EMERGENCY SURGICAL TRACHEAL DECOMPRESSION IN A HUGE RETROSTERNAL GOITER

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Abstract

Introduction. Over the past decades, several definitions and classifications of cervico-mediastinal goiters have been proposed. We analyzed and discussed the clinical presentation, the diagnostic procedures and the surgical technique in relation to post-operative complications and long-term results in a case of a sixty-six years old obese, hypertensive female admitted in the Thoracic Surgery Department with respiratory distress (inspiratory dyspnea, stridor) progressively aggravating during the latest month.

Methods. Cervico-thoracic CT scan revealed the existence of a cervico-mediastinal huge goiter which developed mostly intrathoracic (2/ 3 of the goiter). It determined a tracheal compression, reducing its caliber by two thirds, and its displacement to the right side. The proposed surgical procedure was total thyroidectomy and it involved a bipolar approach (transcervical and transsternal) through a partial upper cervico-sternotomy.

Results. The complete removal of the goiter and the decompression of the trachea have been achieved. Postoperative results were very satisfactory, with the absence of the respiratory distress. The histological examination revealed a multinodular goiter with epithelium hyperplasia.

Conclusion. The presence of a complicated cervico-mediastinal goiter with severe respiratory distress required a surgical excision as the main and immediate treatment option. The surgical procedure represented a milestone for both the anesthesiologist (difficult intubation, with a thin tracheal tube in the absence of the jet ventilation technology) and for the surgeon. The goiter's excision from the visceral mediastinum was very difficult because of its huge dimensions and close relations with trachea and great vessels (anterior) and esophagus, erector spinal muscles and the spine (posterior).

Key words: cervico-mediastinal, substernal, retrosternal, intrathoracic goiter, cervicosternotomy, total thyroidectomy.

INTRODUCTION

Retrosternal thyroid goiter is a rare pathology and its definition varies from author to author. A practical classification is presented in this issue of *Acta Endocrinologica* by Cvasciuc *et al.* The term goiter is accepted worldwide, while the terms “substernal”, “retrosternal”, “intrathoracic” or “cervico-thoracic” are not clearly agreed on. Approximately 80% of the substernal thyroid masses in most series are of the small substernal extension type, 15% are “partial” intrathoracic (in which the major part of the mass is situated within the thorax, according to Wakeley and Mulvany classification – 1940) and only 2-4% are “complete” retrosternal (all of the mass lies within the thoracic cavity) (1, 2). The cervico-mediastinal goiters develop from the cervical region and descend to the mediastinum, behind the great mediastinal vessels (retrovascular). According to Sweet, most of the retrosternal goiters are situated in the anterior compartment of the visceral mediastinum (pretracheal) and only a few in the posterior mediastinum, located retrotracheal, or even posterior of the esophagus (3).

The tendency to enlarge and compress adjacent anatomical structures and the chance of malignancy require a surgical excision as the main treatment option.

The purpose of the paper was to report the biggest cervico-mediastinal goiter observed in our practice. This cervico-mediastinal goiter, with severe respiratory distress and required an emergency surgical excision.

CASE REPORT

A 66-year-old obese, hypertensive woman, from an iodine sufficient area, was admitted to our service with respiratory distress (inspiratory dyspnea, stridor) which progressively aggravated, associated

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with an episode of pulmonary infection, developed during the past month.

Physical examination revealed a cervical mass that moved on swallowing, an important degree of kyphosis, and a short, thick neck.

Interdisciplinary assessment of this case consisted of the cardiac evaluation (clinically, by electrocardiography, echography), ENT (vocal cords exploration through laryngoscopy), and preanesthetic evaluation. Cardiac evaluation revealed some cardiac risk factors: age, obesity, presence of a stable angina, moderate hypertension controlled through an adequate therapy and dyspnea. Under direct visualization, laryngoscopy showed a normal morphology and mobility of both vocal cords.

Preanesthetic evaluation revealed a high anesthetic and surgical risk: emergency surgical intervention in a patient with respiratory failure and cardiac associated comorbidity.

The initial management in this case was oxygen therapy, antihypertensive drugs (enalapril 10 mg/ day associated with hydrochlorothiazide 25 mg/ day) and vasodilator therapy (isosorbide dinitrate 20 mg/ day).

Biological findings of thyroid gland function were within normal limits, with a level of TSH (thyroid stimulating hormone) of 2.1 $\mu\text{U/mL}$, TT4 (total T4) of 6.1 $\mu\text{g/dL}$, TT3 (total T3) of 1.2 ng/dL , free-T3 of 3.1 pg/mL , and free-T4 of 1.1 ng/dL . Other biological findings were also within normal limits.

The standard thoracic X-ray revealed a huge enlargement of the mediastinal opacity and tracheal compression with right tracheal deviation.

At the level of the cervical region, the cervico-thoracic CT scan showed a right cervical thyroid lobe enlargement with a left laryngo-tracheal deviation and

the absence of the left cervical lobe of the thyroid gland (Fig. 1).

Thoracic sections in the transversal plane of the CT scan performed revealed a huge mediastinal mass (left thyroid lobe located in the posterior visceral mediastinum - retrotracheal) with anterior and right displacement of the trachea, as well as a compressed tracheal lumen (its caliber was reduced by two thirds) and esophageal compression with posterior and right displacement. The retrotracheal goiter was confined anteriorly by the aortic arch, the left innominate vein, and the superior vena cava. No obstruction of these vessels was present (Fig. 2).

The sagittal CT reconstruction (Fig. 3) revealed in the same image: a cervico-thoracic goiter mostly developed intrathoracic (2/ 3 of the goiter). This reconstruction helped us notice the anterior deviation of the trachea, the compression of the membranous part of the trachea and the posterior relations of the mediastinal mass: esophagus, erector spinal muscles, and spine.

Coronal reconstruction revealed the huge mediastinal part of the cervico-thoracic goiter with necrosis and calcifications, as well as the inferior limit of the mediastinal mass (extending down to the level of the tracheal carina) (Fig. 4). With the presence of calcification within an enlarged thyroid gland, the risk of malignancy is very high (4). Given the normal thyroid functional data (normal thyroid hormone levels), we were not yet able to decide if this was thyroid cancer or a huge benign goiter.

In the absence of a jet-ventilator, the anesthesiologist performed a difficult tracheal intubation with a thin single lumen tube under fiber-bronchoscopy control.

For the safety of the surgical procedure, with

Figure 1. Cervical section CT scan (transversal plane).

Figure 2. Thoracic sections in the transversal plane of the CT scan.

Figure 3. Cervico-thoracic sagittal CT reconstruction.

Figure 4. Coronal CT reconstruction.

Figure 5. Right thyroid lobe devascularisation, identification and preservation of the right recurrent laryngeal nerve (image from the right cervical region).

Figure 6. Left thyroid lobectomy from a mediastinal approach (1), tracheal tumoral decompression (2), identification and preservation of the left recurrent laryngeal nerve (3) (image from the cervico-thoracic region).

Figure 8. Multinodular goiter with epithelium hyperplasia.

total control of both cervical and mediastinal anatomic structures, and for the complete removal of the thyroid mass, a combined cervical and mediastinal approach was performed through a cervicotomy and a partial upper sternotomy.

In the cervical approach, after sectioning the subhyoidian muscles, the superior cervical blood supply of the right thyroid lobe was identified and controlled (superior and inferior right pedicles and the right thyroid middle vein).

One superior parathyroid gland and the right recurrent laryngeal nerve were identified and preserved. In addition, the right upper thyroid pedicle was identified and controlled at the cervical level. Finally, the right thyroid lobectomy and the removal of the thyroid isthmus tissue were performed (Fig. 5).

Through this cervical approach, we were not able to identify the left inferior thyroid vessels and

the left recurrent laryngeal nerve because the huge substernal portion of the left thyroid lobe covered them. We decided to perform a partial upper sternotomy with left thyroid lobe mobilization through blunt mediastinal dissection. Through this mediastinal approach, we were able to perform the dissection and ligation of the left inferior thyroid vessels.

In addition, we identified and preserved the left recurrent laryngeal nerve and performed a left thyroid lobectomy from a mediastinal approach (Fig. 6).

Finally, we achieved the goal of the surgery: the complete removal of the goiter and decompression of the trachea. We drained the remained cervico-mediastinal cavity in order to prevent accumulation of fluids at this level.

The patient was discharged after 10 postoperative days with absence of any symptoms of respiratory distress or dysphonia and normal levels of calcaemia. Postoperative care included substitutive medication L-thyroxine 150 mcg/ day.

The histologic examination of the thyroid mass revealed a multinodular goiter with epithelium hyperplasia (Fig. 7).

The medium term follow-up showed a very good result with the absence of recurrence of the disease and an euthyroid status of the patient.

DISCUSSION

The patient presented the clinical signs of an acute upper airway obstruction (wheezing and stridor) as results of an important progressive tracheal compression, aggravated by an acute respiratory infection or a spontaneous hemorrhage within the thyroid mass. The management of this event was promptly applied: intubation and emergency thyroidectomy.

Clinical absence of signs of local invasion for this cervico-mediastinal mass (absence of hoarseness due to vocal cord paralysis) sustained the absence of malignancy. The pathological diagnosis was multinodular goiter, without any malignant lesions. This disease is known to have a very good long-term prognosis.

In this case, we highlighted several imagistic signs on the CT scan, which were relevant for establishing the presumable diagnosis of the thyroid cervico-mediastinal mass: a clear continuity of the mediastinal mass with the cervical gland, well-defined borders, presence of calcifications, heterogeneity of the mass, presence of non-enhancing low-density areas,

lateral and anterior displacement of the vessels in the superior mediastinum, with the cradling of the mass by the right and left brachiocephalic vessels. The thyroid scintigraphy was unnecessary because the diagnosis would remain in doubt (less than 50% identification of the thyroid tissue in most reports in literature) and this examination should be performed before a CT scan. The emergency of this case did not allow us to perform this examination without any risks. We considered that the CT scan was the only examination needed in order to allow a very good exploration in this emergency.

In this case, the best approach was the immediate surgical resection of a thyroid mass, thus decompressing the trachea. The use of radioactive iodine was contraindicated because it might aggravate the pre-existing tracheal compression. LeRoux et al. (1984) reported that the acute airway obstruction could occur after the administration of radioactive iodine owing to temporary enlargement of the goiter (5, 6). As reported by Warren (1979) and other authors, acute airway obstruction can lead to sudden death (7).

The anesthetic technique played an important role in the surgical planning. In the absence of a jet ventilation equipment, the anesthesiologist performed the tracheal intubation with a small single lumen tube and laryngo-tracheal visualization under fiber-bronchoscopy control.

In this case, an additional exposure of the upper part of the visceral mediastinum by partial sternal split was necessary due to the presence of a huge substernal left thyroid lobe that touched the carina. The identification of the left recurrent laryngeal nerve and the control of the left inferior thyroid vessels could not be possible unless the retrosternal portion of the gland was removed from the mediastinum. This could not be accomplished by finger or pledged dissection within the capsule of the goiter and was necessary to provide additional exposure by a partial upper sternotomy to complete the mobilization. Generally, the cervicotomy is the approach of choice in cervico-mediastinal goiters, but in this case, the sternotomy was performed because of the impossibility of extracting the huge part of the goiter from the mediastinum (8). Morcellation of the goiter was avoided in order to minimize the possibility of bleeding, which might be difficult to control, and because of the possible presence of an occult carcinoma within the gland. The complete removal of the thyroid mass from both the cervical region and the mediastinum and the decompression of the trachea without any postoperative collapse or kinking of the tracheal wall, were achieved through this combined

cervical and thoracic approach.

The cervico-sternotomy was preferred to cervicotomy alone in order to reduce the operative risks, especially the hemorrhagic and nervous lesions.

The very good prognosis in this case was due to the complete decompression of the trachea without any postoperative complications (tracheomalacia, vocal cord paralysis, hypoparathyroidism) and the histologic features of the thyroid mass (multinodular goiter with epithelium hyperplasia).

Postoperative results were very satisfactory with the absence of any symptoms of respiratory distress or dysphonia and normal levels of calcaemia. The patient was discharged after 10 postoperative days because the partial upper sternotomy and the complexity of this intervention required a prolonged period of recuperation (3 days in other cases of cervico-mediastinal goiters operated only through cervical approach).

For mediastinal goiters, surgery should always be considered, even in elderly patients, because of the high risk of tracheal compression and the low morbidity risk of the surgery. Most mediastinal goiters are benign and can be removed through a cervical approach. Sternotomy should only be performed in selected cases of previous cervical thyroidectomy, invasive carcinoma, and ectopic goiter (9).

Conflict of interest

The authors declare that they have no conflict of interest.

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