Emergent thyroidectomy with sternotomy due to acute respiratory failure with severe thyroid storm

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ABSTRACT

Huge cervical and mediastinal masses may lead to acute respiratory failure caused by laryngotracheal compression and airway obstruction. Thyroid storm is also a life-threatening endocrine emergency originating almost exclusively from uncontrolled Graves' disease. We report a case of a 42-year-old man with acute upper airway obstruction and tachycardia from progressive swelling of a giant thyroid, in conjunction with thyroid storm resulting from uncontrolled Graves' disease. Fiberoptic-assisted nasal intubation was performed while the patient was awake, immediately followed by emergency total thyroidectomy via a cervical and sternal approach. The patient had an uneventful postoperative course and recovered well. Respiratory failure due to swelling of a giant thyroid is a life-threatening condition and should be treated immediately with endotracheal intubation while the patient is awake following emergent total thyroidectomy, even with a sternotomy.

KEYWORDS

Airway obstruction – Emergent treatment – Graves' disease

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Introduction

Graves' disease is a pathologically benign disease of the thyroid gland. Generally, vocal cord palsy (VCP) occurs in malignant thyroid disease. However, in a few cases VCP occurs in benign thyroid disease. Some authors have reported that the preoperative incidence of VCP was 0.3–4.3% among surgical patients who proved to have benign thyroid disease.^{1,2} Retrosternal goitre is a common benign disease of the thyroid gland. Diagnosis is difficult, because patients are usually asymptomatic in the early stages of the disease. When the thyroid starts to enlarge and cause significant compression symptoms, progressing through to giant goitre, it should be considered carefully and treated as soon as possible.

We report a very rare and severe case of bilateral VCP resulting from poorly controlled Graves' disease, accompanied by a complaint of breathing difficulty. The patient was successfully treated with an emergent total thyroidectomy and sternotomy.

Case history

A 42-year-old man suffering from the acute onset of a huge cervical swelling and difficulty breathing presented with shortness of breath and exhibiting poor general health. He had been diagnosed with Graves' disease 19 years earlier

and took methimazole (methylmercaptoimidazole; MMI). However, his irregular daily life resulted in a lack of compliance with regard to taking his medicine. His thyroid function fluctuated, with frequent remissions and exacerbations. In conjunction with his lack of compliance, MMI was interrupted for two months. Therefore, he gradually developed hyperthyroidism with enlargement of the thyroid and tachycardia, and was then referred to our hospital. On examination, he had an irregular pulse rate of 127 beats/minute. Initial thyroid function tests revealed the hyperthyroidism; free-T4 13.0 ng/dl (normal range 0.9–1.4 ng/dl), thyroid-stimulating hormone (TSH) under the threshold of sensitivity (0.3–5.0 µIU/ml), TSH receptor antibody 158.5 (normal ≤ 2), thyroglobulin 5186 ng/ml (normal ≤ 33.7). Computed tomography of the neck and thorax revealed a considerably enlarged thyroid, abounding with blood flow and expanding in the upper mediastinum. The thyroid was compressing the superior vena cava and the cutaneous vein of the neck was abnormally swollen (Fig 1). Laryngoscopy revealed bilateral VCP. Left complete paralysis and right incomplete paralysis of the vocal folds were also detected (Fig 2).

As respiratory failure was severe, an emergency tracheostomy was planned. However, the excessive size of the thyroid necessitated immediate transfer to the operating room to perform an emergent thyroidectomy. First, we made a standard collar incision (Kocher's) on the neck

Figure 1 Computed tomography findings in the neck and thorax (a and b: axial, c: coronal; d: sagittal). The trachea was narrowed and shifted to the right side by the nodular goitre. The trachea was markedly compressed by the nodule.

following the application of fiberoptic-assisted nasal intubation while the patient was awake. Both lobes of the thyroid gland were determined to be enlarged from the supraclavicular region and we identified a well encapsulated mass with a smooth surface, which was causing tracheal compression. In addition, a simple median sternotomy was performed as the inferior part of the left lobe was found to be extended retrosternally. Intraoperative tracheostomy was required and the operation was concluded (Fig 3). Although we could not use any device to

search for recurrent nerves because of severe respiratory failure at the time of intubation, the recurrent nerves were preserved on both sides. During the initial incision to the removal of the thyroid, every tissue (e.g. the neck skin, the surface of the thyroid and muscles) bled easily on touch. The operation took 6 hours and 25 minutes and the amount of bleeding was 1738 ml. The patient required blood transfusion.

Following removal of the thyroid, the trachea returned to the normal site of the neck with no features of tracheomalacia. The thyroid weighed 350 g. Histologically, routine light microscopy analysis following haematoxylin and eosin staining revealed diffuse thyroid hyperplasia. No malignancy was evident in the thyroid (Fig 4). One week after surgery, movement of the right vocal fold improved and we then closed the tracheostomy fistula. On examination two weeks after resection, thyroid function tests revealed free-T4 0.9 ng/dl, TSH 1.77 μ iu/ml, thyroglobulin 11.2 ng/ml. Six months after the operation, the left side VCP has improved completely. The patient had an uneventful post-operative course and recovered well.

Discussion

Acute airway obstruction owing to retrosternal benign goitres or thyroid malignancies has been previously described. However, benign cervical goitres causing acute airway obstruction are rare.⁵ Previous studies have suggested that acute airway obstruction can be caused by an upper respiratory tract infection causing oedema, sudden haemorrhage into a cyst, tracheal collapse or worsening of comorbidities.^{4,5} Generally, enlargement of the thyroid with VCP indicates malignant thyroid tumour. VCP in benign thyroid disease is very rare. VCP is seen in 0.7–4.3% of preoperative patients who undergo resecting of benign thyroid nodules and almost all are cases of unilateral VCP.¹ Bilateral VCP is also extremely rare in preoperative patients with benign thyroid disease. Because the patient in the current case was in a state of airway crisis, a decision was made to

Figure 2 Laryngoscopy revealed bilateral vocal fold palsy and left complete paralysis and right incomplete paralysis of the vocal folds. a) Inspiration. b) Expiration.

Figure 3 We performed total thyroidectomy and sternotomy. Both lobes of the thyroid gland were enlarged from the supraclavicular region and we identified a well-encapsulated mass with a smooth surface, causing tracheal compression. a) skin incision. b and c) the mass exposed.

Figure 4 The thyroid mass. a) Surgical sample. Histological findings revealed diffuse thyroid hyperplasia. No malignancy was evident in the thyroid. b) Low magnification. c) High magnification.

operate immediately. Mechanisms suggested for the production of VCP include compression of the recurrent nerves and/or its blood supply between the tumour and cervical spine or trachea, stretching of the nerve, perinodular inflammation producing minimal artery thrombosis and fibrosis involving the nerve, or direct involvement in the acute swelling and inflammation due to the thyroid storm.^{1–3} Stretching of the recurrent nerve over a large goitre might occur in retrosternal goitres, especially on the left side, where the recurrent nerve has a much longer course to run, part of it in the thorax. We speculate that the acute exacerbation could have been due to thyrotoxicosis, although we cannot completely exclude other causative factors. The patient exhibited extreme enlargement of the thyroid gland, which probably did compress the nerves. At the same time, the patient's thyroid hormone levels were very high and he exhibited symptoms of Graves' disease.

Emergent resection is the primary treatment of choice for retrosternal goitre with clinical symptoms. Surgical removal of the goitre is always indicated and should be performed as soon as possible. The procedure should be performed through a neck incision with sternal incision in severe cases of patients with retrosternal goitre.

Conclusion

An upper airway obstruction due to acute thyroid swelling is a life-threatening condition. It should be treated immediately by performing endotracheal intubation while the patient is awake following emergent total thyroidectomy, even with sternotomy.

References

1. Wang CC, Wang CP, Tsai TL *et al.* The basis of preoperative vocal fold paralysis in a series of patients undergoing thyroid surgery: the preponderance of benign thyroid disease. *Thyroid* 2011; **21**: 867–872.
2. Kay-Rivest E, Mitmaker E, Payne RJ *et al.* Preoperative vocal cord paralysis and its association with malignant thyroid disease and other pathological features. *J Otolaryngol Head Neck Surg* 2015; **44**: 35–39.
3. Sharma A, Naraynsingh V, Teelucksingh S. Benign cervical multi nodular goiter presenting with acute airway obstruction: a case report. *J Med Case Rep* 2010; **4**: 258–261.
4. Sajja LR, Mannam GC, Sompalli S *et al.* Multinodular goiter compressing the trachea following open heart surgery. *Asian Cardiovasc Thorac Ann* 2006; **14**: 416–417.
5. Ito T, Shingu K, Maeda C *et al.* Acute airway obstruction due to benign asymptomatic nodular goiter in the cervical region: a case report. *Oncol Lett* 2015; **10**: 1,453–1,455.