to patients with symptoms of compression, hyperthyroidism, or symptoms of hypothyroidism.<sup>6</sup> The prevalence of nodular struma is higher in older age. In diffuse or multinodular struma, asymmetrical facial cosmetic problems may occur without any other symptoms. In rare cases, patients complain of sudden pain and rapidly developing swelling in the neck after bleeding in a thyroid nodule. Struma-related symptoms can be classified as local symptoms due to the size and location of the thyroid gland, or systemic symptoms independent of the size of the gland.<sup>7</sup>

On neck examination, a mass was found on the right side of the neck measuring approximately 10x6 cm and one on the left neck approximately 4x3 cm, with a hard consistency, well-defined, immobile, skin-colored, painless, and moving when swallowing. Palpation is performed to examine dimensions, location, sensitivity, mobility of the thyroid gland, size and consistency of the thyroid nodule, and evaluation of pathologic lymph nodes. During the physical examination, the patient's upper chest and posterior neck should be exposed for palpation of lymph node metastases. If a mass is found in the neck by palpation, but the lower border of the mass cannot be palpated up to the sternum, a retrosternal struma should be suspected. During extension, the patient is asked to drink water, hyperextend, or wait for 30 seconds with his/her arms folded above the head. In this maneuver, the lower and posterior borders of the thyroid gland can be palpated, as the intrathoracic portion will rise. In addition, redness of the skin and protrusion of the external jugular vein during this maneuver indicate a positive Pemberton sign. If the patient has also retrosternal tracheal compression, dyspnea and stridor may occur during this maneuver.<sup>7</sup>

The thorax X-ray examination showed bilateral soft tissue masses in the neck that had entered the superior thoracic aperture. The thyroid ultrasound obtained enlarged size of the right thyroid gland with appearing of heterogeneity and relative solid multiple nodules of various sizes, and Doppler examination indicated vascularization at the periphery of the nodule. Moreover, enlarged size of the left thyroid with appearing of heterogeneity and relative solid multiple nodules of various sizes. The main reasons for the use of thyroid ultrasonography are availability, low cost of the procedure, and minimal radiation. Ultrasound can detect non-palpable nodular cysts, estimate the size or volume of nodules and struma, monitor changes after therapy, and guide fine needle aspiration biopsy (FNAB).<sup>8</sup>

The result of FNAB examination was benign follicular nodule, which was in accordance with the theory that retrosternal struma was more often benign than malignant.<sup>7</sup> In patients with nontoxic struma, 58% have significant reduction in thyroid volume, but regrowth is seen after discontinuation of therapy.<sup>9</sup> Non-toxic struma has a good prognosis. If the thyroid gland continues to enlarge, it can compress the surrounding structures and may cause difficulties in breathing and swallowing as well as hoarseness, therefore, surgical treatment should be considered.<sup>10</sup>

The patient was operated using a cervical approach with a collar incision. Total thyroidectomy is indicated in patients affected in both lobes. Struma that extends intra-thoracally can be removed through a cervical approach (Kocher incision). However, retrosternal struma surgery is challenging for surgeons. The best surgical approach should be determined based on CT scan evaluation. The complete capsule and the clear boundary between the retrosternal struma and the surrounding tissue are the most important factors for surgery.<sup>11</sup> The collar incision is the standard access for retrosternal struma, except for around 2% who may need for either manubriotomy, sternotomy, or thoracotomy. Most retrosternal struma can be totally removed through a cervical approach, while a partial or total sternotomy should be performed only in a minority of patients, ranging between 1-11%. When performing a thyroidectomy for a retrosternal struma, an experience with a specific interest in thyroid surgery is needed. Although most retrosternal struma can be safely resected through a cervical incision, the combined cervical-thoracic approach has been reported to be necessary in up to 2% of cases. An agreement has been reached that sternotomy is not to the routine recommendation, since a collar incision is sufficient in most situations.<sup>12</sup> After total thyroidectomy through a cervical approach, it is able to remove the entire tissue that extends to the retrosternal region with a good outcome.

## CONCLUSION

Retrosternal struma surgery is still challenging for surgeons. The complete capsule and the clear boundary between the retrosternal struma and the surrounding tissue are the most important factors in surgery. Most struma retrosternal can be totally removed through a cervical approach. Occasionally, the mediastinal mass may be too bulky, deep, or fragile to use instruments or sutures to deliver it into the neck. Therefore, additional surgical access through median sternotomy, or partial upper manubriotomy, or a thoracotomy is needed. Surgery is considered in a large volume struma because of high risk of neck compression. In this case, total thyroidectomy through a cervical approach was performed and was able to remove the entire tissue that extended to the retrosternal region with a good result without performing a sternotomy.

## Conflict of Interest

The authors confirm no conflict of interest in this study.

## REFERENCES

1. Simó R, Nixon IJ, Vander Poorten V, Quer M, Shaha AR, Sanabria A, et al. Surgical management of intrathoracic goitres. *Eur Arch Otorhinolaryngol*. 2019;276(2):305-14. Doi:10.1007/s00405-018-5213-z
2. Sheng YR, Xi RC. Surgical approach and technique in retrosternal goiter: case report and review of the literature. *Ann Med Surg (Lond)*. 2015;5:90-2. Doi: 10.1016/j.jamsu.2015.12.057

3. Knobel M. An overview of retrosternal goiter. *J Endocrinol Invest.* 2021;44(4):679-691. Available from: <https://doi.org/10.1007/s40618-020-01391-6>
4. Cappellacci F, Canu GL, Rossi L, De palma A, Mavromati M, Kuczma P, et al. Differences in surgical outcomes between cervical goiter and retrosternal goiter: an international, multicentric evaluation. *Front Surg.* 2021;11:1341683. Doi 10.3389/fsurg.2024.1341683
5. Mawardi M, Maranatha D. Seorang penderita dengan retrosternal goiter. *Jurnal Respirasi.* 2016;2(1):14-24. Doi: <https://doi.org/10.20473/jr.v2-I.1.2016.14-23>
6. Yong JS, Loh KS, Petersson BF, Thong M. Multinodular goiter: a study of malignancy risk in nondominant nodules. *ENT-Ear Nose Throat J.* 2017;96(9):336-342. Doi: 10.1177/014556131709600821
7. Alkabban FM, Patel BC. Nontoxic Goiter. [Updated 2023 Aug 8]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK482274/>
8. Can AS, Rehman A. Goiter. [Updated 2023 Aug 14]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK562161/>
9. Singh G, Anastasopoulou C, Correa R. Diffuse toxic goiter. [Updated 2023 Feb 27]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK557859/>
10. Mauriello C, Marte G, Canfora A, Napolitano S, Pezzolla A, Gambardella C, et al. Bilateral benign multinodular goiter: What is the adequate surgical therapy? A review of literature. *Int J Surg.* 2016;28(Suppl 1):S7–12. Doi:10.1016/j.ijssu.2016.07.067.
11. Hafez MT, Abdelmaksoud MM, Awany S, Jamjoom AO, Emlaadawy Mabelwahab K. Cervical approach for retro-sternal goiter reaching the arch of the aorta should be always your first option. *Med J Cairo Univ.* 2021;89(6):2403-9. Doi: 10.21608/mjcu.2021.216074
12. Wang X, Zhou Y, Li C, Cai Y, He T, Sun R, et al. Surgery for retrosternal goiter: cervical approach. *Gland Surg.* 2020;9(2):392-400. Doi: 10.21037/gs.2020.03.43