Enormous Goiter in Posterior Mediastinum: Report of 2 Cases and Literature Review

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Retrosternal goiters are commonly situated in the anterior mediastinum, but according to the literature, 10–15% are located in the posterior mediastinum. The authors report two cases of enormous goiter in the posterior mediastinum. Case 1 was a 60-year-old man. His mass measured 12 × 9 × 8 cm and was combined with trachea compression and superior vena cava syndrome. Case 2 was a 59-year-old woman. Her mass measured 9 × 6 × 6 cm and she was admitted with the complaint of dysphagia. Both patients were discharged from hospital after successful operations. They reported normal activities in the follow-up.


Key Words: goiter, posterior mediastinum, retrosternal, 64-slice spiral computed tomography, surgery

Retrosternal goiters are commonly situated in the anterior mediastinum, but according to the literature, 10–15% are located in the posterior mediastinum.1 The authors herein report two cases of enormous goiter in the posterior mediastinum.

Case Reports

Case 1
A 60-year-old man was admitted to hospital with the complaints of cough with white sputum, chest discomfort and shortness of breath for half a month and progressing in 5 days. His symptoms were aggravated with supine dyspnea after admission and he could only fall asleep intermittently by lying on his left side. Respiratory rate was 20 per minute and the other vital signs were good, with alert consciousness. His neck was supple and the trachea was right deviated. A 3 × 3-cm enlarged thyroid gland was palpated in the left neck, the inferior pole of which extended into the thorax through the thoracic inlet. He had bilateral jugular vein distension and conjunctival congestion in the right eye. The veins on the superior thoracic wall were engorged, of which those on the right were obvious. Thoracic auscultation detected harsh intratracheal wheeze.

Laboratory tests reported normal levels of serum T3, T4 and TSH. Thoracic imaging by 64-slice spiral computed tomography (CT) demonstrated an elliptical mass extending from paratracheal in neck to the thoracic superior mediastinum and ending in the left posterior mediastinum (Figure 1). The mass measured 12 × 9 × 8 cm, with a clear border and homogeneous density. Post-contrast images showed slight peripheral enhancement. The trachea was compressed so severely that it deviated to the right and was bow-shaped with a narrowed lumen. Bilateral brachiocephalic veins...
and branches of the arch of the aorta were compressed and deviated anteriorly or laterally. The esophagus had also moved to the right. The clinical diagnosis was enormous intrathoracic posterior mediastinal goiter, trachea compression and superior vena cava syndrome.

The patient underwent emergent operation because of the severe disturbance to his sleep. His chest was opened by anteromedian sternotomy and the incision was extended 3–4 cm along to the left neck. There was a multinodular goiter in the left neck that extended to the posterior mediastinum through the thoracic entrance, in front of which passed the brachiocephalic artery and the left brachiocephalic vein transversely. As a result, the superior caval vein and right brachiocephalic vein were compressed to the right. We placed tourniquets at both the distal and proximal ends of the superior vena cava and left brachiocephalic vein. The trachea deviated to the right and was bow-shaped. We tried puncturing the mass and took out caffie fluid. Afterwards, we dealt with the cervical vessels around the thyroid mass, including superior, lateral, isthmus and so on. Then, we drew the posterior mediastinal thyroid mass toward the head and isolated it with alternate blunt or sharp dissection between the true and false capsules of the thyroid. The operator isolated the mass from the posterior mediastinum to the left superior pulmonary hilum and left bronchia by putting the fingers between the spine and the posterior of the mass. Then we isolated the bilateral area of the mass until we reached the anterior arch of the aorta and posterior of the three main branches. The fingers moved downwards to the left pulmonary hilum and touched the pulsate of the left pulmonary artery. After full isolation, we drew the mass from the posterior mediastinum to the thoracic inlet and resected the intact mass and majority of the left lobe of the thyroid gland, while the small part of the normal thyroid gland that was on the posterior side in the left neck was...
reserved. After the removal of the mass, the trachea regained its normal position without chondromalacia. Bilateral mediastinal pleura were slightly injured during the operation. There were no postoperative complications.

Pathology report was nodular thyroid goiter with cystoid degeneration. The patient was discharged from hospital after 11 days. He reported normal activity in the follow-up visit 1 month after the surgery.

**Case 2**

A 59-year-old woman was admitted with the complaint of dysphagia. She developed dyspnea, which was aggravated by physical exercise. Respiratory rate was 18 per minute and other vital signs were good, with alert consciousness. Her neck was soft and the trachea was slightly deviated to the left. A 2 × 3-cm enlarged thyroid gland was palpated in the right neck, the inferior pole of which extended into the thorax through the thoracic inlet. She had bilateral jugular vein distension, and the veins on the superior thoracic wall were engorged, with a right predominance. Thoracic auscultation detected rough intratracheal wheeze.

Laboratory tests reported that T\textsubscript{3} was 7.29 pmol/L (normal upper limit is 6.8 pmol/L), T\textsubscript{4} was 21.45 pmol/L, which was in the normal range. TSH was 0.08 mIU/mL, which was less than the lower limit of normal (0.27 mIU/mL). Thoracic scan by 64-slice spiral CT demonstrated an elliptical mass extending from paratracheal in neck to the thoracic superior mediastinum and ending in the right posterior mediastinum (Figure 2). The mass measured 9 × 6 × 6 cm, with a clear border and heterogeneous density. On arterial phase imaging, the mass demonstrated prominent enhancement. Hyperattenuated calcifications and

![Figure 2. Case 2: images from 64-slice spiral computed tomography.](image-url)
hypoattenuation round the lesion were also manifested. The trachea was compressed so severely that it deviated to the left and was distorted. Bilateral brachiocephalic veins, the superior vena cava, and branches of the arch of the aorta were compressed and moved anteriorly or laterally. The esophagus had also deviated to the left. The clinical diagnosis was intrathoracic posterior mediastinal goiter, trachea compression, esophagus compression and superior vena cava syndrome.

Considering that the dyspnea had developed recently, the patient was operated on immediately after necessary preoperative examinations. Her chest was opened by anteromedian sternotomy on the upper third of the sternum and the incision extended 2–3 cm along to the neck. There was a multinodular thyroid mass in the right neck which dropped into the right posterior mediastinum through the thoracic inlet. The mass took up one fifth of the space of the right thoracic cavity, in front of which passed the brachiocephalic artery and left brachiocephalic vein transversely. As a result, the superior vena cava and right brachiocephalic vein were compressed to the right, while the trachea deviated to the left. The operative procedure was the same as for Case 1, except for the reversed orientation of left and right. After the removal of the mass, the trachea and vessels regained their normal positions without chondromalacia. Bilateral mediastinal pleura were slightly injured during the operation. There were no postoperative complications.

Pathology report was nodular thyroid goiter. The patient was discharged from hospital after 10 days. She reported normal activities in the follow-up visit 1 month after the operation.

Discussion

Position of goiter in posterior mediastinum

The extension of a thyroid goiter in the neck into the inferior thoracic inlet behind the sternum is known as a retrosternal goiter, while some scholars define goiters of which 50% are below the thoracic entrance as intrathoracic goiters.2 Most retrosternal goiters are attributed to be part of goiters in the neck. There is the condition of a solitary mass in the posterior mediastinum that is known as an autonomous ectopic goiter, but it is rare clinically.3

Retrosternal goiters are most commonly situated in the anterior mediastinum, but according to Shahar and Dow, 10–15% of retrosternal goiters are located in the posterior mediastinum.1 However, Chin et al found that five goiters in the posterior mediastinum out of 190 goiter patients scanned by CT (7.1%) had a part of the goiter in the anterior mediastinum.4 The two cases reported here were both of a huge mass, most of which was situated in the posterior mediastinum and ended at the pulmonary hilum. So we classified them as posterior mediastinal goiters. Wu et al5 divided the intrathoracic goiter into three types according to the thyroid position in the thoracic cavity as presented on imaging and by clinical signs: type I goiters have their inferior pole over the arch of the aorta; type II goiters are those below the arch of the aorta and extending into the posterior mediastinum; type III are giant goiters that inburst into the chest or are present with superior vena cava syndrome. According to the above classification, the two cases reported here are type III goiters.

Clinical manifestations and diagnosis

Most patients with retrosternal goiter have the clinical manifestations of cervical mass, dyspnea, hoarseness, superior vena cava syndrome, dysphagia, pericardiac effusion, thyrotoxicosis caused by toxic multinodular goiter and so on.6,7 Toxic multinodular goiter, a common complication of nontoxic multinodular goiter, usually occurs after the age of 50 in patients who have had nontoxic multinodular goiter for many years.8 In those with posterior mediastinal goiter, the compressing symptoms of superior vena cava syndrome, dysphagia and dyspnea are extremely prominent.9 Sometimes, such patients are wrongly diagnosed with asthma spasm. Ket et al reported a case where an enormous posterior mediastinal goiter caused acute respiratory failure and airway obstruction, which required urgent endotracheal intubation.
and respiratory support. Shahar and Dov reported that in their series, 25% of patients presented with acute airway distress and 10% required emergency airway intubation. However, de Perrot et al had only 11 cases (6%) out of 185 patients with mediastinal goiter who needed endotracheal intubation to relieve the dyspnea. Testini et al had only one case (4%) out of 25 patients with cervic mediastinal goiter who had acute airway obstruction. The abrupt worsening of respiratory function is usually caused by respiratory tract infection, sudden hemorrhage in the nodules, and the position of the posterior mediastinal goiter. The goiter in our Case 1 was situated in the left posterior mediastinum. The patient suffered chest discomfort and shortness of breath for half a month before surgery, and the symptoms worsened after hospital admission. He had progressing dyspnea with supine position and could only sleep intermittently when lying on his left side. All these manifestations are similar to the descriptions in Ket et al’s report. The goiter in our Case 2 was located in the right posterior mediastinum and intraburst into the thorax. Her dyspnea was not as severe as that in Case 1, but she developed dysphagia and superior vena cava syndrome.

The diagnosis of retrosternal goiter is not difficult according to clinical manifestations and findings from X-ray, CT or magnetic resonance imaging. But with regard to intrathoracic goiters, especially the intrathoracic posterior mediastinal goiter that is located behind the arch of the aorta or the superior vena cava and their branches, compressing the trachea and esophagus, determination of the exact orientation requires multilayer images of the mediastinum scanned by 64-slice spiral post-contrast CT. We found that it helped significantly in directing the operation.

Indications for surgery and choice of surgical technique

We prefer surgery if there is no contraindication because as the mass of the intrathoracic goiter increases, it compresses adjacent organs such as the trachea, esophagus, and superior vena cava. In addition, intrathoracic goiter carries a risk of malignancy. Of note, posterior mediastinal goiter may lead to intravesicle hemorrhage or respiratory tract infection, which may cause acute respiratory dysfunction and require urgent endotracheal intubation or emergent operation. To avoid acute airway obstruction or acute respiratory failure, emergent endotracheal intubation and operation were carried out in Case 1 after definite diagnosis, which relieved the severe airway obstruction and superior vena cava obstruction. Case 2 was also operated on promptly after the exclusion of esophageal diseases. Her obstructive symptoms disappeared after the operation.

Most retrosternal goiters can be resected from the neck with a low arc incision. Ahmed et al reported a 3.4% (9/267) rate of median sternotomy. Currently, there are no definitive criteria for selecting patients who would likely require a median sternotomy. The retrospective study of de Perrot et al suggested that most mediastinal goiters can be removed through a cervical approach, and sternotomy should only be performed in cases of previous cervical thyroidectomy, invasive carcinoma, or ectopic goiter. However, most studies indicate that the chance of sternotomy for posterior mediastinal goiter is greatly increased. The type III intrathoracic goiters described by Wu et al require a midline sternotomy besides the cervical incision. Chong et al suggested that posterior mediastinum goiters require cervicothoracic associated incision. Ket et al reported cases in whom cervical incision was combined with right posterolateral thoracic incision for huge goiters that occupy the majority of the thoracic cavity. There have also been reports of using cervical incision with anterior mediastinal incision to cut posterosternal goiters, avoiding sternotomy and thoracotomy. But we consider that this method may not be suitable for the removal of posterior mediastinal goiters. When there is distal dislocation of the left brachiocephalic vein and ≥70% of the mediastinal mass is below the thoracic outlet, in particular, a distal border below the level of the aortic arch, we often need a sternotomy combined with cervical incision, especially when the size of the mass is larger than the thoracic
Ahmed et al suggested that patients with radiologic and CT evidence of goiter extending below the aortic knuckle at the tracheal bifurcation require median sternotomy, but a trial of cervical delivery must be undertaken before resorting to sternotomy.\(^{15}\)

In the two cases reported here, determination of the precise orientation was made with the help of 64-slice spiral CT. The goiters were mainly located in the chest with a little in the neck, and the relationship with the mediastinal vessels was complicated. What is more, both patients developed superior vena cava syndrome, tracheal compression and dyspnea. As a result, thoracic incision was necessary. We preferred the midline sternotomy and extended the incision to the neck appropriately, avoiding a low arc incision. The resection of the mass in the neck and chest was carried out successfully. As the mass in Case 2 was smaller than that in Case 1, we carried out sternotomy only on the upper third of the sternum, extending to the left sternum at the level of the third intercostal space. The lower part of the thorax was intact and the outlet of the thorax was enlarged, so the mass was easy to remove. We concluded that removal of goiters that are almost falling into the thorax can be carried out successfully without a cervical arch incision. Of course, together with developments in surgical technique, new technology will also be applied to surgery of intrathoracic goiter, such as video-assisted thoracoscopy,\(^ {18}\) mediastinoscopy,\(^ {19}\) and robotic approach.\(^ {20}\)

Complications associated with the surgical removal of a substernal goiter are hematoma, recurrent laryngeal nerve injury, pneumomediastinum, tracheomalacia, postoperative pleural effusion, transient hypocalcemia, and cervical plexopathy.\(^ {6}\) There have been reports of patients with giant mediastinal goiters who developed negative-pressure pulmonary edema and unilateral phrenic nerve paralysis postoperatively.\(^ {21, 22}\) Our two cases were diagnosed with precise orientation and appropriate incisions, without any complications after surgery.

In conclusion, enormous intrathoracic goiters usually compress important intrathoracic organs, which makes surgical risk high and surgical technique difficult. Careful preoperative determination of the exact orientation of the goiter, appropriate operative timing and method, and felicitous incision according to the goiter volume and position are keys to successful diagnosis and management of the disease.

References


