
Clinical Anaesthesia File

Anaesthetic management of a patient with a large neck mass

Case presented by

Joanne Todesco MD FRCPC
R. Tudor Williams MB FRCPC
Department of Anaesthesia
Foothills Hospital
University of Calgary

Case discussed by

Chris J. Eagle MD FRCPC
Department of Anaesthesia
Foothills Hospital
University of Calgary

Large thyroid masses present several potential difficulties for anaesthetists. These include distortion of the airway, endocrine disturbances, and metastatic effects. A typical case is presented and the anaesthetic management and considerations are described.

Les tumeurs grosses thyroïdiennes peuvent influencer la conduite de l'anesthésie par déformation trachéale, dysfonctionnement endocrinien et présence de métastases. Un cas typique de ce genre d'anomalie est présenté et sa conduite anesthésique est discutée.

A 56-yr-old woman was seen in the preoperative assessment clinic. Over recent months, she had noted progressive enlargement of her thyroid gland, dysphagia for solids, increased cough, voice change, shortness of breath on moderate exertion, and orthopnoea. The patient noted shortness of breath 15 min after lying on her back, but not if she were in the right or left lateral decubitus positions. The patient denied stridor. She had a 13 yr history of Hashimoto's thyroiditis which had been treated with thyroid replacement therapy until two months before this visit. Her past medical history was otherwise unremarkable apart from a long smoking history. She was scheduled to have a partial thyroidectomy.

There are several concerns raised by this presentation. First, increasing shortness of breath accompanied by difficulty in swallowing, even without stridor, may indicate compression of the trachea and oesophagus by the thyroid. This may be accompanied by recurrent laryngeal nerve paresis, which commonly presents as a change in voice. Orthopnoea in association with thyroid tumours raises the additional possibility of retrosternal spread of the tumour and compression of mediastinal structures. Additional investigations, for example a CT scan of the thorax, are indicated.

*Address correspondence to: Dr. C.J. Eagle, Department of Anaesthesia, Foothills Hospital, Calgary, Alberta T2N 2T9.
Accepted for publication October 14, 1993.*

Second, in addition to the local compressive effects of the tumour, local invasion or metastatic spread by malignant tumours should be of concern, especially with the presentation of a recently growing mass. There are case reports of laryngotracheal invasion by thyroid neoplasms.¹ Although these are most commonly associated with haemoptysis and stridor, malignancy remains a consideration. Rarely, enlargement of thyroid gland can occur with lymphoproliferative disorders and secondary tumours. Does this patient have adenopathy suggesting a lymphoma? If so, then there must be concern about mediastinal adenopathy and mediastinal compression.

Third, she has been receiving thyroid replacement medication for several years and this has been stopped recently. Is the patient clinically euthyroid? Inquiry should be made about the common symptoms of hypothyroidism, for example, changes in perception of energy level, cold intolerance, weight gain, and skin changes. Finally, thyroid carcinoma can be associated with multiple endocrine neoplasia (MEN), so a tacit suspicion about other endocrine disorders is appropriate.² Specifically, MEN IIa consists of pheochromocytoma, medullary thyroid carcinoma, and may include parathyroid hyperplasia; MEN IIb is similar but is associated with characteristic dysmorphic features.

Physical examination revealed a normally developed 73 kg woman who had an obvious neck mass. She was in no apparent distress and her vital signs were normal. The mass extended from the posterior cervical triangle on the left, over the left clavicle to the sternal notch and around the right side of the neck. The mass was smooth, rock hard, and fixed to the trachea. The remainder of the physical examination was unremarkable. The oral structures were normal and were classified as Mallampati grade I. The patient had full range of movement of her cervical spine.

The patient has a normal upper airway complicated by a large neck mass, which is apparently not retrosternal but which extends to the base of the neck. If required, emergency tracheostomy would be difficult and probably bloody. The size of the tumour would make cricothyrotomy impossible. Thus a number of options, normally held in reserve for emergency airway management, have been eliminated. In addition, the mass in the left neck will result in distortion of the airway and will increase the risk of tracheomalacia. This patient requires a chest x-ray, CT or MRI scan of her neck and thorax, and flow-volume loops to determine any obstruction to air flow.

A needle aspiration of thyroid tissue had been undertaken which showed lymphoid cells. The CT scan showed a large, diffuse, homogeneous mass in the left neck extending from the hyoid bone superiorly down to the level of the notch of the manubrium sternum, with a maximal transverse diameter of about 9 cm in the plane of the scan. The mass displaced the trachea to the right and the carotid vessel to the left. No neck or mediastinal lymphadenopathy were seen. A fiberoptic laryngoscopy had been performed by the referring surgeon. The larynx was seen with difficulty, displaced 3 cm to the right, with decreased movement of the left vocal cord. Routine preoperative blood work was within normal limits. A flow-volume loop study was ordered but not performed due to scheduling errors. The attending endocrinologist felt that the patient was euthyroid.

Given this information, I would look at the CT scan with the help of a radiologist to review the anatomy of the larynx and trachea and rule out any substernal extension by the tumour. Fiberoptic laryngoscopy suggests that tracheal intubation may be difficult and does not shed any light on the anatomy of the subglottic airway.

Review of the CT scan by two radiologists produced divergent opinions about the presence of tracheal compression.

At this point, some review of the possible options is in order.

Thyroidectomy can be performed under regional anaesthesia using bilateral superficial cervical plexus blocks. I have no experience with this technique for thyroidectomy, although unilateral blocks are commonly used for carotid endarterectomy. In addition, the potential for tracheomalacia raises the possibility of intraoperative airway obstruction requiring expeditious management, if the patient was not already intubated. The size and hardness of the tumour raises the possibility of long and bloody surgery, two relative contraindications to regional anaesthesia.

When considering general anaesthesia, the most logical approach would be to proceed following awake fiberoptic intubation, recognizing the potential difficulty posed by distortion secondary to the tumour. If this were not accomplished successfully, the least invasive response for this elective surgery would be to back off and try again on another day with a more experienced anaesthetist or endoscopist. Although fiberoptic intubation can be complicated by inability to advance the endotracheal tube past the vocal cords (following placement of the endoscope

into the trachea), a number of methods may be employed to overcome this difficulty. These include rotation of the endotracheal tube, use of small or warmed tubes, paediatric bronchoscopes, guidewires, and tube changers. Sometimes, combinations of these methods are required. It should be apparent that the commonly used percutaneous approach to anaesthetize the superior laryngeal nerve would not be available in this case, although an intraoral approach would be possible.

Consideration could also be given to awake direct laryngoscopy, and laryngoscopy following inhalational induction of anaesthesia. The first option is commonly employed by anaesthetists following sedation of the patient and application of local anaesthesia to the airway. It burns few bridges. The second approach runs a risk of airway obstruction prior to intubation, which may be difficult to manage because of distorted anatomy, and is therefore a less attractive alternative. If this route is chosen the surgeon should be available in the room with a rigid bronchoscope. Heliox should also be available in case of partial obstruction.³ An opened tracheostomy tray is less likely to prove useful given the location of this mass. In the event of an impossible oral or nasal tracheal intubation and an absolute contraindication to tracheostomy, cardiopulmonary bypass using a femoral venous to arterial circulation might be considered. However, since heparin coated circuits are not commonly used, systemic heparinization would be required with the attendant risk of increased intraoperative and postoperative bleeding. This is not an attractive alternative.

Plan of management

The consulting anaesthetist should discuss with this patient the rationale for, and process of awake fiberoptic intubation. The patient should be prepared preoperatively with an antisialogue and appropriate sedation. The major potential intraoperative problems are surgical haemorrhage and nerve damage, although pneumothorax is also possible for procedures carried out in the base of the neck. In the recovery room, the patient is at risk of airway obstruction, from bilateral recurrent laryngeal nerve paralysis, tracheomalacia, and haematoma. Later in the postoperative course, there is a risk of hypocalcaemia from unavoidable parathyroidectomy. If recognized, the parathyroid glands can be transplanted by the surgeon.

Actual course

The anaesthetist and patient elected to proceed with awake fiberoptic intubation following pretreatment with 0.2 mg of glycopyrrolate *iv* and 2 mg of lorazepam *po*. The airway was anaesthetized with nebulized xylocaine.

Although the upper airway was distorted, the larynx was easily seen through the endoscope and the subglottic structures identified. The trachea was intubated easily, anaesthesia induced, and surgery performed without incident. The trachea was extubated whilst she was awake in the operating room following a partial thyroidectomy. There was no visual evidence of tracheomalacia or vocal cord paralysis shown by examination with the fiberoptic bronchoscope. The patient was taken to ICU for overnight observation and was discharged to the ward the next day. The only postoperative abnormality was a decrease in serum calcium level to a minimally subnormal value. The tissue diagnosis was lymphoma. The patient was discharged from hospital and continues to do well while undergoing additional treatment.

Discussion

The management of patients suffering from hyper- or hypothyroidism has been described previously.^{4,5} When patients present for surgery with large thyroid masses, the principal consideration is the effect of the mass on local structures, either cervical or in the superior mediastinum, or both. In the neck the principal structure affected is the trachea. Involvement of laryngeal nerves suggests a malignant process.⁶ Tracheal compression produces abnormal anatomy of the airway structures and the potential for both difficult intubation and difficult surgical access to the airway. Physical examination shows a typical mass, the extent of which may be better characterized by CT or MRI scans. The degree of functional tracheal obstruction can be assessed by flow-volume loops which will normally show characteristic fixed obstruction to air flow, i.e., plateaus in both the inspiratory and expiratory limbs.⁷ Patients with retrosternal goitres may have additional problems associated with superior vena caval obstruction.⁸ These are decreased venous return from the upper extremities, airway oedema, dependence on spontaneous ventilation to augment venous return, and haemodynamic instability. Goitres uncommonly produce the most feared effects of anterior mediastinal masses, for example, cardiac compression. However, as in this case, the differential diagnosis of thyroid masses includes lymphoma, which potentially may produce the effects of an anterior mediastinal mass by mediastinal lymphadenopathy. The possibility of severe intrathoracic compression should not be dismissed lightly, and the management of patients with mediastinal masses has been described.⁹

Airway management is based on the principle of burning no bridges. As in this case, awake fiberoptic intubation should be a major consideration.

References

- 1 Britto E, Shah S, Parikh DM, Rao RS. Laryngotracheal invasion by well-differentiated thyroid cancer: diagnosis and management. *J Surg Oncol* 1990; 44: 25-31.
- 2 Schmike RN. Disorders affecting multiple endocrine systems. *In: Wilson JD, Braunwald E, Isselbacher KJ, et al. (Eds.). Harrison's Principles of Internal Medicine, 12th ed. Toronto: McGraw-Hill, Inc., 1991: 1811-2.*
- 3 Rudow M, Hill AB, Thompson NW, Finch JS. Helium oxygen mixtures in airway obstruction due to thyroid carcinoma. *Can Anaesth Soc J* 1986; 33: 498-501.
- 4 Roizen MF. Diseases of the endocrine system. *In: Katz J, Benumof JL, Kadis LB (Eds.). Anesthesia and Uncommon Diseases, 3rd ed. Toronto: W.B. Saunders Co., 1990: 245-92.*
- 5 Stoelting RK, Dierdorf SF, McCammon RL. Anesthesia and Co-existing Disease, 2nd ed. New York: Churchill Livingstone, 1988: 473-516.
- 6 Wartofsky L, Ingbar SH. Diseases of the thyroid. *In: Wilson JD, Braunwald E, Isselbacher KJ, et al. (Eds.). Harrison's Principles of Internal Medicine, 12th ed. Toronto: McGraw-Hill, Inc., 1991: 1699.*
- 7 Benumof JL. Anesthesia for thoracic surgery. Toronto: W.B. Saunders Co., 1987: 351.
- 8 Erian RF. Superior vena cava syndrome. *In: Bready LL, Smith RB (Eds.). Decision making in anesthesiology, 2nd ed. St Louis, Inc., 1992: 96-7.*
- 9 Pullerits J, Holzman R. Anaesthesia for patients with mediastinal masses. *Can J Anaesth* 1989; 36: 681-8.