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Case Report

Management of Large Cervical Thyroid Goiters

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Abstract

Thyroid goiter is a common condition caused by iodine deficiency or autoimmune diseases. Multiple factors can play into the prognosis of thyroid goiter such as location, responsiveness to medical management, and endocrine disturbances. Thyroidectomy and/or radioiodine ablation are the current standards for treatment of this condition. Diagnosis is based on history of foreign residence, physical exam, and clinical manifestations. Cervical and substernal thyroids represent the most common locations for the gland. Symptoms from thyroid goiters range from obstructive respiratory symptoms, dysphagia, nerve palsies, or thyroid malfunction. In very rare cases, goiters can present larger than 10 cm in length with major clinical manifestations. In numerous underdeveloped countries, extremely large goiters present a major challenge to manage due to lack of iodine in food products. Many of these patients present to the U.S. with severe dyspnea and other compressive symptoms that can complicate surgical intervention. Unfortunately, there is no current standard for the appropriate management of these larger masses, especially if malignancy is present. Most of the previous literature suggests subtotal thyroidectomy, but contains minimal follow-up in order to establish adequate treatment protocols. Over the last decade, our clinic has seen 12 patients presenting with true cervical thyroid masses larger than 10 cm, all with major obstructive symptoms. Due to the size of the masses, special considerations to airway management (including elective tracheostomy) is needed. We present a multidisciplinary approach and outcomes for this rare condition, with special considerations to the surgical techniques used.

Keywords: Cervical Thyroid; Goiters; Tracheostomy

Introduction

Thyroid goiters are an abnormal growth of the thyroid gland caused by autoimmune disease, thyroid malfunction, or iodine deficiency [1,2]. They can be diffuse or nodular, and can present with normal or abnormal thyroid function. While the incidence of thyroid goiter is reported to be 2.92% at its peak, the malignancy is treated with surgical intervention via thyroidectomy, radioiodine ablation, and/or Levothyroxine suppressive therapy to prevent reoccurrence [3]. In nearly all cases, thyroidectomy is the preferred treatment over medical management as it has been shown to be the most definitive method of symptom resolution [4].

A normal thyroid gland encircles the trachea on the anterior side of the neck caudal to the larynx and posterior to the esophagus. Typically, goiters are recognized based on clinical presentation and physical exam, often manifesting with mass effect and compressive symptoms. Patients with symptomatic goiters frequently present with a cervical/sternal mass, dyspnea, dysphagia, and hoarseness [5-7]. In some cases, superior vena cava syndrome and secondary malnutrition have also been reported [5-7].

In very rare cases, goiters can present larger than 10 cm and cause major clinical manifestations. These large cervical thyroid masses have become rare in the US since the addition of iodine to multiple foods [8], but they continue to be a prevalent issue in third-world countries where iodine supplementation is not commonly used and treatment is difficult to seek. These large goiters present unique surgical challenges such as increased difficultly in avoiding crucial nerves and vessels during resection.

We report our surgical approach to these rare, large goiters with particular focus on cervical access over the sterno-thoracic approach commonly used.

Methods

We retrospectively reviewed all patients presenting with thyroid masses at our institution over the last 10 years. Extremely large masses were defined as greater than 10 cm in length. Patients presenting with predominantly substernal masses were excluded, as were any patients that required sternotomy or a thoracic approach. The remaining cases represented purely cervical goiters.

Symptoms of dysphagia, dyspnea, and malnutrition were recorded, along with type of thyroidectomy, airway management, and malignancy.

Results

Over the past 10 years, our clinic saw a total of 29 patients presenting with extremely large thyroid masses. After the exclusions of substernal masses and patients requiring sternotomy or a thoracic approach, a total of 12 patients remained who met the criteria for cervical thyroid masses larger than 10 cm. Out of the observed 12 patients, every one presented with some degree of dysphagia and most were found to have tracheomalacia as well. Shortness of breath (SOB) was found in nine of the 12 patients, which was attributed to mass effect of the thyroid goiter. Of those nine patients, four had complete resolution of their SOB after thyroidectomy. Additionally, 3/12 patients had significant malnutrition at the time of presentation and required nutritional support via a PEG tube. The PEG placement was required in order to obtain an adequate preoperative nutritional state.

All 12 patients underwent operative therapy with three undergoing subtotal thyroidectomy and nine undergoing total thyroidectomy. Of the 12 patients, 10 underwent elective tracheostomy for airway protection, with one patient requiring tracheostomy prior to thyroidectomy due to the inability to intubate the patient safely. Only one patient had a malignancy on pathology, which was identified as a follicular carcinoma and was treated with radioiodine postoperatively. There were zero nerve injuries or mortalities in our series at a follow-up time of 3 months.

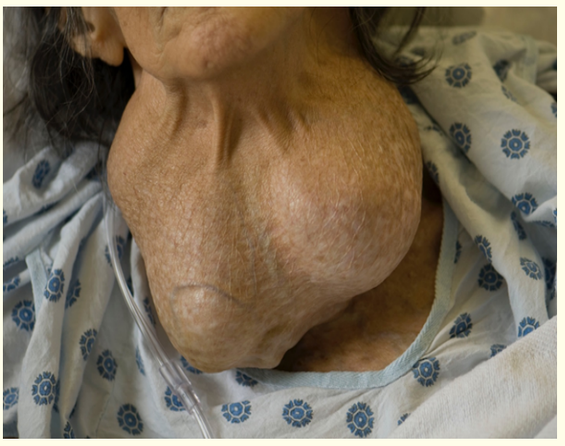

Figure 1: Large Cervical Thyroid Goiter causing airway compromise

Discussion

Approaches to extremely large thyroid masses depend on the symptoms and underlying condition, and are often modified based on the specific presentation. Previous literature has examined multiple surgical approaches, taking the unique challenges due to goiter location and size into consideration. In one such case, Veronesi., *et al.* [11] reported a giant intrathoracic goiter treated with a cervicosternotomic approach and mediastinal structure dislocation only to find strong adherences complicating the excision. Additionally, Chen., *et al.* [12] reported the use of a right posterolateral thoracotomy approach for a posterior mediastinal goiter with compressive symptoms.

In the case of benign cervical conditions, multiple techniques are used. In a study of 123 patients, Gao., *et al.* [13] reported 79 patients who underwent bilateral subtotal thyroidectomies, and over 40 patients who underwent unilateral subtotal thyroidectomies, both with good outcomes. Subtotal thyroidectomy can be used in these situations as the procedure rarely causes nerve invasion or entrapment. However, malignant thyroid nodules present a much greater problem, typically involving the nerve and/or parathyroid glands, as well as the trachea itself. In extremely large thyroid goiters, esophageal and large vessel invasion can also be present.

In patients presenting to our specialty clinic, we evaluate for airway compromise, nerve involvement, and dysphagia symptoms, as well as thyroid and parathyroid gland function. Patients with thyroid goiters greater than 10cm are considered extremely large and undergo an extensive work-up prior to surgery.

When a patient presents with large thyroid goiter, they will undergo a triple endoscopy to evaluate cord movement, esophageal impingement, and tracheal collapse. In cases where the goiter has been present for five or more years, the risk of tracheomalacia and required tracheostomy is increased [14]. If tracheal collapse or cord dysfunction is identified, the surgical approach is altered accordingly. In addition, patients are also seen by the pulmonary department in order to evaluate underlying lung function, as many require tracheostomy at the time of surgery [15]. All abnormal nodules are biopsied to evaluate for underlying malignancy, followed by a total thyroidectomy if there is suspicion of malignant transformation.

In the operating room, the patient is managed by the "difficult airway" team. The patient is prepared for awake intubation either by nasotracheal intubation or awake bronchoscopy and ET tube placement [16], and the patient's neck is then prepped prior to initiation of anesthetics in case of sudden airway loss or emergent cricothyroidotomy. Patients are kept sitting upright at a level that is comfortable for them to breathe, and nerve monitoring is used in all cases. We report only one patient who was unable to be intubated prior to administration of anesthetics. This patient underwent open tracheostomy under monitored anesthesia care (MAC) prior to proceeding with thyroidectomy.

After securing the airway, the patient is placed in a supine position, prepped, and draped. A cervical incision is made 1-2 finger lengths below the cricothyroid membrane [17,18]. The incision is carried laterally beyond the mass to completely expose the Sternocleidomastoid (SCM) muscle, and is then carried below the platysma to the level of the infrahyoid muscles. Subplatysmal planes are created superiorly and inferiorly, which are carried slightly farther than in the typical thyroidectomy. Superiorly, the cricothyroid membrane and hyoid bone are exposed. Inferiorly the sternal notch and sternal attachment of the SCM are both completely exposed.

Similar to a typical thyroidectomy, the medial attachments of the sternohyoid muscles are then divided vertically to the sternal

notch and hyoid bone. If the entire thyroid mass can be lifted from the wound and the esophagus and trachea can be well visualized, the thyroidectomy is started. If these structures cannot be identified, the sternohyoid muscle is further divided horizontally to the superior belly of the omohyoid. This allows for complete visualization and control of the mass and crucial structures.

If the thyroid mass can be lifted, identification of the recurrent laryngeal nerve is attempted at the inferior border of the thyroid. If mass size or poor mobility prevents this, the nerve is identified in the tracheoesophageal groove as it exits from the thoracic cavity. Thorough identification and dissection of the recurrent laryngeal nerve at one of the different exits in its course is strongly recommended, as greater than 2% of near-total thyroidectomies result in nerve injury [19]. Once the nerve is identified, it is then carefully preserved and tested throughout the dissection while the thyroid is lifted. We routinely use nerve monitoring for all thyroid cases and strongly recommend it for difficult cases. The middle and inferior thyroid arteries are divided and the parathyroid gland is carefully preserved if possible. If the gland appears ischemic, a small section is sent for a frozen section confirmation, and the remaining portion is preserved for re-implantation. The final step is to carefully remove the superior pole of the thyroid while preserving the superior laryngeal nerve and parathyroid gland. The mass is then removed from the tracheal attachments.

If there is difficulty with dissection of the inferior thyroid or in preserving the recurrent laryngeal nerve, we often consider splitting the thyroid itself at the level of the trachea to reduce the mass and allow for easier manipulation of the gland. With this technique, the attachments to the trachea can be taken down prior to taking down the vascular supply. Care must be taken in these cases, as there is great variability in the nerve position and greater risk of injury inferiorly using this technique. Additionally, a subtotal thyroidectomy can be done to ensure nerve preservation. We suggest marking the residual thyroid tissue with a small clip for future identification. Finally, if malignancy is identified pathologically, iodine ablation of this residual tissue can be done post-operatively. This ablation has a 46% greater resolution rate then radioiodine alone [20].

If re-implantation of the parathyroid glands is necessary, we prefer to place these in the SCM muscle belly, and again mark this with a small clip to help with identification post-operatively. Unlike a subtotal parathyroidectomy, we re-implant all glands after pathology confirmation of parathyroid tissue. The glands are then minced and implanted into a small pocket within the SCM, which is then sutured, closed and clipped.

The surgical bed is carefully inspected and activated thrombin in collagen is placed in the field. Patients are placed in Trendelenburg and forced Valsalva is performed to a pressure of 40 mm HG. All patients with airway compromise, tracheomalacia, or difficulty with intubation undergo elective tracheostomy for airway protection.

Patients who do not undergo elective tracheostomy are awoken and extubated in the OR. Only after 5 minutes of breathing without the endotracheal tube is the wound closed. The sternohyoid is re-approximated, but the midline is not closed. The platysma is closed in an interrupted fashion, the excess skin is removed, and the incision is closed with interrupted sutures. Due to the large potential space, an opening is left in the skin at the midline to allow for the drainage of fluid and blood. We have transitioned over time to tight surgical dressing rather then drain placement in these patients.

After the procedure is completed, patients stay in the hospital with the head of the bed elevated. A minor kit is kept at the bedside for all patients. Patients with a tracheostomy are given education on tracheostomy care and discharged with the tracheostomy in place provided their calcium levels are normal [21]. One week post-surgery, the tracheostomy is removed in the office unless the patient has tracheomalacia. Patients with tracheomalacia are managed by the pulmonary team, and their tracheostomy is removed when tracheal compression is not significant for airflow. Once the tracheostomy is removed, an airtight dressing is placed over the site for an additional week. Patients who do not have a tracheostomy placed are monitored for 24 hours and then discharged home with visiting nurse care.

All patients are seen in the office at 1 week and a repeat triple endoscopy is performed for any patient who complains of dysphagia or voice changes. Parathyroid function is monitored and supplementation is given for any patient with symptoms or low levels.

Conclusions

Surgical management of extremely large cervical thyroid masses requires a multidisciplinary team and careful counseling of the patients. We believe this approach provides excellent results and high patient satisfaction. Our steps include:

1. Pre-operative thorough work-up and preparation including a triple endoscopy.
2. Difficult airway management team well skilled at bronchoscopy and nasotracheal intubation.

3. Wider dissection planes of the subplatysmal flaps and division of the sternohyoid if necessary.
4. Division of the thyroid mass in the midline to help with mobilization and identification of the recurrent laryngeal nerve.
5. Re-implantation of the parathyroid glands if ischemic.
6. Elective tracheostomy for airway protection.
7. Early and frequent follow-up for all patients. Repeat triple endoscopy for any patients with symptoms.

The importance of these modifications to the operative approach are to allow for better visualization and mobilization in these large masses. Additionally, close follow-up is essential in these patients in order to avoid late complications. Ultimately, we believe this approach provides for good results with low morbidity.

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Volume 2 Issue 1 January 2018