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Tailored airway management for simultaneous thyroidectomy and tracheal stenosis tumour biopsy: navigating dual pathologies

Nor Hidayah **Zainool Abidin**, Norhafidzah **Ghazali**, Fazilawati **Zakaria**, Nor Izatul Azma **Azhar**

Department of Anaesthesiology and Critical Care, Hospital Raja Perempuan Zainab 2, Kota Bharu, Kelantan, Malaysia

Abstract

Tracheal stenosis secondary to tumour presents potential airway complications such as bleeding, airway oedema, laryngospasm and bronchospasm secondary to airway irritation, and difficulty advancing the endotracheal tube through the slit-like diameter of the trachea lumen. We present a case with double pathology of goitre and intraluminal tracheal tumour for thyroidectomy and tumour biopsy. A multidisciplinary discussion was held preoperatively between the otorhinolaryngology surgeons, radiologist, and anaesthesiologists to define resectability and perioperative management. The awake fibreoptic intubation oral approach using a microlaryngeal tube size 5 with target-controlled infusion of remifentanil sedation was successful. The airway was anaesthetised with a sphenopalatine ganglion block, palatopharyngeal arch nerve block, nebulisation lignocaine, and spray-as-you-go lignocaine to obtund the pharyngeal and laryngeal reflexes. Post thyroidectomy, direct rigid laryngoscopy was performed for tumour biopsy. The patient was later admitted to the intensive care unit for postoperative ventilation and monitoring. We learned that there is no single universal airway technique for airway management as it should be tailored based on the individual patient's airway pathology and comorbidities after careful perioperative discussion and airway planning.

Correspondence: Dr. Nor Hidayah Zainool Abidin, MBBS (IIUM), MMED (USM), Department of Anaesthesiology and Critical Care, Hospital Raja Perempuan Zainab 2, Kota Bharu, Kelantan, Malaysia.
E-mail: Nhza85@yahoo.com

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Introduction

Airway management in a large multinodular goitre (MNG) frequently involves a video laryngoscope and awake tracheal intubation (ATI) due to a potentially difficult airway. In addition, intratracheal tumours may worsen tracheal stenosis, with the possibility of airway complications such as bleeding, oedema, and laryngospasm. Careful management of double airway pathologies requires careful perioperative planning, as any complication may lead to a "cannot intubate, cannot oxygenate" scenario.

Case presentation

We present a 53-year-old woman with underlying controlled bronchial asthma on 2 puffs twice a day of the metered dose inhaler steroid and no prior history of intensive care unit (ICU) admission or intubation.

Two years prior to presentation, she had been diagnosed with benign follicular lesion MNG confirmed by fine-needle aspiration cytology. An ultrasound of the neck had revealed MNG, with the right thyroid measuring 1.4 cm x 2.6 cm x 3.9 cm and the left thyroid measuring 1.6 cm x 2.3 cm x 3.6 cm. A contrast-enhanced computed tomography (CT) of the neck showed the right thyroid measuring 3.1 x 2.3 cm x 5.2 cm, while the left thyroid measured 2.7 cm x 2.4 cm x 5.8 cm. There was no retrosternal extension. The CT scan also showed a subglottic mass suggestive of a soft tissue lesion located on the right side, posteriorly, crossing the midline and commencement of the trachea measuring 1.5 cm x 1.3 cm x 1.4 cm. This mass caused a tracheal stenosis measuring 5 mm in diameter. The patient defaulted follow-up until after a year, when she developed chronic cough and throat discomfort.

Upon presentation at our centre, the patient had no difficulty breathing, dysphagia, or hoarseness of voice. She was euthyroid on tablet carbimazole 5 mg daily. A repeated CT scan of the neck showed an intratracheal mass measuring 5.1 mm with a tracheal lumen diameter of 1.1 cm x 0.7 cm. Direct flexible laryngoscopy confirmed normal epiglottis, vallecula, arytenoid, aryepiglottic fold, and fossa. The vocal cord was mobile and symmetrical, and there was a subglottic mass over the posterior part of the trachea, which looked pinkish and was not fungating.

Given the patient's multiple comorbidities and complex airway problems, a multidisciplinary discussion was held to make choices regarding the lesion's resectability as well as surgical and anaesthetic perioperative management, including airway management. After discussion, the plan was to proceed with total thyroidectomy, followed by tracheal tumour biopsy.

Preoperatively, nebulisation with 4 ml lignocaine 2% was administered over 5 minutes. This was followed by a pterygopalatine ganglion block using a cotton bud dipped with 5 ml lignocaine 2% and phenylephrine 50 mcg inserted into the right nostril to the posterior nasopharyngeal wall. Xylocaine 10%, 0.1 ml ~ 20 mg, was sprayed twice over the bilateral posterior pharyngeal wall at the base of the palatoglossal arch to block the glossopharyngeal nerve. The patient also gargled 8 ml lignocaine 1% and swallowed it followed by administration of intravenous (IV) glycopyrrolate 200 mcg as an anti-sialagogue.

Sedation technique

Sedation was commenced with IV 1 mg midazolam followed by target-controlled infusion (TCI) of remifentanil using the Minto model at 3 to 4 ng/ml. The anaesthesiologist stood in front of the patient since the patient was more comfortable in the sitting position. An Ovassapian airway was inserted, and the patient was instructed to open her mouth to facilitate fibreoptic insertion. We used a paediatric, single-use, 3.5-mm Storz Fibreoptic Intubation Video Endoscope (KARL STORZ, Tuttlingen, Germany) to facilitate the insertion of a 5.0-mm microlaryngoscopy tube (MLT). We increased the TCI remifentanil slowly until 8 ng/ml for a brief period during the insertion of the endotracheal tube (ETT) through the trachea. Upon successful intubation, total intravenous anaesthesia-TCI was maintained with TCI propofol 3 µg/ml and TCI remifentanil 3 ng/ml was given under bispectral index (BIS) monitoring to keep BIS between 40 and 60.

After the thyroidectomy, the otorhinolaryngology team decided to perform direct laryngoscopy and telescoping. This was based on the discussion of intraoperative airway planning between the otorhinolaryngology surgeons and anaesthesiologists supported by the initial awake fibreoptic intubation (AFOI) video findings in Figure 1a. The tumour was approximately 0.5 cm from the vocal cord and 1.5 cm posterior to the lateral location in Figure 1b. Following the tissue biopsy, as shown in Figure 2, the otorhinolaryngology team replaced the MLT with a 7.0-mm ETT under direct rigid scope. The fibreoptic procedure showed that there was no airway collapse during respiration, and tracheomalacia was ruled out by the surgeon after thyroidectomy. The patient was then admitted to the ICU for postoperative monitoring and ventilation and was transferred to the general ward the next day.

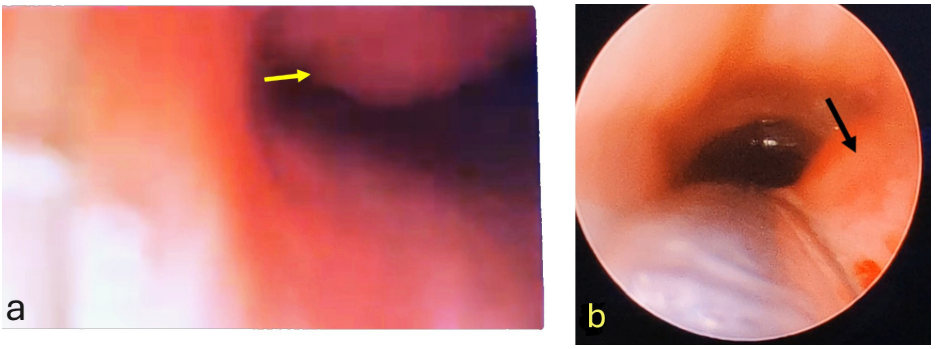

Fig 1. (a) Tumour in the posterior wall during AFOI as shown by yellow arrow (oral approach and operator at patient's front). *(b)* Rigid laryngoscopy view with MLT in situ. The black arrow shows the tumour just beside the MLT.

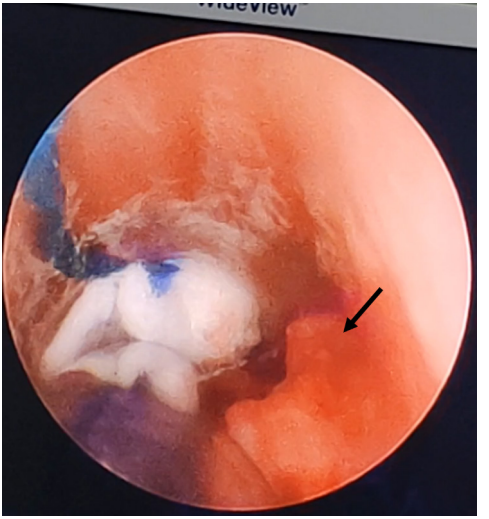

Fig 2. Arrow shows intratracheal tumour after biopsy.

Discussion

MNG may cause external compression of the trachea, while prolonged MNG may also potentially cause tracheomalacia with an incidence of 1.4%.[1] In comparison, intratracheal tumours present another ventilation concern due to critical airway stenosis with intratracheal airway obstruction.[2-4] Among the airway management considerations were the high possibility of bleeding upon touching the tumour,[5] airway oedema[6] upon multiple intubation attempts with loss of ability to ventilate, and airway irritation causing laryngospasm or bronchospasm.[2,5,6]

In this case, the patient presented with both MNG and intratracheal tumour, which required 2 procedures by the endocrine and otorhinolaryngology surgeons. The endocrine surgeon's preference was intraoperative nerve monitoring (IONM) to help prevent recurrent nerve injury, while the otorhinolaryngology surgeons required space for the intratracheal procedures. As anaesthetists and airway experts, facilitating both surgical teams' requirements was among our primary goals. However, airway management must balance the necessity with potential airway manoeuvres and complications, as described in Table 1.

Table 1. Options for airway management in this case

Options	Airway technique	Advantages	Disadvantages
A	AFOI using IONM with the smallest size ID of 6.0 mm (ED of 8.5 mm).	AFOI has a proven safety and success rate.5,7 IONM helps monitor nerve conduction to prevent recurrent laryngeal nerve injury during thyroidectomy.8	AFOI requires an adequate level of sedation and topical anaesthesia.2 Tube size larger than the tracheal slit has the probability of difficult ETT insertion. Need to change ETT during tracheal tumour biopsy.
B	AFOI using 3.5-mm single-use Storz to insert MLT size ID 5 mm (ED 6.5 mm), smallest size ID 4.0 (ED 5.6 mm). Followed by rigid bronchoscopy by the ENT team.	AFOI has a proven safety and successful rate.5,7 MLT may protect the airway during tumour manipulation without obstructing the surgical field view.	AFOI procedure requires an adequate level of sedation and topical anaesthesia.2 A small size of fibreoptic to fit the small lumen MLT should be available. MLT might impair lesion visibility.

Options	Airway technique	Advantages	Disadvantages
C	Aintrée intubation catheter and jet ventilation	Allows jet ventilation and the insertion of a fibreoptic tube if needed.	Inadequate gas exchange/ventilation via the narrow lumen and risk of pneumothorax.2
D	Awake tracheostomy	Opportunity to electively secure the airway before surgical manipulation to prevent airway crisis.	Risk of tracheostomy-related complications.9 Difficulty of performing tracheostomy before thyroidectomy. Tracheostomy might not be needed postoperatively.

AFOI: awake oral fibreoptic intubation; ED: external diameter; ENT: ear, nose, throat ID: internal diameter IONM: intraoperative nerve monitoring; MLT: microlaryngoscopy tube

Several approaches to securing airway in tracheal procedure have been described in the literature.[5,7,10,11] For example, Koul *et al.*[6] reported airway manoeuvres using rigid bronchoscopy alone. However, the intratracheal mass may get detached and dislodged distally, leading to distal airway obstruction. The bleeding during removal may also lead to respiratory problems. Satoh *et al.*[3] reported a successful case using high-frequency jet ventilation, but there was a risk of barotrauma and potential airway obstruction by the mass. Therefore, we decided to use Option B as described in Table 1, which the surgical team agreed to as the monitoring of recurrent laryngeal nerve can be done surgically.[9] This is because there is a significant chance that the IONM tube size will not fit through the trachea. MLT also offers better tumour visibility due to its small external diameter.

After thyroidectomy, the decision to proceed with direct rigid laryngoscopy and telescoping was made after considering the nature of the tumour and the ability to proceed with the MLT tube in situ. If there was a difficulty, the plan was to proceed with jet ventilation with tracheostomy being the last resort.[2,10] The main learning point from this case was the opportunity to familiarise ourselves with multiple airway devices and the option to secure a challenging airway. For instance, we needed to be well-versed with the external diameter of each ETT and the diameter of the flexible bronchoscope to pass through the small tracheal lumen. Additionally, the key to successful ATI is the appropriate method of anaesthetising the airway. This requires a basic knowledge of upper airway anatomy.[7,11]

For sedation during AFOI, remifentanil offers intense analgesia and sympatholytic effects, which is rapidly titratable.[10,12] We used TCI remifentanil, increasing the dose up to 8 ng/ml for a brief duration during the tracheal passage of the ETT and quickly reducing the dose back to 3 ng/ml once the ETT was in situ. This was also described in other case reports with clinical endpoints of patient comfort, relief of anxiety, and pain for this procedure.[13] However, it is essential to recognise the tendency of remifentanil to cause opiate-induced hyperalgesia,[14,15] where the recommended dosage for remifentanil is 1–3 ng/ml.[12] Upon assessment, our patient was comfortable throughout the procedure with a tolerable pain score postoperatively.

Conclusion

Airway management in difficult and rare situations requires multidisciplinary care and good communication throughout the perioperative period. Most of the time, ATI can be done successfully with adequate airway anaesthesia and procedural sedation, provided there is appropriate airway planning in case of a failed airway. Nonetheless, balanced anaesthesia with excellent postoperative analgesia and admission to the postanaesthetic intensive care unit should be routine.

Declarations

Informed consent

The patient consented to the publication of the clinical data and images contained in this case report.

Competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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