Retrosternal Thyroid Goiter: 15 Years Experience

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Key words: thyroid, goiter, retrosternal, dyspnea

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 RNLP 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.

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

<table>
<thead>
<tr>
<th>Average age (yrs)</th>
<th>Male : female ratio</th>
<th>Location of RSG</th>
<th>Incision</th>
<th>Operation</th>
<th>Histology</th>
</tr>
</thead>
<tbody>
<tr>
<td>55 (range 23–85)</td>
<td>1 : 1.2</td>
<td>Left</td>
<td>37 (50%)</td>
<td>Lobectomy + isthmectomy</td>
<td>Benign nodular goiter</td>
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<tr>
<td></td>
<td></td>
<td>Right</td>
<td>26 (34%)</td>
<td>Subtotal thyroidectomy</td>
<td>Papillary Ca</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bilateral</td>
<td>12 (16%)</td>
<td>Total thyroidectomy</td>
<td>Follicular Ca</td>
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</tbody>
</table>

RNLP = recurrent laryngeal nerve palsy
RSG = retrosternal goiter

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.

RNLP = recurrent laryngeal nerve palsy
RSG = retrosternal goiter
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 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

<table>
<thead>
<tr>
<th>Presenting signs and symptoms</th>
<th>4 (5%)</th>
<th>60 (80%)</th>
<th>12 (16%)</th>
<th>10 (13%)</th>
<th>3 (4%)</th>
<th>66 (88%)</th>
<th>3 (4%)</th>
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<tr>
<td>Impending airway obstruction</td>
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<td>Respiratory (dyspnea, choking, stridor)</td>
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<td>Hoarseness</td>
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<td>Dysphagia</td>
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<td>Severe</td>
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<td>Neck mass</td>
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<td>Symptoms related to thyrotoxicosis</td>
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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.

References


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**Capsule**

**MicroRNA management**

MicroRNAs (miRNAs), small, ~22-nucleotide non-coding RNAs that have been found in most of the plants and animals so far studied, generally regulate gene expression by suppressing the activity of messenger RNAs (mRNA) bearing complementary target sequences. These targets, or “seeds,” are apparently only seven to eight nucleotides long, and so, all things being equal, should occur randomly throughout the genome with relatively high frequency. Farh and associates show that expression of regulated seed-bearing mRNAs correlates with the presence of the appropriate miRNA. However, non-regulated mRNAs present at high levels in miRNA-expressing tissues have a paucity of complementary seed matches in their sequence. Thus, miRNAs are influencing the expression, the evolution, or both of the majority of mRNAs.

*Science* 2005;310:1817

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**Capsule**

**Prions in urine?**

The factors enabling horizontal prion spread for diseases, including sheep scrapie and chronic wasting disease in deer and elk, have been discussed for many years. Seeger et al. found that infectious urinary prions are consistently shed by mice suffering from chronic inflammatory kidney conditions (nephritis) long before any clinical symptoms of scrapie are seen. In the absence of kidney inflammation, or if inflammation occurs in other organs (such as the liver in hepatitis), urinary prion infectivity was never observed, even in transgenic mice that over-express the prion protein. Thus, inflammation of excretory organs may be one of the co-factors responsible for the spread of prion diseases, and it may be important to screen biopharmaceuticals derived from urine.

*Science* 2005;310:324

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