Surgical management of retrosternal goiter: Local experience at a university hospital

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Abstract:
BACKGROUND AND OBJECTIVE: Retrosternal goiter (RSG) is a term that has been used to describe a goiter that extends beyond the thoracic inlet. Surgery plays an important role in the treatment of these patients, but whether all or selected patients with RSG should undergo this operation remains controversial. Our aim is to look into the demographics, presentation, and treatment of patients with RSG and essentially to determine the role of surgery in its treatment.

SETTING AND DESIGN: Retrospective study, teaching hospital-based.

METHODS: Retrospective analysis of 537 thyroidectomies performed at King Khalid University Hospital between 2003 and 2010. The twenty-six patients with RSG were analyzed further, with regard to demographics, presentation, indications, and outcome of surgical treatment. Statistical analysis was performed, where age was expressed as mean and range, and other variables were presented as numbers and percentage.

RESULTS: There were 26 patients (4.8%) with RSG out of 537 thyroidectomies, who underwent an operation for removal of RSGs, in a seven-year period. The most common presentation was dyspnea (34.6%) and the surgical procedure predominantly used was total thyroidectomy. The RSGs were removed by collar incision in 96% of the cases. The final histological diagnosis revealed malignancy in 26.9% of the thyroid specimens. There was no mortality and minor complications occurred in nine patients.

CONCLUSIONS: The presence of an RSG is an indication for surgery owing to the lack of effective medical treatment, the higher incidence of symptoms related to compression, low surgical morbidity, and the risk of malignancy.

Key words: Retrosternal goiter, surgery, thyroidectomy

Methods

Between June 2003 and June 2010, 537 patients underwent thyroid surgery at King Khalid University Hospital. Of them, 26 patients (4.8%) fit the diagnostic criteria of RSG and were enrolled in this study. The medical records of these patients were retrospectively analyzed. An RSG was diagnosed when the majority (>50%) of the gland was located below the thoracic inlet in the computerized tomogram (CT) scan. Large thyroid masses with their inferior borders at the thoracic inlet were not included. All patients had undergone investigations of thyroid namely; thyroid function tests, ultrasonography, chest X-ray, indirect laryngoscopy, fine needle aspiration (FNA), and CT scan of the neck and chest.

In selected patients (38%), thyroid scintigraphy was performed. Pulmonary function tests were performed in eight patients (36.7%) who...
presented with dyspnea. All patients underwent thyroid surgery and were evaluated with respect to their demographics, surgical procedures, and thyroid gland localization, during surgery, histopathological results, and postoperative complications.

Postoperative hypoparathyroidism was defined as symptomatic hypocalcemia that required calcium supplementation. It was considered permanent if the patient still required calcium supplement six months postoperatively.

Results

The ratio of thyroidectomies due to RSG to all thyroidectomies in this population was 4.8%. The median age was 54 years (range 32–77 years) and there were 20 female patients. The patients’ characteristics are summarized in Table 1. All patients were euthyroid except one patient who had a toxic goiter, which was controlled preoperatively. The most common presentation was dyspnea, occurring in 34.6% of the patients followed by neck swelling in 30.8% of the patients [Table 2]. There was no significant comorbidity and all the patients were offered surgery. The surgical procedure predominantly used was total thyroidectomy (42.3%) and the final histological diagnosis revealed malignancy in 26.9% of the specimens [Table 1]. There were five papillary and two follicular carcinomas. All malignancies were detected only after the final histology. No formal neck dissection was performed, but lymph nodes in zones 6 and 7 were removed along with the retrosternal part of the goiter.

Median sternotomy was needed in only one patient and in 96% of the patients, cervical collar incision was adequate for the removal of these masses. There were no perioperative deaths and morbidities were minimal, as minor complications occurred in nine patients; most of them resolved completely [Table 3]. All patients received the thyroid stimulating hormone (TSH)-suppressive treatment with the thyroid hormone postoperatively. There was no recurrence during an average follow-up period of two years (range three months to seven years).

Discussion

At present, many different treatment modalities have been described for the management of goiters. As early as 2400 BC, the Chinese discovered that the ingestion of seaweed was potent in the treatment of goiter.[9] However, they did not realize that it was the iodine present in the seaweed that was responsible for the therapeutic effects.

Retrosternal goiter was first described by Haller in 1749.[10] The incidence of RSG is reported to range from 3 to 20% of the patients undergoing thyroid surgery.[2,3] This wide range in the incidence is mainly due to the variation in the definition of RSG.[11] Four definitions of RSG are identified: A thyroid in which any part of it extends below the thoracic inlet,[12] a gland reaching the aortic arch,[13] a thyroid reaching the level of T4 (on chest X-ray),[14] and greater than 50% (or the majority) of the gland residing below the thoracic inlet.[13] We have used the last definition in the present series. Several factors favor the passage of the goiter into the mediastinum: Downward traction caused by normal swallowing, respiration creating negative intrathoracic pressure, and the pull of gravity on the goiter.[16] Although the epidemiology of the RSG varies according to the definition, sex ratio, and mean age in our series are in-keeping with other reports.[17,18]

The most common symptom in our series was dyspnea, occurring in 34.6% of the cases. The most common symptoms of RSG resulted from compression of the trachea or the esophagus or both.[19,20] This complication was caused by the progressive nature of the disease, combined with the narrow passage of the inlet.[21] A classical chest X-ray finding of the RSG included a mediastinal mass with tracheal deviation and compression, and visualization of the smooth or nodular outline of the tumor [Figure 1]. However, 30% of these patients may have a completely normal chest X-ray (to be consistent, chest X-ray or radiograph).[22] In our series, 20% of chest X-rays were normal. All patients had an ultrasound as part of the routine evaluation of goiters, which suspected the retrosternal extension in some patients; however, the ultrasound could not provide detailed information about the RSG.

A CT scan can showed the relationship of the goiter with the trachea, the esophagus, and great vessels, as well as

| **Table 1: Patient characteristics** |
|-------------------------------------|
| **Median age** | 54 (range 32 – 77) |
| **Male: Female ratio** | 1: 3.3 |
| **Location of retrosternal component of goiter** | Left: 10 (38.5%) |
| **Right: 9 (34.6%)** |
| **Bilateral or midline: 7 (26.9%)** |
| **Surgical procedure** | Total thyroidectomy: 11 (42.3%) |
| **Near total thyroidectomy: 2 (7.7%)** |
| **Subtotal thyroidectomy: 5 (19.2%)** |
| **Hemithyroidectomy: 8 (30.8%)** |
| **Histopathological diagnosis** | Benign: 19 (73.1%) |
| | Malignant: 7 (26.9%, four papillary, two follicular and one occult papillary) |

| **Table 2: Symptoms or signs in patients with retrosternal goiter** |
|-------------------------------------|
| **Symptom or sign** | **No. (%)** |
| **Neck swelling** | 8 (30.8) |
| **Dyspnea (including two cases of acute airway obstruction)** | 9 (34.6) |
| **Neck discomfort** | 2 (7.8) |
| **Hoarseness of voice** | 1 (3.9) |
| **Asymptomatic** | 6 (23.1) |

Only the most prominent sign or symptom is mentioned for each patient. *Because of rounding the percentage do not total 100

| **Table 3: Postoperative complications in nine patients operated on for retrosternal goiter** |
|-------------------------------------|
| **Morbidity** | **No (%)** |
| **Transient symptomatic hypoparathyroidism*** | 4 (15.4) |
| **Hematoma** | 2 (7.7) |
| **Wound infection** | 1 (3.9) |
| **Pneumonia** | 1 (3.9) |
| **Transient laryngeal nerve paresis** | 1 (3.9) |

*Transient symptomatic hypocalcemia requiring treatment for no more than four weeks

58

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how deeply into the chest the gland descends\(^\text{(23)}\) [Figure 2]. In this series, a CT scan was performed routinely for all patients. Although the CT scan is the most useful tool in the detailed assessment of a relevant anatomy, it is not routinely performed in all centers.\(^\text{(24)}\) Some of our patients, during the early phase of our study, underwent nuclear imaging (any specific indication for those undergoing nuclear imaging?), but neither nuclear imaging nor sonography is essential for the preoperative evaluation of known RSG.\(^\text{(25)}\) An esophagogram can confirm esophageal compression, but it does not add much to its management.\(^\text{(26)}\)

An FNA biopsy of an RSG may be helpful when a large cervical component exists, but this is not usually recommended, because it is technically difficult, may be dangerous to perform, and can miss the true pathology.\(^\text{(4,5)}\) The majority of our patients presented with a multinodular goiter (MNG). An MNG adversely affects the preoperative diagnosis of thyroid cancer with FNA, as it is particularly impossible to evaluate all of the nodules. Thyroid cancer is frequently an incidental postoperative finding originating from one of the numerous nodules, although the FNA biopsy result is reported as benign. In our series only one patient presented with toxic goiter. The reported incidence of hyperthyroidism in patients with RSG varies widely from 0 to 50%.\(^\text{(8)}\) None of our patients with RSG was treated medically. Trials of thyroid suppression with L-thyroxine therapy had little effect on disease progression.

The surgical treatment of goiter was contemplated as early as 900 AD by an Arabic surgeon named Abucasis. Denoting goiters as ‘elephants of the throat’, Abucasis has recorded that a goiter resembles the tumor from an arterial aneurysm,\(^\text{(27)}\) and furthermore he has stated that it is dangerous to incise it. As Abucasis had done over 1,000 years before, Robert Liston, a prominent surgeon of his time, also warned surgeons against the performance of thyroidectomies.\(^\text{(28)}\)

In the present series, with the exception of one patient (4%) among all the RSGs, sternotomy could be avoided. Although it is reported that the majority of cervico mediastinal type goiters can be removed through a conventional cervical approach,\(^\text{(13)}\) the surgical approach required for RSG is the subject of significant debate.\(^\text{(39)}\) Our patient who needed a sternotomy (originally described in a case report),\(^\text{(30)}\) was on treatment for asthma for a long time and presented as an emergency with respiratory distress. The goiter was extending down to the level of the pulmonary trunk and during the operation there were engorged veins rendering blind manipulation almost impossible. Similar approaches for similar presentations have been described before.\(^\text{(31,32)}\) More than 50% of our patients had more extensive surgeries (total and near total thyroidectomies). Performing extensive thyroid resection eliminated the need for reoperation, if a thyroid cancer was incidentally diagnosed postoperatively.\(^\text{(33)}\)

In the present report, although postoperative morbidity was minimal, temporary hypoparathyroidism was the most common (15.4%). Some authors reported that temporary hypoparathyroidism seemed to occur more often after thyroidectomy for RSG, than after a standard thyroidectomy.\(^\text{(34)}\) The incidence of malignancy in this series was 26.9% in the final histopathological diagnosis. This was much higher than in the reported incidences of malignancy in RSG, in different series,\(^\text{(5,11)}\) as we have shown in a previous report.\(^\text{(35)}\) However, the predominance of well-differentiated carcinoma in our patients goes in line with the previous reports.\(^\text{(36)}\)

In conclusion, the poor response of RSG to medical treatment, the higher incidence of symptoms related to compression, difficulty in following clinically, the risk of malignancy, and development of acute airway obstruction, make the presence of RSG an indication for surgery. Cervical incision is nearly always adequate, with negligible operative mortality and minimal complications.

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References

1. Newman E, Shaha AR. Substernal goiter. J Surg Oncol 1995;60:207-12.
2. Torre G, Borgonovo G, Amato A. Surgical management of substernal goiter: Analysis of 237 patients. Am Surg 1994;60:826-31.
3. Moran JC, Singer JA, Sardi A. Retrosternal goiter: A six-year Institutional Review. Am Surg 1998;64:89-93.
4. Armour RH. Retrosternal goiter. Br J Surg 2000;87:519.
5. Singh B, Lucente FE, Sahara AR. Substernal goiter: A clinical review. Am J Otolaryngol 1994;15:409-16.
6. Madjar S, Weissberg D. Retrosternal goiter. Chest 1995;107:207-12.
7. Cho HT, Cohen JP, Som ML. Management of substernal and intrathoracic goiters. Otolaryngol Head Neck Surg 1986;94:282-7.
8. Sanders LE, Rossi RL, Shahian DM, Williamson WA. Mediastinal goiters: The need for an aggressive approach. Arch Surg 1992;127:699-13.
9. Langer P. History of goiter, in endemic goiter. World Health Organization. Monograph Series 44, Geneva, Switzerland: World Health Organization; 1960. p. 9-25.
10. Wright D, Mathisen DJ. Mediastinal tumors: Diagnosis and treatment. World J Surg 2001;25:204-9.
11. Haller A. Disputationes Anatomicae Selectae, Gottingen, Holland: Vandenhoeck; 1749. p. 96.
12. Cougard P, Matet P, Goudet P, Bambili R, Viard H, Vaillant G, et al. Les goiters plongeants: 218 cas operes. Ann Endocrinol (Paris) 1992;53:230-5.
13. Vadasz P, Kotsis L. Surgical aspects of 175 mediastinal goiters. Eur J Cardiothorac Surg 1998;14:393-7.
14. Chow TL, Chan TT, Suen DT, Chu DQ, Lam SH. Surgical management of substernal goiter: Local experience. Hong Kong Med J 2005;11:360-5.
15. de Souza FM, Smith PE. Retrosternal goiter. J Otolaryngol 1983;12:393-6.
16. Sianesi M, Del Rio P, Arcuri MF, Soliani P, Rusca M. Cervicomediastinal goiter. Chir Ital 2002;54:15-8.
17. Maruotti RA, Zannini P, Viani MP. Surgical treatment of substernal goiters. Int Surg 1991;76:12-7.
18. Katlic MR, Grillo HC, Wang C. Substernal goiter (analysis of 80 patients from Massachusetts General Hospital). Am J Surg 1985;149:283-7.
19. Anci C, Dertsiz L, Altumbas H, Demircan A, Emek K. Operative management of substernal goiter: Analysis of 52 patients. Int Surg 2001;86:220-4.
20. Poglio F, Paolasso I, Falcone Y, Grimaldi S, Cocito D. Upper airways obstruction due to Retrosteral goiter in a patient with myxehnia gravis. Neuronal Sci 2010;31:407-9.
21. Madjar S, Weissberg D. Retrosternal goiter. Chest 1995;108:78-82.
22. Makeiff M, Marier F, Khudjadze M, Garrel R, Crampette L, Guerrier B. Substernal goiter: Report of 212 cases. Ann Chir 2000;125:18-25.
23. Sanders LE, Rossi RL, Shahian DM, Williamson WA. Mediastinal goiters: The need for an aggressive approach. Arch Surg 1992;127:609-13.
24. Bashist B, Ellis K, Gold RP. Computed tomography of intrathoracic goiters. Am J Radiol 1983;140:455-60.
25. Porzio S, Marocco M, Oddi A, Lombardi V, Porzio O, Calvelli C, et al. Endothoracic Goiter: Anatomoclinical and therapeutic consideration. Chir Ital 2001;53:453-60.
26. Alfonso A, Christoudias G, Amaruddin Q. Tracheal or esophageal compression due to benign thyroid disease. Am J Surg 1981;142:350-4.
27. Spink MS, Lewis GL (editors). Albucasis on surgery and instruments. Los Angeles, CA: University California; 1973. p. 340.
28. Liston R. Lectures of the operations and on diseases and accidents requiring operations with numerous. In: Mutter TD, Robert L, Editors, 1794-1847. Philadelphia, PA Book in English; 1846.
29. Huins CT, Georgallas C, Mehrzad H, Tolley NS. A new classification system for retrosternal goiter based a systematic review of its complications and management. Int J Surg 2008;6:71-6.
30. Khairy G, AlSaif A. Large retrosternal goiter. A diagnostic and treatment dilemma. Oman Med J 2010;25:154-7.
31. Flati G, Degaiocono T, Porosksa B, Flati D, Gaj F, Talarico C, et al. Surgical management of substernal goiters. When is sternotomy inevitable? Clin Ter 2005;156:191-5.
32. Irfan M, Jihan WS, Shahid H. Massive goiter with retrosternal extension encasing trachea and Oesophagus. Med J Malaysia 2010;65:85-6.
33. Erbil Y, Bozbora A, Barbaros U, Ozarmagan S, Azezlui A, Molvalilar S. Surgical management of substernal goiters: Clinical experience of 170 cases. Surg Today 2004;34:732-6.
34. Ozdemir A, Hassabecie M, Hamaloglu E, Ozenic A. Surgical treatment of substernal goiter. Int Surg 2000;85:194-7.
35. Khairy GA. Solitary thyroid nodule: The risk of cancer and the extent of surgical therapy. East Afr Med J 2004;81:459-62.
36. Shahar AR, Burnett C, Alfonso A, Jaffe BM. Goiters and airway problems. Am J Surg 1989;158:378-80.