

RESEARCH ARTICLE

Clinical Presentation and Surgical Treatment of Retrosternal Goiter: A Case Series Study

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ABSTRACT

Background: The retrosternal goiter (RSG) is a slow-growing mass often benign in nature; thyroidectomy remains the preferred standard curative treatment. This study aimed to explore the local experience of RSG with respect to the clinical presentation, classifications, management, and outcomes.

Method: A retrospective chart review was conducted to include all cases diagnosed with RSG and underwent thyroidectomy between January 1998 and December 2013.

Results: A total of 1210 patients underwent thyroidectomy; of which 30 (2.5%) patients were diagnosed to have RSG. The commonly reported symptoms were dyspnea (40%), pain and discomfort (30%), dysphagia (26.7%), and hoarseness (20%). Thirteen patients (43.3%) were completely asymptomatic. The fine-needle aspiration cytology was performed in 22 (73.3%) patients, of whom the majority was benign (77.3%). The grading classification showed that grade 1 is the most frequent (73.3%). Total bilateral thyroidectomy was the most prevailing procedure in 57% cases followed by partial thyroidectomy. All patients underwent retrosternal thyroidectomy through a cervical incision except for one case. Postoperative histopathology showed frequent benign multinodular goiter (83.3%), followed by papillary thyroid cancer (10%) and thyroiditis (6.7%). The most common complication after thyroidectomy was tracheomalacia (13.4%), transient hypocalcemia (10%), and hypoparathyroidism (6.7%). There was no intraoperative or perioperative mortality.

Conclusion: RSG is a rare entity often presented with pressure symptoms, mostly involving anterior

mediastinum and had a challenging surgical procedure. A large multicenter study is needed to include more cases in order to have a consensus on the definition and classification system for such important clinical goiter presentation.

Keywords: retrosternal goiter, thyroid gland, surgical intervention, outcome, surgery, endocrine

INTRODUCTION

The thyroid gland is anatomically located in the neck region. When it gets localized or generalized hypertrophy, it is referred to as goiter. The natural history of goiter is suggestive of the slow development of symptoms and progressive enlargement with subsequent obvious neck swelling, pressure symptoms, or secondary hormonal dysfunctions.¹ The most frequently reported symptoms are dyspnea, choking, sleep discomfort, dysphagia, and hoarseness, which are mainly related to the airway and esophageal compression.² The thyroid gland upon enlargement may extend down into the mediastinum, and if more than 50% of the mass extended into the mediastinum, it is described as retrosternal (or substernal) goiter.² Because of the diversity in the definition of substernal goiters, the reported rates vary greatly between 5% and 22%.¹ These are often identified in the anterior mediastinum and rarely in the posterior mediastinum, which is an important consideration for planning the surgery.^{3,4} Because of slow mass expansion, retrosternal goiter (RSG) often remains asymptomatic and is detected incidentally upon radiological investigation.⁵ The diagnostic workup of RSG considered clinical history, physical examination, and radiological investigation.^{6,7}

There are many definitions and classification of the RSG. The commonly used definition considers that more than half (or majority) of the gland extends beyond the thoracic inlet,^{8,9} whereas other definitions specify any part of the gland^{10,11} or even refer to the need for mediastinal exploration to fulfill the diagnosis.¹² Moreover, in some occasions, it might be ectopic (true mediastinal aberrant intrathoracic thyroid tissues from birth [congenital] with unique and different vascular supplies) that may explain the wide difference in the reported incidence in literature; that is why some authors advocate the name primary mediastinal goiter for the ectopic and secondary for the extending goiters. Patients with RSG are primarily managed by surgical intervention

if symptomatic or suspicious for malignancy and have a wide range of incidence in the current literature. Regardless of the underlying etiology, which is mostly benign, RSG is usually approached surgically.^{13,14} However, it remains controversial whether most or selective RSG cases require surgical intervention.¹² As regional data are scarce on such a rare disorder, we aim to present our experience of RSG to explore the demographic characteristics, clinical presentation, classifications, management, and outcomes of this thyroid entity in a tertiary care hospital. This will increase the awareness of junior clinicians. This case series has been reported in line with the PROCESS criteria.¹⁵

METHOD

A case series with a retrospective chart review was conducted to include all cases diagnosed with RSG and underwent thyroidectomy at our institute between January 1998 and December 2013. The records of these patients were analyzed with regard to the demographics (age and gender), clinical presentation (asymptomatic, dyspnea, pain, and dysphagia), comorbidities, personal and family history of cancer, radiological imaging (ultrasonography, radioactive iodine study, computed tomography [CT] scan, and magnetic resonance imaging [MRI]) and fine-needle aspiration cytology (FNAC; ultrasound-guided and clinic) findings, RSG classification, operation type (primary or reoperation), surgical approaches (cervical, complete sternotomy, and manubriotomy), excision type (total thyroidectomy, hemithyroidectomy, and subtotal thyroidectomy), and clinical followup. All cases were investigated by a standard workup, and surgeries were conducted by an experienced surgical team. The outcomes included the hospital and ICU length of stay, postoperative complications, and mortality (30 days and on followup). The Huins grading and anatomical classification system were utilized for our RSG cases.^{16,17} An RSG was diagnosed based on any goiter reported by the preoperative or intraoperative report to extend to the thorax through the thoracic inlet.¹⁰ The institutional review board (IRB# 14197/14) has approved and granted exempt status for this retrospective study.

Statistical analysis

Data were reported as proportion, mean (\pm standard deviation), median, and range, when applicable. Data

analysis was carried out using SPSS version 18 (SPSS Inc., Chicago, IL, USA).

RESULTS

During the study period, a total of 1210 patients underwent thyroidectomy; of which 30 (2.5%) patients were diagnosed to have RSG. The median age of patients was 50 (range, 31–80) years, and the majority of cases include men (18 patients, 60%). The median body mass index was 31.5 (range, 22–48) kg/m². The majority was symptomatic (56.6%) with progressive anterior neck swelling. The symptoms most commonly reported were dyspnea (40%), pain and discomfort (30%), dysphagia (26.7%), and hoarseness (20%), and only a few had thyroid dysfunction (Table 1). The majority was euthyroid, and only two (6.7%) patients had hyperthyroidism and two (6.7%) had hypothyroidism based on findings of thyroid function test. Nineteen (63.4%) had a prior history of thyroid illness (nodular disease or goiter). Thirteen patients (43.3%) were completely

asymptomatic, and the mass was detected incidentally upon chest radiography.

The thyroid ultrasonography was performed as the primary diagnostic imaging in 29 (96.7%) patients. The nuclear iodine scan was performed in nine (30%) patients, whereas seven (23.3%) cases underwent a chest CT scan as part of their workup, and only one (3.4%) patient had an MRI. The most common ultrasound finding was multinodularity (60%) and mixed solid/cystic nodules (43.4%). The associated lymph node enlargement was reported in four (13.3%) patients. The FNAC was performed in 22 (73.3%) patients. The majority was benign (77.3%), and the remaining five (22.7%) patients had unsatisfactory results. None of them were found to have malignancy at this stage. In three cases with a postoperative finding of cancer, the preoperative cytology results showed that two out of three were benign and one was suspicious. All the patients underwent surgery (22 had a total thyroidectomy, 5 right hemithyroidectomy, and 3 left hemithyroidectomy).

Table 1. Characteristics of patients with retrosternal goiter (1998–2013) (n = 30).

Variable	n (%)	Variable	n (%)
Age (median, range)	50 (31–80)	Imaging	
Male	18 (60.0)	Ultrasonography	29 (96.7)
Female	12 (40.0)	Radioactive iodine study	9 (30)
BMI (median, range)	31.5 (22–48)	Computed tomography scan	7 (23.3)
Presenting symptoms		Magnetic resonance imaging	1 (3.4)
Asymptomatic	13 (43.4)	Ultrasonography finding	
Dyspnea	12 (40)	All with RSG	30 (100)
Pain and discomfort	9 (30)	Solid hypo-echoic nodule	18 (60)
Dysphagia	8 (26.7)	Mixed solid/cystic	13 (43.4)
Hoarseness	6 (20)	Intranodular vascularity	8 (26.7)
Hyperthyroidism	2 (6.7)	Solid hyper-echoic nodule	5 (16.7)
Hypothyroidism	2 (6.7)	Lymphadenopathy	4 (13.3)
History of nodule or goiter	19 (63.4)	Microcalcifications	3 (10)
Superior vena cava syndrome	0 (0)	Calcification around the periphery of a nodule	3 (10)
Comorbidities		Irregular margin	2 (6.7)
Hypertension	7 (23.3)	FNAC	22 (73.3)
Diabetes mellitus	5 (16.7)	US-FNAC one time	12 (54.5)
Dyslipidemia	2 (6.7)	US-FNAC >1 time	5 (22.7)
Smoking	2 (6.7)	P-FNAC	5 (22.7)
Ex-smoker	3 (10)	FNAC findings	
Stroke	1 (3.4)	Benign cytology	17 (77.3)
Coronary artery disease	1 (3.4)	Unsatisfactory	5 (22.7)
History of cancer other than thyroid	1 (3.4)	Suspicious or malignancy	0 (0)
Family history of thyroid cancer	0 (0)		

BMI, body mass index; RSG, retrosternal goiter; FNAC, fine-needle aspiration cytology; US-FNAC, ultrasound-guided FNAC; P-FNAC, palpatory FNAC.

thyroidectomy). The indications for surgery were as follows: 16 patients were symptomatic secondary to thyroid nodules compressing nearby structures, and the others were for cosmetic issues. The final histopathology in two from the cosmetic group was papillary thyroid cancer (15.5%) compared with one in the symptomatic group (6.25%).

Table 2 shows the classification, management, postoperative complications, and outcome of RSG. The grading classification showed that grade 1 (above the aortic arch) was most frequent (73.3%), followed by grade 2 (between the arch and the pericardium) in seven (23.3%) cases, and only one (3.4%) patient had grade 3 (below the right atrium).

With regard to the localization, most of the masses (22 cases, 73.3%) were contained within the anterior mediastinum; seven (23.3%) were in the posterior mediastinum (six ipsilateral and one retrotracheal and retroesophageal extension), and one (3.3%) had a true isolated mediastinal goiter. The surgical approach was primary in 28 (93.3%) cases, whereas only 2 (6.7%) patients had it as a reoperation (recurrent) through a classic lower cervical collar incision by

general surgery service. Total bilateral thyroidectomy was the most prevailing procedure in 57% (17) cases followed by partial thyroidectomies (11 had hemithyroidectomy and 2 had subtotal thyroidectomy). All patients underwent retrosternal thyroidectomy through a cervical incision except for one case. This patient reported to have a congenital ectopic intrathoracic thyroid enlargement, which was approached with full sternotomy, and none of the patients required manubriotomy.

All specimens were sent for final histopathology postoperatively. The majority of cases were diagnosed with benign multinodular goiter (83.3%), three (10%) patients had papillary thyroid cancer, and two (6.7%) were reported to have evidence of thyroiditis.

Postoperative complications for RSG were reported in 14 patients. The most common complications are given in Table 2. The intensive care unit median stay was 6 (range, 2 – 11) days, and the median overall hospital stay was 7.67 (range 2 – 44) days.

No patients died within 30 days postoperatively. All 30 patients were on clinical followup postoperatively. However, one patient (3.4%) died, and one (3.4%)

Table 2. Classification, management, post-operative complications and outcome of RSG.

Variable	N (%)	Variable	N (%)
Classification of retrosternal goiters		Post-operative complications	
Above aortic arch (above T4) (Grade 1)	22 (73.3%)	Tracheomalacia	4 (13.4%)
Aortic arch to pericardium (Grade 2)	7 (23.3%)	Temporary tracheostomy	2 (6.7%)
Below right atrium (Grade 3)	1 (3.4%)	Hypocalcaemia (transient)	3 (10%)
Type of operation		Hypoparathyroid (transient)	2 (6.7%)
Primary	28 (93.3%)	Recurrent laryngeal nerve injury	1 (3.4%)
Re-operation	2 (6.7%)	Pneumothorax	1 (3.4%)
Type of excision		Thrombosis of left subclavian vein	1 (3.4%)
Total thyroidectomy	17 (56.7%)	Wound infection	0 (0%)
Hemi-thyroidectomy	11 (36.7%)	Bleeding	0 (0%)
Subtotal thyroidectomy	2 (6.7%)	ICU admission	6 (20%)
Central lymph node dissection	2 (6.7%)	ICU length of stay (days) median, range	6 (2 – 11)
Approach for retrosternal goiters		Hospital length of stay (days)	7.67 (2 – 44)
Cervical	29 (96.7%)	Outcome	
Full sternotomy	1 (3.4%)	Mortality (30 days)	0 (0%)
Manubriotomy	0 (0%)	Mortality on follow up	1 (3.4%)
Histopathology results		Metastatic papillary cancer on follow-up	1 (3.45)
Multinodular goiter	25 (83.3%)		
Papillary thyroid cancer	3 (10%)		
Thyroiditis	2 (6.7%)		
Positive lymph node for cancer	0 (0%)		

Table 3. Anatomical classification of RSG.

Type	Location	Anatomy	Present study [n (%)]
I	Anterior mediastinum	Anterior to great vessels, trachea and RLN	22 (73.3%)
II	Posterior mediastinum	Posterior to great vessels, trachea and RLN	-
IIA	Ipsilateral extension		6 (20.0%)
IIB	Contralateral extension		-
II B1	Extension posterior to both trachea and esophagus		1 (3.3%)
II B2	Extension between trachea and esophagus		-
III	Isolated mediastinal goiter	No connection to orthotopic gland; may have mediastinal blood supply	1 (3.3%)

developed metastatic papillary cancer on clinical followup. The deceased case died 25 months after the thyroid operation secondary to a brain tumor at the age of 68 years. The one who had metastasis seven years after the primary surgery was diagnosed with lymph node metastasis and had radioactive iodine therapy. The patient is still alive with no sign of distant metastasis (10 years postthyroidectomy).

Table 3 shows the anatomical classification of RSG; of which the majority were located in the anterior mediastinum (73.3%) followed by ipsilateral extension (20.0%), extension posterior to both trachea and esophagus (3.3%), and isolated mediastinal goiter (3.3%).

DISCUSSION

The current study reviewed the local experience in the diagnosis and management of RSG presented over more than a decade in a single center.

The overall incidence of RSG in the present study is 2.5% in patients who underwent surgical intervention for goiter.¹³ The occurrence of RSG varies widely ranging from 1.7% to 30% of thyroidectomies based on the definition/diagnostic criteria and prior operation history.⁷ The possible explanation for incidence variability could be attributed to the lack of a standard definition of RSG or failure of the documentation of the diagnosis in a patient's medical records. Also, the incidence of RSG tends to be higher in areas in which goiter is endemic.¹⁸ Earlier studies have reported predominance of female gender in patients diagnosed with RSG, which is in contrast with the present study.^{5,8,19} The male predominance may reflect the peculiar census of the population of

Qatar with predominant expatriate men. Qatar is not an endemic area for RSG; all salt used is iodized, and people mostly live near the coast. Moreover, the median age of our patients coincides with that of an earlier study from Saudi Arabia¹³; otherwise, our patients are younger in age in comparison with other reports.^{2,5,20} Consistent with our findings, earlier investigators have reported dyspnea or dysphagia as one of the frequent symptoms, which was resulted from compression of trachea or esophagus.^{2,7,13,21} Also, the majority were euthyroid, and very few had symptoms related to the gland function, which corresponds to the reported pattern of presentation of these lesions.⁶ Similarly, Testini et al.²² reported normal thyroid function for all RSG cases tested perioperatively.

Mostly, RSG is a slow-growing mass, which often remains asymptomatic (20–40%) for longer duration and is diagnosed accidentally on radiographic investigation.^{2,21,23}

The preoperative imaging for RSG mainly includes chest radiography, thyroid ultrasonography, and scintigraphy.²⁴ Notably, ultrasonography is readily available, with low exposure risk and guide FNAC, but is not very useful for the preoperative evaluation for the retrosternal extension.²⁴ Moreover, a CT scan is considered as the most reasonable modality to assess the extent of the goiter as it provides detailed anatomic features of the thyroid gland, trachea, and esophagus.²⁵ In the present study, FNAC has been performed in two-third cases; of which the majority were benign. Our findings are supported by an earlier study that reported the diagnosis of cancer in few RSG cases (3–21%) due to the difficulty in

performing FNAC in the mediastinal region, which could result in a missed diagnosis.²⁶ Many grading systems for RSG have been proposed by earlier studies for better understanding and classification of the lesion. There are two widely used classification systems: one considered the proportion of goiter mass in the mediastinum (proposed four grades),²⁷ and one relied on the relationship of goiter with anatomical structures of the mediastinum with three grades.¹⁶

In our series, similar to other reported surgical approaches, the majority of patients with RSG underwent a cervical incision approach for operative intervention except for one patient who required sternotomy. This patient was found to have congenital ectopic intrathoracic thyroid enlargement, which was approached with full sternotomy. This approach is justifiable because of the intrathoracic blood supply as reported by Polistena et al.¹⁴ in their large series of mediastinal goiter and in some cases of the less common extension to posterior mediastinum. Several studies also suggested cervicotomy for the majority of anterosuperior mediastinal goiters (up to 90%), except a few which requires a sternal split.^{7,13,24} However, Ayandipo et al.²¹ reported an adequate cervical incision approach in only two-thirds of the RSG patients. Also, the operative approach proved to be feasible through the neck in our patients, which involves total bilateral thyroidectomy in 57% cases and partial thyroidectomy in the rest, which is similar to the study by Mercante et al.²⁸ Total and partial excisions of the gland are common practices unless malignancy is considered, where total excision would be the recommended approach according to the National Comprehensive Cancer Network guidelines.²⁹ Moreover, performing an adequate thyroid mass resection minimizes the need for reoperation.^{30–32}

The risk of postoperative morbidity is higher in patients who underwent resection of RSG as compared with those who underwent cervical thyroidectomy only.³³

A previous study reported that hypoparathyroidism and recurrent laryngeal nerve injury are the frequent postoperative complications: 1.2% after hemithyroidectomy and 8.4% after total thyroidectomy.^{7,34} Similar to our findings, Khairy et al.¹³ reported transient hypoparathyroidism to be the most frequent (15.4%) complication. Rugu et al.² reported transient hypocalcemia in 13% of the cases postoperatively, which is two-fold higher than in our series.

It was observed that patients who underwent thyroidectomy for RSG were more likely to develop transient hypoparathyroidism as compared with those who had a standard thyroidectomy.³⁵

The rate of recurrent laryngeal nerve injury is lower in our series as compared with earlier reported rates (8.5–13.2%).^{5,36} In the present study, tracheomalacia was reported in four patients, of which two patients required tracheostomy. A previous study from Nigeria reported 12 (27%) tracheomalacia, of which six necessitated tracheostomy.²¹

Overall, the complication rate is relatively low in our series and earlier reports could be explained by the fact that most of the cases were noticed in the anterior mediastinum, which is not expected to disturb the anatomical relation of neither the parathyroid glands nor the recurrent laryngeal nerve, which run in the tracheoesophageal groove. However, the posterior extensions where the course of the nerve would be different may inflict a higher risk of injury.³⁴ No cases of neck hematoma, wound infection, or other injuries were reported, which suggest that RSG is not riskier than cervical goiter excision, a similar finding to Raffaelli et al.'s report.³⁷

Limitations

The limitations of the present study include the retrospective design with the inherent possibility of incomplete documentation or missing charts and the relatively smaller sample size to derive a significant conclusion or generalizability of the findings. Moreover, there is a lack of clear definition or standard in the practice of attending surgeons in defining the RSG and lack of data on the history of the familial or prior disease. Finally, the preoperative diagnosis of malignant RSG by FNAC might be underestimated. This could be attributed to the difficulty in sampling owing to the size and localization of the gland and limited accuracy of FNAC procedure.

CONCLUSIONS

RSG is a rare entity often presented with pressure symptoms and had challenging surgical procedures. The standard cervical incision remains the preferred approach with a fairly lower risk. It is crucial that the treating surgeon should be familiar with the anatomic classification and grading for RSG. Further, a large multicenter study is needed to include more cases in

order to have a consensus on the definition and classification system.

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Ethical approval

This study was approved by the Medical Research Center at Hamad Medical Corporation, Doha, Qatar

(IRB# 14197/14). A waiver of consent was granted for this retrospective study as there was no direct contact with patients, and data were anonymously collected.

Conflict of interest

None.

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