

The Necessity for a Thoracic Approach in Thyroid Surgery

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Hypothesis: A thoracic approach is commonly required in certain subsets of patients with a mediastinal thyroid mass.

Design: A retrospective review.

Setting: A tertiary referral center.

Patients: Nine hundred seventy-six consecutive patients who underwent thyroid surgery by a single surgeon from June 1, 1991, to March 30, 1999. Symptoms of airway compression, including respiratory distress, dyspnea, hoarseness, dysphagia, and persistent cough, were the most common presenting symptoms. The patients ranged in age from 27 to 89 years (mean, 63 years).

Results: Patients in whom the computed tomographic scan and operative findings revealed that at least 50% of the thyroid mass was below the thoracic inlet were considered to have a mediastinal mass. These strict criteria identified 94 patients with a mediastinal thyroid mass. Twenty-seven (29%) of these patients required a thoracic approach. The thoracic approach consisted of 21 partial sternotomies, 5 full sternotomies, and 1 right pos-

terolateral thoracotomy. Fifteen patients had a malignant neoplasm. Fourteen patients had a papillary carcinoma, and 3 of these patients had a multifocal microscopic papillary carcinoma within a multinodular colloid goiter. One patient had a follicular carcinoma. Seven patients underwent reoperative surgery, 5 for a malignant tumor and 2 for a benign tumor. Five patients had a posterior tumor, and 2 had an aberrant mediastinal thyroid mass. Twenty-two (81%) of the 27 patients who underwent a thoracic approach fell into one of the following categories: malignant neoplasm, reoperation, or aberrant or posterior mediastinal thyroid mass.

Conclusions: Subsets of patients with a mediastinal thyroid mass are at considerably increased risk for requiring a thoracic surgical approach. These subsets include patients with malignant mediastinal tumors, patients undergoing reoperative thyroid surgery, and patients with posterior or aberrant mediastinal thyroid masses. Surgeons should be prepared for the increased likelihood of a thoracic approach in these subsets of patients.

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A THORACIC approach for thyroid surgery may be indicated for deep extension of mediastinal benign or malignant thyroid masses, metastatic mediastinal lymph nodes, or aberrant or posterior mediastinal thyroid masses. The proportion of intrathoracic thyroid masses that require a thoracic approach is difficult to determine because of controversy regarding the definition of a mediastinal thyroid mass. Most researchers define as retrosternal, substernal, or intrathoracic any thyroid mass in which 50% of the mass is below the level of the thoracic inlet. Only occasionally in the English-language literature^{1,2} is there documentation of depth and precise location of the mass in the mediastinum. This lack of consensus results in only an approximate generalization of the

proportion of mediastinal thyroid masses that require a thoracic approach.

We studied a large consecutive group of patients who underwent thyroid surgery for benign or malignant disease. We reviewed the incidence and indications for a thoracic approach in thyroid surgery and the preoperative evaluation, pathological features, complications, and operative procedures required when a thoracic approach was necessary.

RESULTS

Of the 27 patients who required a thoracic approach, 22 were included in 1 or more of the following categories: malignant neoplasm, reoperation, or aberrant or posterior mediastinal thyroid mass. Only 5 patients required a thoracic approach at the initial surgery for a benign anterior me-

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PATIENTS AND METHODS

The medical records of 976 consecutive patients who underwent thyroid surgery at Rhode Island Hospital, Providence, from June 1, 1991, to March 30, 1999, by a single endocrine surgeon (J.M.M.) were reviewed. Patients in whom the computed tomographic (CT) scan and operative findings revealed that at least 50% of the mass was below the thoracic inlet were considered to have a mediastinal mass. These strict criteria identified 94 patients with a mediastinal thyroid mass. A thoracic approach was required in 27 (29%) of these patients. Only patients who required a thoracic approach were included in this study. The patients ranged in age from 27 to 89 years (mean, 63 years). There were 21 women and 6 men.

PRESENTING SYMPTOMS

Twenty-two of the 27 patients requiring a thoracic approach were symptomatic. The remaining 5 patients were identified by an abnormal result on a routine chest x-ray film.

Symptoms of compression, including respiratory distress, dyspnea, hoarseness, dysphagia, and persistent cough, at the thoracic inlet were the most common presenting symptoms. Two patients required emergency hospitalization

for respiratory distress. Both of these patients had recurrent laryngeal nerve paresis and severe tracheal compression from the mediastinal mass. One of the patients had a papillary carcinoma, and the other had a multinodular colloid goiter. Two other patients with papillary carcinoma presented with recurrent laryngeal nerve paresis. Twenty-two patients displayed at least 1 of the following symptoms: dyspnea on exertion, excessive coughing or choking spells that would occasionally awaken the patient from sleep, hoarseness, or dysphagia. One patient presented with severe thyrotoxicosis and airway compression. The presenting findings that led to the diagnosis of the mediastinal mass are as follows:

Finding	No. of Patients*
Abnormal chest x-ray film	5
Airway compression	17
Dysphagia	7
Thyrotoxicosis	1
Hoarseness	9

*Some patients had more than 1 symptom at the time of diagnosis.

PREOPERATIVE EVALUATION

In 23 of the 27 patients requiring a thoracic approach, the thyroid mass was palpable in the neck. A mass was not

diastinal mass. The factors contributing to the need for a thoracic approach are as follows:

Factor	No. of Patients
Initial surgery for papillary carcinoma*	9
Reoperative surgery for papillary carcinoma*	5
Reoperative surgery for a benign tumor	2
Posterior location*†	5
Aberrant mediastinal mass‡	2
Deep anterior extension benign mass	5

*One patient had a multifocal microscopic papillary carcinoma.

†One patient is also included in initial surgery for papillary carcinoma.

‡One patient had a 6.0-cm follicular carcinoma.

The location of the mediastinal thyroid mass requiring a thoracic approach was anterior left (n = 9), anterior bilateral (n = 6), anterior right (n = 5), posterior right (n = 3), posterior left (n = 2), and aberrant (n = 2). The mediastinal masses ranged from 6.0 to 14.2 cm.

The patients who required a thoracic approach can be divided into those who underwent the thoracic approach as part of their initial surgery (n = 20) and those who underwent the thoracic procedure as part of reoperative surgery (n = 7).

The operative procedures used in the 20 patients who required a thoracic approach at their initial surgery were partial median sternotomy in 15, full median sternotomy in 4, and right posterolateral thoracotomy in 1.

Patients who underwent a thoracic approach as part of their initial surgery included 9 with a papillary carcinoma, 2 of which were multifocal within a large colloid goiter; 1 with a follicular carcinoma; 5 with a posterior mediastinal tumor; and 2 with an aberrant thyroid mass. One of the patients with a posterior mediastinal mass had

a multifocal microscopic papillary carcinoma in a multinodular colloid adenoma, and 1 of the patients with an aberrant thyroid mass had a follicular carcinoma. The remaining 5 patients had deep extension of the benign anterior mediastinal mass. The surgical procedure performed and the location, pathological features, and size of the mediastinal thyroid mass for patients requiring a thoracic approach as part of their initial thyroid surgery are listed in **Table 1**.

Adherence to the mediastinal pleura or vascular structures was the indication for a thoracic approach in 7 of the patients with a malignant neoplasm. Two of these patients required a full sternotomy, and 5 required a partial sternotomy. All 7 of these patients had a papillary carcinoma. One of these 7 patients had a multifocal microscopic papillary carcinoma within a multinodular colloid goiter.

Only 1 patient at the initial surgery required a thoracic approach because of mediastinal lymph node involvement. Mediastinal metastatic lymph nodes can almost always be removed from the cervical incision. Our 1 patient who required a thoracic approach underwent a total thyroidectomy and bilateral paratracheal and thymic node dissection when it became apparent that there was extensive deep mediastinal extension of lymph nodes with a metastatic papillary carcinoma. These nodes extended anteriorly to well below the brachiocephalic vein. They were easily removed through a partial median sternotomy.

All patients who underwent a thoracic approach as part of their initial surgery for a malignant neoplasm underwent a total or near total thyroidectomy in addition

palpable in the neck in 4 patients, and could only be palpated with swallowing in 3. In the remaining 20 patients, the mass was palpable in the neck but the inferior end of the mass could not be palpated even when the patient swallowed. The Pemberton sign was positive in 4 patients.

Preoperative testing consisted of chest radiography, mediastinal CT, iodine 123 (¹²³I) scintiscanning, thyroid function studies, and fine needle aspiration biopsy. Some or all of these studies were done in each of the patients who underwent a thoracic approach. Flexible laryngoscopy was performed in all patients undergoing reoperation and in patients with voice changes.

The routine chest radiographs frequently did not show a mediastinal mass. Significant tracheal deviation, however, provided a clue to the presence of a mediastinal mass, which the CT scan subsequently confirmed. The CT scan was done in 25 patients and provided the precise location, depth, and relation to adjacent mediastinal structures essential for considering a thoracic approach. The anterior mediastinal mass extended to a level below the left brachiocephalic vein in each of these patients and to below the aortic arch in 3 patients. Significant tracheal narrowing with or without tracheal deviation was present in 18 patients.

The ¹²³I thyroid scan was done in 4 patients, and demonstrated the thoracic component in 2.

Twenty-two of these patients had normal results on thyroid function studies. Four patients were hyperthyroid, manifested only by a suppressed thyrotropin level with no overt symptoms of hyperthyroidism. One patient had a suppressed thyrotropin level, elevated levels of thyroxine and triiodothyronine, severe symptoms of hyperthyroidism, dysphagia, hoarseness, and a large mediastinal mass.

Patients with hoarseness or even severe hoarseness did not always demonstrate loss of vocal cord function. Three patients with hoarseness and 2 with severe hoarseness and marked tracheal compression demonstrated normally functioning vocal cords. The voice in each of these patients returned to normal with removal of the mediastinal mass and correction of the tracheal compression. A paralyzed vocal cord was demonstrated preoperatively in 4 patients. Three of these patients had a malignant neoplasm, and 1 had a benign tumor.

Fine needle aspiration biopsy was performed in 10 patients and showed inadequate cells for diagnostic purposes in 4, benign cells in 4, suspicious cells in 1, and malignant cells in 1. In 1 patient with a posterior mediastinal mass, the initial clinical impression was an inoperable pulmonary malignant neoplasm. A CT-guided needle biopsy, however, revealed benign thyroid tissue.

to removal of the mediastinal mass. Two patients who had multiple benign masses in both lobes also underwent a total thyroidectomy. The remaining patients in this group underwent a lobectomy or a lobectomy and partial resection of the contralateral lobe along with removal of the mediastinal mass.

Two patients who required a thoracic approach at the initial thyroid surgery had an aberrant thyroid mediastinal thyroid mass. In each of these patients, the mass was completely separate from the cervical thyroid, with no apparent cervical blood supply to the tumor.³ The complete separation of the mediastinal thyroid mass with no apparent cervical blood supply raised the suspicion of an aberrant thyroid mass, and a partial median sternotomy was done in each case. One of these patients had a follicular carcinoma with bone metastasis. This patient had multiple masses in both lobes of the cervical thyroid. A total thyroidectomy was initially performed for the cervical thyroid; however, there was no evidence of a malignant neoplasm. The completely separate mediastinal mass removed by a partial median sternotomy was a 6.0-cm follicular carcinoma. The remaining patient with an aberrant thyroid mass, which was a follicular adenoma, was detected during a parathyroid exploration for primary hyperparathyroidism.

Five patients with a posterior mediastinal mass required a thoracic approach at the initial thyroid surgery. The location of the mass was right posterior in 3 patients and left posterior in 2. One of the patients with a right posterior mass was initially considered by chest x-ray film to have an inoperable pulmonary malignant neoplasm. The results of a subsequent CT-guided bi-

opsy demonstrated benign thyroid tissue. This mass was removed through a right posterolateral thoracotomy. This is the only patient requiring a thoracic approach who did not undergo a partial or full sternotomy. In the 4 remaining patients, the posterior mediastinal mass went behind the brachiocephalic trunk and brachiocephalic veins, requiring careful dissection to free the tumor from these vessels. In 2 of these patients, this dissection could be accomplished through a partial median sternotomy. The remaining 2 patients required a full sternotomy. One of the patients who required a full sternotomy had a right posterior mass, and the other had a left posterior mass. In the patient with the right posterior mass, the mass extended almost to the hilum of the right lung. Even with a full sternotomy, there was inadequate exposure to resect this lesion. A double lumen endotracheal tube was necessary to collapse the right lung to gain adequate exposure to resect this 13-cm mass. The patient who underwent a full sternotomy for the left posterior mediastinal mass was the only patient with a posterior mass who had a malignant neoplasm. This patient had a multifocal papillary carcinoma within a large multinodular colloid goiter that extended to the level of the pericardium.

Five patients in this study required a partial sternotomy at the initial surgery for deep extension of a benign anterior mediastinal mass. In all 5 of these patients, the mass extended inferiorly to the level of the pericardium. All 5 patients had a multinodular colloid goiter.

The 7 patients who underwent the thoracic approach as part of reoperative surgery consisted of 5 who

Table 1. Characteristics of the Mediastinal Thyroid Mass in 20 Patients Requiring a Thoracic Approach at Initial Surgery*

Patient No.	Surgical Procedure	Location	Pathological Features	Size, cm
1	Partial sternotomy	AR	B	10.8
2	Partial sternotomy	AB	B	12.0
3	Partial sternotomy	AB	B	10.0
4	Partial sternotomy	AR	B	8.4
5	Partial sternotomy	AB	PC	7.9
6	Partial sternotomy	AB	PC	8.6
7	Partial sternotomy	AL	PC	12.2
8	Partial sternotomy	AB	PC	10.4
9	Partial sternotomy	AL	PC	8.6
10	Partial sternotomy	AR	PC	7.4
11	Partial sternotomy	AL	B	9.2
12	Partial sternotomy	PR	B	10.8
13	Partial sternotomy	PL	B	9.4
14	Partial sternotomy	Aberrant	FC	6.0
15	Partial sternotomy	Aberrant	B	8.0
16	Full sternotomy	AL	MPC	8.2
17	Full sternotomy	AL	PC	8.6
18	Full sternotomy	PR	B	14.1
19	Full sternotomy	PL	MPC	9.2
20	Right posterolateral thoracotomy	PR	B	8.6

*AR indicates anterior right; B, benign; AB, anterior bilateral; PC, papillary carcinoma; AL, anterior left; PR, posterior right; PL, posterior left; FC, follicular carcinoma; and MPC, multifocal PC.

had a papillary carcinoma and 2 who underwent reoperative surgery for a benign tumor. Three of the 5 patients who underwent a reoperation for a papillary carcinoma were referred from other hospitals. One of these patients was referred because of a recurrent tumor in the thoracic inlet extending into the mediastinum that developed 2 years after a total thyroidectomy and bilateral modified neck dissection. One patient was referred immediately after surgery from another hospital because of a large papillary carcinoma that extended below the brachiocephalic vein and could not be removed from the cervical incision. The remaining patient referred from another hospital developed a recurrent substernal mass 10 years after the resection of a mass initially considered benign. The pathological feature at the reoperative thoracic approach was a multifocal microscopic papillary carcinoma in a multinodular goiter. Two patients with a papillary carcinoma underwent reoperative surgery after undergoing initial surgery at our hospital. One of these patients developed deep mediastinal node metastasis from a papillary carcinoma 2 years after total thyroidectomy, modified neck dissection, and iodine ¹³¹I therapy. The other patient who developed a recurrence after initial surgery at our institution underwent a total thyroidectomy and paratracheal and thymic node dissection for a papillary carcinoma that recurred at the site of the original tumor 3 years after the initial surgery. Dense scar from the previous surgery; inability to medially rotate the thyroid to identify the recurrent nerve; and adherence to the mediastinal pleura, vascular structures, or both were the technical reasons that necessitated a thoracic approach in this group of patients.

Table 2. Characteristics of the Mediastinal Thyroid Mass in 7 Patients Requiring a Thoracic Approach for Reoperative Surgery*

Patient No.	Surgical Procedure	Location	Pathological Features	Size, cm
1	Full sternotomy	AL	PC	10.8
2	Partial sternotomy	AL	B	12.0
3	Partial sternotomy	AB	B	11.2
4	Partial sternotomy	AL	PC in the lymph nodes	6.0
5	Partial sternotomy	AR	PC	8.6
6	Partial sternotomy	AL	MPC	9.1
7	Partial sternotomy	AR	PC	10.4

*AL indicates anterior left; PC, papillary carcinoma; B, benign; AB, anterior bilateral; AR, anterior right; and MPC, multifocal PC.

The surgical procedure performed and the location, pathological features, and size of the mass in patients requiring a thoracic approach for reoperative thyroid surgery are listed in **Table 2**.

Fifteen (56%) of the 27 patients who underwent a thoracic approach had a malignant neoplasm. There were 14 patients with a papillary carcinoma and 1 with a follicular carcinoma. Three of the patients with a papillary carcinoma had a microscopic multifocal papillary carcinoma within a multinodular colloid goiter.

There was no mortality, blood transfusion requirement, tracheomalacia, need for tracheotomy, or wound infection in patients included in this study. A pulmonary embolus, phrenic nerve paresis, and hypoparathyroidism occurred in the patient with a right posterior mediastinal mass who underwent a full sternotomy. Two patients had recurrent laryngeal nerve paresis. Both of these patients had a malignant neoplasm. This complication occurred at the initial surgery in 1 of these patients and at reoperative surgery in the other. Two patients with a papillary carcinoma and bilateral paratracheal node metastasis experienced permanent hypoparathyroidism.

COMMENT

Thyroid mediastinal problems that may require a thoracic approach include large benign or malignant thyroid masses or, much less commonly, extensive lymph node metastases. Reoperative surgery for a mediastinal thyroid mass, large posterior mediastinal tumors, and aberrant thyroid masses also increases the risk for a thoracic approach.

A thyroid malignant neoplasm was an important factor in the high incidence of a thoracic approach in this study. This study of 976 consecutive patients identified 94 (9.7%) with a mediastinal mass, which is consistent with the incidence of 1% to 20% reported in the English-language literature.^{4,5} A thoracic approach was necessary in 27 patients (29%), and 15 (56%) of these patients had a malignant neoplasm. The largest recent surgical series,⁶ consisting of 5263 consecutive patients who underwent thyroid surgery, identified 621 (11.8%) with an intrathoracic thyroid. Forty-four (7.1%) of these

621 patients required a thoracic approach, and 9 (20%) of these 44 patients had a malignant neoplasm. Correction of these data only for the 2.6-fold increase in the incidence of a malignant neoplasm found in the present study would calculate to a 14% need for a thoracic approach. If these data were further corrected for the increased numbers of malignant neoplasms and the 2 patients with aberrant thyroid masses, the predicted incidence of a thoracic approach would rise to 22%.

The surgical finding of an aberrant intrathoracic thyroid is an indication to strongly consider a thoracic approach.⁷ This lesion develops from embryonic foregut endoderm that descended into the mediastinum separate from the thyroid and derived its blood supply from adjacent mediastinal vessels with no cervical source. An attempt to mobilize this type of lesion from the mediastinum by the cervical approach may lead to severe bleeding from avulsion of the thoracic vessels.^{3,7}

Large posterior mediastinal masses presented technical problems that required a thoracic approach in 5 patients in this study. Partial or full sternotomy, posterolateral thoracotomy, or a combined cervical and anterior thoracotomy through the second or third intercostal space has been proposed for posterior mediastinal thyroid masses that could not be removed through the cervical approach. In one series,⁸ however, 122 of 128 posterior mediastinal goiters were successfully removed via the cervical approach.

Several technical maneuvers have been described to facilitate removal of mediastinal thyroid masses. These include early ligation of the upper pole vessels, division of the thyroid isthmus, and placement of an instrument along the lateral border of the mass into the mediastinum to break the mediastinal negative pressure.⁴ In our opinion, the mobilization of a mediastinal thyroid mass into the neck incision can be safely carried out only when the recurrent nerve is dissected free from the tumor. A "blind" delivery of the mass from the mediastinum can lead to stretching that can cause permanent injury or even transection of the recurrent laryngeal nerve, frequently entrapped by benign or malignant thyroid nodules or lymph nodes with the metastatic tumor.

Lahey⁹ has described "morcellation" to facilitate delivery from the substernal location. We would not advocate this procedure or making linear incisions in the capsule of the mass to extract part of the contents to reduce the size of the mass. This can lead to significant bleeding and violates oncologic principles if the lesion is malignant.

A high proportion of patients with a mediastinal mass in this study required a thoracic approach. This incidence is higher than is reported in the English-language literature and is most likely attributable to the strict definition of a mediastinal mass used in this study but predominantly to the patient population from a tertiary referral center. If patients with substernal extension of a thyroid mass that did not exceed 50% of the mass below the thoracic inlet were included in the definition of a group with a mediastinal mass, there would be a considerably higher number of patients in this group. The patient population, however, was the most significant factor contributing to the increased need for a thoracic approach in

this study. In this total group of 27 patients who underwent a thoracic approach, 22 (81%) fell into one of the following categories: malignant neoplasm, reoperation, or aberrant or posterior mediastinal thyroid mass. Only 5 patients (19%) requiring a thoracic approach had a benign anterior mediastinal mass. These data are illustrated in Table 2.

This study indicates that there is a considerably increased need for a thoracic approach in certain subsets of patients with a mediastinal thyroid mass. These subsets include patients with malignant mediastinal thyroid tumors, patients undergoing reoperative thyroid surgery, and patients with posterior or aberrant mediastinal thyroid masses. Surgeons caring for patients with these characteristics should be prepared for the increased need for a thoracic approach.

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REFERENCES

1. Katic MR, Grillo HC, Wang C. Substernal goiter: analysis of 80 patients from Massachusetts General Hospital. *Am J Surg.* 1985;149:283-287.
2. Moran JC, Singer JA, Sardi A. Retrosternal goiter: a six-year institutional review. *Am Surg.* 1998;64:889-893.
3. Hall TS, Caslowitz P, Popper C, Smith GW. Substernal goiter versus intrathoracic aberrant thyroid: a critical difference. *Ann Thorac Surg.* 1988;46:684-685.
4. Allo MD, Thompson NW. Rationale for operative management of substernal goiters. *Surgery.* 1983;94:969-977.
5. Sanders LE, Rossi RL, Shahian DM, Williamson WA. Mediastinal goiters: the need for an aggressive approach. *Arch Surg.* 1992;127:609-613.
6. Nervi M, Iaconi P, Spinelli C, Janni A, Micoli P. Thyroid carcinoma in intrathoracic goiter. *Langenbecks Arch Surg.* 1998;383:337-339.
7. Houck WV, Kaplan AJ, Reed CE, Cole DJ. Intrathoracic aberrant thyroid: identification critical for appropriate operative approach. *Am Surg.* 1998;64:360-362.
8. De Andrade MA. A review of 128 cases of posterior mediastinal goiter. *World J Surg.* 1977;1:789-797.
9. Lahey FH. Intrathoracic goiters. *Surg Clin North Am.* 1945;25:609-618.

DISCUSSION

Walter B. Goldfarb, MD, Portland, Me: One interesting thing is that the incidence of sternotomy in your series when related to thoracic goiters is 10 times that in the literature. One of the largest series in the literature is by Reeves and Delbridge from Australia, who, in primary substernal goiters, open the sternum 2% of the time and only 3% with recurrent goiters. In Proye's series of 489 substernal goiters, in Lillie, sternotomy was utilized only 1 time. Your incidence of carcinomas of 55% is also considerably higher than that in the literature for substernal goiters.

The definition of what is a substernal goiter is not clear. It is difficult to define in a patient with a huge goiter in the neck as well as a considerable substernal component, as is often the case with a multinodular goiter. There are 2 patients in this series who have had total thyroidectomies, so you are not really splitting the sternum for goiter but for nodes or recurrence of tumor.

Another unique feature of your series is the high incidence of posterior mediastinal goiters. I've never seen it, and as you say it's hard to find in the literature. A unique feature is the aberrant or thyroid rest which you have in the mediastinum. One of the things I have seen is in taking out huge mul-

tinodular goiters, sometimes by reaching in you put in your finger and you pull out another multinodular goiter and I am not sure that is a primary thoracic goiter.

One of the things I've noticed in these cases is that they are often more of an anesthetic tour de force than they are a surgical one. Anesthesiologists have fiberoptic equipment and getting these patients intubated is easier. However, we have had 4 emergencies with acute airway obstruction, and these can present a real problem. One was in such respiratory distress with a URI [upper respiratory infection] that her already compromised airway had swollen almost shut and we put her on femoral-femoral bypass under sedation. After she was on bypass, she was intubated uneventfully. And we have had a couple of patients who have come in the hospital with asymptomatic huge goiters, who had hip surgery and couldn't be extubated because they now had tracheitis. These patients, both with huge goiters, came in for something else and developed a compromised airway post another surgical problem. That is something one has to consider.

In your paper, you discussed the operative technique of exposing the lateral margin and finding the nerve and the parathyroids. To try and find the nerve and the parathyroids is sometimes very difficult, and usually I have to go inferiorly and free up the mass before I dissect laterally to find the nerve and the parathyroids.

Dr Monchik: Dr Goldfarb is correct that there is a high incidence of a malignancy in the patients who required a thoracic approach. In fact, 56% of the patients who required a thoracic approach had a malignancy. Although not mentioned in the manuscript, only 14% of the 94 patients with a mediastinal mass had a malignancy. The fact that a high percentage of the patients with a mediastinal mass required a thoracic approach appears to be related to the strict definition of a thoracic mass and, to a more significant extent, the patient population. The definition used to define a mediastinal mass for this report required that at least 50% of the mass be below the thoracic inlet. The number of thyroid lesions considered mediastinal would be considerably greater if any thyroid mass extending below the thoracic inlet was defined as mediastinal. The patient population was the most significant reason for the high incidence of thoracic approach in this study. In the 27 patients who required a thoracic approach, 22 (81%) fell into one of the following categories: malignancy, reoperation, posterior or aberrant thyroid. Only 5 patients requiring a thoracic approach had a benign anterior thyroid mass. The partial sternotomy for metastatic papillary carcinoma to mediastinal lymph occurred in 1 patient at the initial surgery and 1 patient at reoperative surgery.

There is a critical problem with intubation when severe tracheal compression is present. This situation requires an experienced anesthesiologist. Sevoflurane induction has been helpful in this situation because it is easily reversible. Awake intubation over a flexible bronchoscope or through a rigid bronchoscope after spraying the oral pharynx with local anesthesia is used for more severe tracheal obstruction.

The 2 aberrant thyroid masses described in this article were not a piece of a multinodular thyroid mass that became separated from the cervical thyroid. The mass in each case derived its blood supply from a mediastinal source, which is the identifying feature of an aberrant mass as opposed to a mass that originated from the cervical thyroid.

David I. Soybel, MD, West Roxbury, Mass: I just wanted to clarify something about the slide where you showed the symptoms or signs that would lead to the recognition of the goiter, which isn't the same thing as the reason for the referral, the reason for deciding to do the operation. At least in the Veterans Administration regionally where I'm working, we basically only see these patients referred to us when there's compromise of the airway or a change in the scan that makes the endocrinologist nervous that there's a cancer present. As a result, I think our conversion or our use of sternotomy is probably similar to yours. And I just wondered how do you decide when you're going to operate on these. How do you educate your pulmonary people and your endocrinologists so you don't get to the point where you're having to split the sternum. Because that's been my problem.

Dr Monchik: This is a very controversial point. As you probably know, one of the best articles was written by Thompson and Allow, where they claim that everybody with substernal thyroid mass ought to be operated on. I generally don't feel that way but some of my colleagues in Boston, particularly the endocrinologist Gil Daniels, for one, like to have these people operated on because he can't follow them. He says it's hard to follow someone with a mediastinal mass. I kind of weigh the age and the problems the patient is having. I clearly do not operate on everybody with a mediastinal mass. You say, well, what's the likelihood that someone is going to suddenly bleed and present with respiratory distress? I've had 1 case in my whole life where that happened. In fact, I was going on vacation that evening. I saw him at 12 o'clock in the office and scheduled him for surgery. At 1 o'clock, he was in the emergency room turning blue. It doesn't happen that often.

Anthony S. Patton, MD, Danvers, Me: I just want to echo that experience. I've seen several totally aberrant thyroid masses in the chest that have separate blood supply in just a normal thoracic surgical practice.