

Retrosternal Thyroid Goiter: 15 Years Experience

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Abstract

Background: Thyroidectomy for goiter is a common surgical procedure performed in most hospitals in Israel. Both general and ear, nose and throat surgeons are familiar with thyroidectomy for cervical goiters. In about 1–15% of thyroidectomies, the goiter is intrathoracic and requires somewhat different management. This topic has not been reviewed in the literature recently.

Objective: To evaluate the clinical presentation, preoperative workup, surgical complications and risk of malignancy in retrosternal goiters.

Methods: We retrospectively reviewed the records of 75 patients who underwent thyroidectomy for retrosternal goiter in the General Thoracic Surgical Department of our institution during a 15 year period, January 1990 to January 2005.

Results: All the patients (41 women and 34 men) were symptomatic at presentation, with choking and dyspnea being the most common complaint. Computerized tomography scan of the neck and chest were obtained before the operation in 71 patients (95%). Ten patients (13%) had a previous partial thyroidectomy. A cervical approach was used in 68 patients (91%). Seven patients (9%) required median sternotomy to complete the operation. One patient (1.3%) died from postoperative respiratory failure. Transient recurrent laryngeal nerve palsy occurred in 5 patients (7%) and permanent RLNP in 3 (4%). The incidence of transient and permanent hypoparathyroidism was 10% and 2.6% respectively. Sixty-six lesions (88%) were benign and 9 (12%) were malignant.

Conclusions: Choking and dyspnea are the most common presenting symptoms of retrosternal goiter. CT scan is an important component of the preoperative evaluation and operative planning. Surgical removal of the thyroid is the treatment of choice and most patients have symptomatic improvement following the operation. Since a substernal thyroidectomy may be technically different from cervical thyroidectomy, a surgical team familiar with its unique pitfalls should perform the procedure.

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Retrosternal, or intrathoracic, goiter was first described by Haller in 1749 [1]. The incidence of RSG varies considerably, ranging from 1% to 15% of thyroidectomies, depending on the defining criteria [2–5]. The accepted treatment is surgical resection. The indications for operation include compression of adjacent structures (most commonly the trachea), suspected malignancy, and thyroid function abnormality. The operative technique and the postoperative complications differ somewhat from cervical thyroidectomy, as discussed below.

RLNP = recurrent laryngeal nerve palsy

RSG = retrosternal goiter

Patients and Methods

From January 1990 to January 2005, 75 patients who fit Katlic's diagnostic criteria for RSG [5] underwent thyroidectomy in the General Thoracic Surgical Department of Rambam Medical Center. The department is the regional center for general thoracic surgery and has become a referral center for RSG. Approximately 50% of the patients were referred from other hospitals or outpatient clinics in northern Israel. The medical records of these patients were reviewed retrospectively. Preoperative evaluation included thyroid function tests, chest radiograph and computerized tomography scan of the neck (in 95% of the patients). Postoperative hypoparathyroidism was defined as symptomatic hypocalcemia that required calcium supplementation, or a calcium level under 7 g/dl with normal albumin concentration. Hypocalcemia was considered permanent if the patient still required calcium supplementation 6 months after surgery. Patients' records were analyzed with regard to age and gender, the surgical procedures performed, postoperative complications, and histology.

Results

Of the 75 patients who underwent thyroidectomy for retrosternal goiter, 34 were men and 41 were women [Table 1]. Seven patients (9%) had a history of previous partial thyroidectomy in another medical center.

Table 1. Patients' characteristics

Average age (yrs)	55 (range 23–85)
Male : female ratio	1 : 1.2
Location of RSG	
Left	37 (50%)
Right	26 (34%)
Bilateral	12 (16%)
Incision	
Standard collar	55 (73%)
Cervical T	13 (17%)
Partial sternotomy	5 (7%)
Complete sternotomy	2 (3%)
Operation	
Lobectomy + isthmectomy	52 (69%)
Subtotal thyroidectomy	11 (15%)
Total thyroidectomy	12 (16%)
Histology	
Benign nodular goiter	66 (88%)
Papillary Ca	5 (7%)
Follicular Ca	3 (4%)
Medullary Ca	1 (1%)

Table 2. Presenting signs and symptoms

Impending airway obstruction	4 (5%)
Respiratory (dyspnea, choking, stridor)	60 (80%)
Hoarseness	12 (16%)
Dysphagia	10 (13%)
Severe	3 (4%)
Neck mass	66 (88%)
Symptoms related to thyrotoxicosis	3 (4%)

All patients were symptomatic at presentation. Respiratory symptoms such as choking, dyspnea and stridor were the most common symptoms [Table 2]. Nine patients with compressive symptoms had no palpable goiter in the neck, however a RSG was found on chest CT scan [Figure 1]. All patients had a preoperative chest X-ray, and 71 (95%) had a CT scan of the neck and chest. The four patients who did not have a preoperative CT scan underwent the surgery before 1994.

In most of our patients a standard collar or a modified cervical T incision was adequate. Complete incision of the interclavicular ligament was performed in more than 90% of the cases. Sternotomy was performed in seven patients [Table 1]. The intrathoracic goiter was located anterior to the trachea in 62 cases (83%). In 13 patients (17%) a considerable portion of the goiter reached the pre-vertebral fascia posterior to the esophagus. Operative procedures included total thyroidectomy in 12 patients (16%) and subtotal thyroidectomy in 11 (15%). Fifty-two patients (69%) underwent lobectomy and isthmectomy. The histopathology results are shown in Table 1. Eighty-eight percent of lesions were benign nodular goiter and 12% were malignant.

The postoperative complication rate was 30%. Transient recurrent laryngeal nerve palsy occurred in 5 patients (7%) and permanent RLNP in 3 (4%). Two of the three patients with permanent RLNP had malignant tumors. The rate of transient and permanent hypoparathyroidism was 10% and 2.6% respectively. Other complications included postoperative bleeding and wound infection in one patient each (1.3%). Three patients (4%) required temporary tracheostomy following the operation due to bilateral RLNP (one patient) and prolonged mechanical ventilation (two patients). One patient with known ischemic heart disease and chronic obstructive pulmonary disease died a few hours following the operation from acute respiratory failure. Postmortem examination revealed intact trachea, recurrent laryngeal nerves and parathyroid glands.

In the postoperative period 80% of the patients reported immediate symptomatic relief. This improvement was most significant in patients with preoperative dyspnea and choking.

Discussion

Retrosternal goiters are classified as either primary or secondary [6,7]. The primary goiter is an exceptional finding and this group represents approximately 1% of substernal goiters. The primary intrathoracic thyroid is congenital and arises from aberrant tissue situated in the mediastinum. In most cases there is no connection with the normal cervical gland, and the blood



Figure 1. Preoperative CT scan of the chest in a patient with RSG

supply is from “non-anatomic” mediastinal vessels. The vast majority of retrosternal goiters are secondary [3–5,7]. These goiters originate from the downward extension of the gland along the planes of the cervical and mediastinal fascia. The blood supply arises principally from the inferior thyroid arteries and most of the venous return is through the inferior thyroid veins. The connection between the mediastinal and the cervical parts of the gland is usually apparent on the preoperative CT scan and during surgery [8].

The definition of RSG is not uniform and varies among authors. Lindskog and Goldenberg [4] defined RSG as a lesion of the thyroid extending to the fourth thoracic vertebra on chest X-ray, whereas Crile [2] described substernal goiter as one that extends down to the aortic arch. Hedayati and McHenry [9] considered every thyroid that extends below the manubrium as substernal goiter. Katlic and colleagues [5,10] proposed the most important definition from the practical point of view: they classified RSG as goiter with more than 50% of the gland mass inferior to the suprasternal notch. We support this definition. We used Katlic’s criteria to classify RSG in our study because this definition enables surgeons to properly assess the unique difficulties and the actual complication rate. Physical examination of these patients will reveal the presence of a goiter in approximately 90% of the patients, but the absence of a cervical mass does not exclude RSG. In 10% of the patients, the cervical component of the gland is not enlarged but the mediastinal portion of the goiter may be bulky and cause the symptoms. Unlike cervical goiters that may grow to enormous size and remain asymptomatic, retrosternal goiters tend to cause symptoms early in their course. The clinical manifestations of RSG are attributed to compression or displacement of the adjacent

aero-digestive tract and mediastinal great vessels at the thoracic inlet. Eighty percent of our patients had compressive symptoms, with dyspnea being by far the most frequent complaint. Although seldom seen, patients with RSG may develop acute airway obstruction which is usually attributed to intrathyroidal hemorrhage. In our series 4 patients (5%) required emergency operation due to impending airway obstruction. The cause for respiratory deterioration in these patients was the combined effect of severe prolonged mechanical pressure and acute edema and congestion. There was no evidence of intrathyroid bleeding. This surgical emergency is preventable by early diagnosis and elective resection of RSG upon diagnosis.

The preoperative workup of patients with RSG has not yet been standardized. General clinical evaluation including complete blood count, chemistry and thyroid function test is usually performed, as for patients with cervical goiter. The reported incidence of hyperthyroidism varies widely, ranging from 0% [12] to 50% [2]. In the present study only three patients (4%) had toxic goiter. The histopathologic diagnosis of RSG is similar to that of cervical goiters. The reported incidence of malignancy in the literature ranges from 3 to 17% [8–11]. Twelve percent of our patients had malignant thyroid tumor that required total thyroidectomy. Preoperative diagnosis of malignant RSG might be relatively difficult to establish. The reasons are sampling difficulties due to size and location of the gland and limited cytologic accuracy. Only one of our patients had a definitive preoperative diagnosis of malignant tumor.

Preoperative imaging workup for cervical goiters includes, in most cases, chest X-ray, thyroid ultrasonography and scintigraphy. On the basis of our experience and the data presented here, we conclude that this approach is not appropriate for patients with RSG. Although not established yet, the use of preoperative thoracic CT is of tremendous value for planning the operative strategy. The scan demonstrates the anatomic characteristics of the gland and its relationship with the trachea, the esophagus and the great vessels in the mediastinum. Thyroid ultrasonography and scintigraphy are not useful and should not be a routine part of the preoperative evaluation.

The surgical strategy for treating RSG is somewhat different from the one used for cervical goiter due to anatomic and physiologic dissimilarities. Firstly, the gland is usually larger than the thoracic inlet (and should be removed through this opening unless sternotomy is performed). Secondly, although situated in the mediastinum, the RSG blood supply originates in the neck. Thirdly, RSG growing into the mediastinum causes anatomic variations in the location of the recurrent laryngeal nerve and the parathyroid glands. Finally, venous congestion due to compromised drainage (pressure on the jugular and innominate systems) may cause severe venous bleeding until removal of the thyroid from the mediastinum is completed. These difficulties make retrosternal thyroidectomy unique and technically challenging. Dissection of the superior pole is similar to cervical thyroidectomy. The middle thyroid vein usually has a number of congested branches that should be meticulously tied to prevent bleeding. In most cases the anatomy of

the inferior thyroidal vessels and the location of the recurrent laryngeal nerves are not obvious. The surgeon should open the interclavicular ligament, find the correct plane for careful digital mediastinal exploration, and gradually bring the retrosternal part of the gland all the way through the thoracic inlet into the cervical incision. Only then can the anatomic conditions be clarified and the procedure completed. In some cases this step is impossible without sternotomy.

In this study, 91% of the patients underwent retrosternal thyroidectomy through a cervical incision. Opening the thoracic inlet was accomplished by dissection of the interclavicular ligament. In 9% of the patients it was not sufficient and a median sternotomy was required. In these cases, partial sternotomy is usually adequate. The complication rate following RSG resection is somewhat higher than the average rate for cervical thyroidectomy [12,13]. Recurrent laryngeal nerve injury and hypoparathyroidism are the most common complications. The anatomic variations and the wide mediastinal dissection are probably the main causes for this finding. Despite the extended procedure and the slightly elevated complication rate, 80% of the patients report immediate postoperative relief. The improvement is more significant in patients with severe preoperative dyspnea.

Based on our experience and the data presented in this paper we suggest early surgical consultation for patients with RSG. An incidental finding of RSG or recognized goiter with even mild dyspnea, choking or pressure sensation in the neck should be considered an adequate indication for surgical intervention. We strongly recommend CT scan of the neck and chest as an essential part of the preoperative imaging evaluation. CT provides preoperative information on the anatomic conditions. It is important that the surgeon be familiar with the anatomic relationship of the goiter with the trachea, blood vessels and esophagus in order to prevent devastating complications during the digital dissection. The surgical team treating patients with RSG should be familiar with cervical thyroid surgery but should also have a thorough knowledge of mediastinal anatomy and specific operative techniques in order to achieve good results.

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