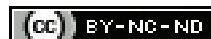


Anaesthetic Management of a Patient with Thyroid Carcinoma: A Case Report of a Complex Perioperative Course

ANUPAMA KUMARI¹, SARA MARY THOMAS²

ABSTRACT

Thyroid carcinoma is a rare but aggressive malignancy that poses significant challenges for anaesthesiologists. The anaesthetic considerations for these patients are multifaceted, involving careful evaluation of airway management, cardiovascular stability, and postoperative care. It requires meticulous planning, precise technique, and close monitoring to ensure optimal outcomes. A thorough understanding of the unique challenges posed by thyroid cancer is essential for anaesthesiologists to provide high-quality care. Hereby, the authors present a case report of a 52-year-old female patient with a large thyroid carcinoma who presented with a difficult airway in which awake fiberoptic intubation was successfully used to secure the airway. Despite meticulous surgical resection of the mass under general anaesthesia, the patient experienced an accidental vascular injury to an aberrant neck vessel, which led to severe bleeding. Even with optimal anaesthetic management, including judicious fluid and blood transfusion, the patient developed delayed postoperative complications and unfortunately succumbed to death 15 days later. The present case highlights the complexities and challenges involved in the anaesthetic management of patients with thyroid carcinoma. It emphasises the need for careful preoperative planning, meticulous intraoperative management, and vigilant postoperative care to optimise patient outcomes.

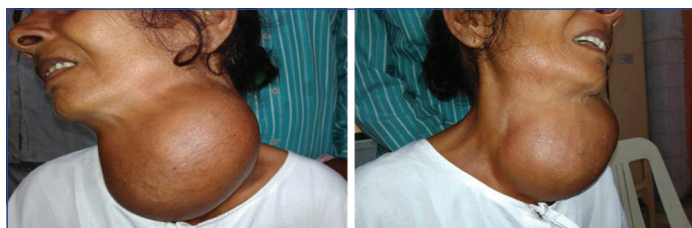
Keywords: Awake fiberoptic intubation, Large neck mass, Perioperative stroke, Thyroid malignancy

CASE REPORT

A 52-year-old female patient presented to the Anaesthesia Department for a pre-anaesthetic assessment prior to a total thyroidectomy and cervical lymph node dissection. The patient was 154 cm tall and weighed 52 kg. She provided a history of neck swelling for one year, which had increased to a present size of 12 cm by 14 cm over the past month [Table/Fig-1-4]. Additionally, she complained of a weight loss of 10 kg and difficulty swallowing solids for the last two months. She experienced difficulty breathing in a supine position and noticed a change in her voice.



[Table/Fig-1,2]: Front images of thyroid mass. (Images from left to right)



[Table/Fig-3,4]: Lateral images of thyroid mass. (Images from left to right)

On physical examination, the lower border of the swelling was non-palpable, and a dull note was appreciated over the sternum on percussion. Pemberton's sign was positive, and neck movements were significantly restricted. Upon airway examination, she was found to have a reduced Mouth Opening (MO) (2 cm), a Mallampati grade III classification, and crooked incisors. She was a smoker and tobacco consumer for 10 years, with a history of consuming 10 pack-years and 3-4 tobacco sachets per day. The patient had a known

case of hypertension for 15 years and was on Tablet Telmisartan 40 mg, which she was taking irregularly. Her thyroid profile was euthyroid, and she was not on any replacement therapy.

All other basic blood investigations, Electrocardiogram (ECG) and 2D-Echo were within normal limits. Indirect Laryngoscopy (IDL) revealed a deviation but normal structure and function of the vocal cords. A Computed Tomography (CT) scan of the chest showed thyroid enlargement causing significant compression of the adjacent trachea, extending inferiorly into the retrosternal area [Table/Fig-5]. The larynx was also found to be deviated to the right side due to mass effect. Fine Needle Aspiration Cytology (FNAC) of the mass revealed a malignant thyroid lesion with Bethesda grade VI.



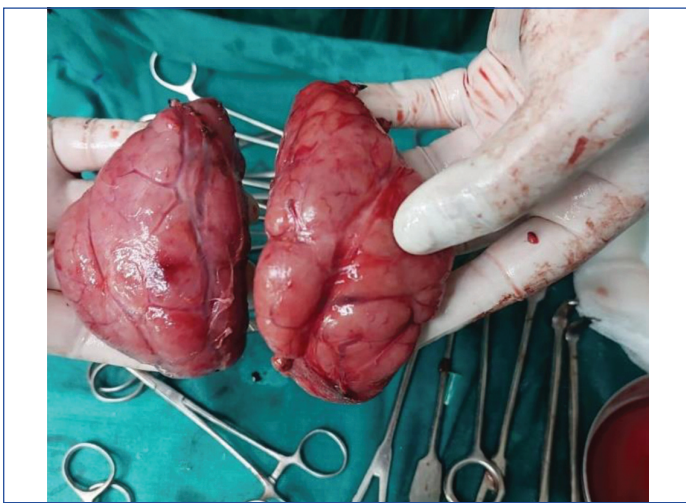
[Table/Fig-5]: The CT scan image showing thyroid mass with tracheal deviation.

We planned for general anaesthesia with an Awake Fiberoptic Intubation (AFOI) for surgery. After the adequate starvation duration, obtaining the proper consent from the patient and counselling her, the patient was wheeled into the operating theatre. She was informed about the procedure of awake fiberoptic intubation, and

her consent was obtained for tracheostomy and postoperative ventilatory support. Two wide-bore 18 G intravenous catheters were established in both forearms. Nebulisation with 2 mL of 4% lignocaine was initiated, and she was requested to gargle with viscous lignocaine 10% 20 minutes prior to being shifted to the operating room. Premedication with intravenous Inj. Glycopyrrolate 0.2 mg, Inj. Ondansetron 4 mg, and Inj. Fentanyl 100 µg was administered.

Awake fibreoptic nasal intubation (due to reduced mouth opening) was attempted, and despite some difficulties in manipulation (due to a deviated trachea), successful nasal intubation was achieved with a flexo-metallic tube. Intratracheal placement was confirmed with auscultation and End-tidal CO₂ (EtCO₂). The tube was fixed at the mark where equal air entry was achieved. Inj. Propofol 100 mg and Inj. Atracurium 0.5 mg/kg were administered, and the patient was placed on controlled ventilation. Maintenance of general anaesthesia was achieved using a combination of oxygen and air (50:50%), sevoflurane (MAC 1), and Inj. Atracurium infusion. Intraoperative observations including Heart Rate (HR), ECG, SpO₂, Non Invasive Blood Pressure (NIBP), EtCO₂, temperature, and urine output were monitored.

Surgery commenced, but due to the large mass of the thyroid gland and adhesions, dissection was challenging. After meticulous dissection, both lobes of the thyroid could be removed [Table/Fig-6]. While achieving haemostasis, a sudden spurt of bleeding occurred, forming a blood pool that obscured the field of vision. Given the rapid and spurt-like, pulsatile nature of the bleeding, arterial bleeding was suspected, leading to an acute loss of approximately 600-700 mL of blood. As the bleeding could not be controlled, compression haemostasis was applied, and a cardiovascular surgeon was urgently called.



[Table/Fig-6]: Specimen of thyroid gland after surgical excision.

Two units of packed red cells were requested urgently, and colloids and crystalloids were administered intravenously. A slow infusion of inotropic support in the form of Inj. Noradrenaline 0.1-0.2 mcg/kg/min was also initiated to maintain haemodynamic stability. The cardiovascular surgeon was able to clamp and successfully repair the bleeding artery with a graft. The bleeding artery was suspected to be an anatomically abnormal branch of the vertebral artery. Following successful haemostasis, closure was completed. An elective tracheostomy was performed in view of tracheomalacia, which was confirmed through palpation and a leak test.

At the end of the surgery, with stable haemodynamics, the patient was reversed. She was conscious and oriented with spontaneous breathing, and thus was placed on T-piece oxygen support. She was then transferred to the Intensive Care Unit (ICU) for further observation and management. The patient was relatively stable in the postoperative phase and was therefore discharged on the seventh postoperative day. On the 12th postoperative day, the

patient presented to the emergency department with complaints of convulsions and weakness in the left upper and lower limbs. She was suspected of having an ischaemic stroke; medical management was initiated, but the patient unfortunately died a few hours later.

DISCUSSION

Thyroidectomy is the most common endocrine surgery performed among all surgeries, with specific anaesthetic concerns regarding airway management [1]. A large thyroid gland poses a risk of upper airway obstruction due to the displacement and rotation of the larynx and trachea, as well as oedema of adjacent structures. Retrosternal extension of the gland may lead to compression of the tracheobronchial tree, pulmonary artery, or superior vena cava, presenting with symptoms such as cough, stridor, dyspnoea when lying down, dysphagia, choking, and engorgement of the superficial veins of the neck and chest wall [2].

Pre-anaesthesia evaluation involves airway assessment with a special emphasis on predicting any potential difficulties in accessing the airway. Risk factors include the large size of the thyroid gland, which may displace the trachea; a higher Mallampati score (\geq III); a short thyromental distance (\leq 6 cm); a shorter inter-incisor gap (\leq 2 cm); obesity; and restricted neck movements due to a large neck mass. Clinical evaluation before surgery typically involves IDL to assess vocal cord function and an ultrasound of the thyroid [3].

Substernal goitre and the presence of respiratory symptoms should be further evaluated using CT scan or Magnetic Resonance Imaging (MRI) to assess the size, location, caudal extent of the goitre, and the degree of tracheal compression [2]. These patients may exhibit respiratory pressure symptoms such as hoarseness, cough, wheezing, dyspnoea, or obstructive sleep apnoea, which can be attributed to tracheal compression or nerve involvement. The induction of anaesthesia may exacerbate airway obstruction and impact major cardiovascular structures [2].

A malignant thyroid mass further increases the risk of difficult intubation, potentially due to tissue infiltration with associated fibrosis, which may reduce the mobility of laryngeal structures and impede the view of the glottic opening during laryngoscopy [3]. The patient in this case report also presented with these symptoms. The CT scan provided an accurate measurement of the site of tracheal obstruction and helped predict the appropriate size of the endotracheal tube and the plan for intubation.

Plan A in present case was AFOI followed by general anaesthesia. This was the preferred option, given the potential for airway obstruction following a decrease in muscle tone after induction of General Anaesthesia (GA). Awake intubation helps to maintain the patency of the natural airway, ensures spontaneous ventilation, and protects against the risk of reflux.

Many authors have reported their approaches to anaesthetic management in cases involving large thyroid masses. Anaesthetic management for various thyroid lesions by different authors, such as Gültekin A et al., Liou JY et al., Sriramka B et al., Ding Y et al., and Barbabosa BMA et al., is represented in tabular format [Table/Fig-7] [1,3-6]. Dempsey GA et al., performed a retrospective review of 34 patients (a case series) regarding the anaesthetic management of all patients with large retrosternal goitres (extending to the aortic arch or beyond) who were scheduled for thyroidectomy at their hospital during a specific time period. They concluded that airway-related complications are unusual in a well-equipped operating theatre and reported that there were no clinically relevant cases of tracheomalacia after surgery, with only one instance of difficult tracheal intubation [7]. They concluded that in a well-equipped theatre, where all anaesthetic and supporting staff are well trained in the management of failed intubation drills and where necessary equipment is easily accessible, the incidence of airway-related morbidity and mortality is reduced.

Author	Thyroid lesion	Anaesthetic management
Gültekin A et al., [1]	Large goitre with hypertension and atrial fibrillation	Fibreoptic bronchoscope after inducing general anaesthesia.
Liou JY et al., [3]	Large thyroid carcinoma with tracheal and oesophageal invasion	Extracorporeal Circulation Membrane Oxygenation (ECMO) established before induction of general anaesthesia, under local anaesthesia. Followed by failed fibreoptic intubation. Successful intubation with tradition direct laryngoscope with glidescope.
Sriramka B et al., [4]	Cerebral palsy adult patient with large thyroid mass	Fibreoptic assistance under dexmedetomidine sedation followed by general anaesthesia.
Ding Y et al., [5]	Thyroid carcinoma with 50% tracheal obstruction	Supraglottic airway device followed by tracheostomy and flexometallic tube through it followed by suction catheter passed retrogradely through tracheostomy along which endotracheal tube was railroaded.
Barbabosa BMA et al., [6]	Large goitre with dyspnoea and dysphagia	Fibrescope Ascope Videoscopy with intravenous sedation.

[Table/Fig-7]: Different anaesthetic management reported by various authors for different thyroid lesions [1,3-6].

Bouaggad A et al., in their study, documented that there was increased difficulty in endotracheal intubation associated with tracheal deviation and compression, Mallampati grading III and IV, the presence of dyspnoea, and reduced neck mobility (<90°) [8]. Difficulty in airway management in these patients may arise at any stage of securing the airway, such as difficult bag and mask ventilation, difficult tracheal intubation, and difficulty with positive pressure ventilation due to tracheal compression or deviation, as well as postoperative problems arising from tracheomalacia [7].

The invention and introduction of the fibreoptic bronchoscope and the method of AFOI to secure difficult airways have been a boon in the field of airway management in anaesthesia. This method permits the utilisation of either the oral or nasal route to achieve clear visualisation of the vocal cords and allows for the easy passage of an endotracheal tube into the trachea under direct vision [8].

The World Health Organisation (WHO) classifies neck masses into following types [5]:

Class 0: palpable mass within the neck structure;

Class I: visible, palpable, and undermining the curves and neckline;

Class II: a very large goitre with retrosternal extension that causes tracheal deviation, as well as compression of the trachea and oesophagus.

The patient discussed in this report had a Class II neck mass with restricted mouth opening (MO of 2 cm, Mallampati Grading III), which increased the challenges in securing the airway. Traditional direct laryngoscopy and video laryngoscopy were difficult, with reduced chances of successful intubation due to the limited mouth opening. Therefore, fibreoptic intubation was employed as the first-line method of airway management and was successfully performed after some difficulties. As failed intubations can lead to increased morbidity and mortality, pre-assessment is essential, and the possibilities for intubation should be strategised.

Other options, such as blind nasal intubation and tracheostomy, were not considered as primary plans for securing the airway. Blind nasal intubation can be associated with multiple traumas and frequent failed intubations, while tracheostomy is particularly difficult to perform in the presence of a large, vascular, adherent mass [9]. Additionally, other anaesthesia options, such as superficial and deep cervical plexus blockade, as well as cervical epidural anaesthesia, are not preferred nowadays because they may lead to inadequate anaesthesia, or their effect may wear off during surgery, potentially resulting in cardiorespiratory arrest [10].

Thyroid surgeries are associated with early postoperative complications such as hypocalcaemia, recurrent laryngeal nerve injury, haematoma, seroma, wound infection, tracheal damage, hoarseness, dysphagia, and chylous fistula. Rare complications can include cellulitis, infection, and vascular damage to the carotid artery, jugular vein, or oesophagus [11]. The extent of surgery and the experience of the surgeon can also influence the incidence of postoperative complications. The patient in this report experienced the rare complication of accidental vascular injury during neck dissection, which led to massive bleeding and necessitated the involvement of a cardiovascular surgeon for vascular repair. Following the vascular repair and adequate fluid and blood transfusion, the patient was haemodynamically stable. She underwent tracheostomy at the end of the surgery due to tracheomalacia. She was reversed from muscle relaxants, was awake, haemodynamically stable, and breathing spontaneously.

On the 12th postoperative day, the patient developed a cerebrovascular stroke, which resulted in convulsions and left-sided paralysis. Perioperative stroke has recently been defined as a cerebrovascular accident occurring up to 30 days after surgery [12]. Its association with non carotid head and neck surgery remains inconclusive, and its incidence is often underestimated because most perioperative strokes are covert, presenting as Postoperative Cognitive Decline (POCD) and delirium [13].

In a retrospective single-institution study of 100 patients undergoing major non carotid head and neck procedures, it was reported that the postoperative stroke rate was 4.8% [14]. Strikingly, an article published in the New England Journal of Medicine noted that the mean global lifetime risk of all forms of stroke increased from 22.8% in 1990 to 24.9% in 2016 [15]. Perioperative stroke risks largely depend on the type of surgery, with an incidence ranging from 0.1 to 1.9% in non cardiovascular, non neurological, and minor vascular surgery [16].

Perioperative strokes are primarily ischaemic in nature, rather than haemorrhagic. They can be classified as embolic, thrombotic, haemodynamic (due to hypoperfusion of vulnerable areas), or a combination of these mechanisms (for example, hypoperfusion in the context of an embolic stroke). Other causes of perioperative stroke may include a hypercoagulable state after surgery and surgery-induced inflammatory responses [17].

The outcome following perioperative stroke is usually poor and is associated with increased rates of morbidity, mortality, and prolonged lengths of hospital stay. The 30 day mortality rate after perioperative stroke related to non cardiac, non neurological surgeries has been documented to be as high as 46% after general surgery and upto 87% in patients with a previous history of stroke [15].

CONCLUSION(S)

The anaesthetic management of a case involving thyroid carcinoma poses significant challenges due to the potential for airway obstruction, intraoperative bleeding, and other perioperative complications. This case highlights the importance of careful preoperative planning, meticulous intraoperative management, and vigilant postoperative care in patients undergoing thyroid cancer surgery. Despite optimal intraoperative anaesthetic management, our patient succumbed to death 15 days postoperatively. This emphasises the aggressive nature of thyroid carcinoma and the need for continued research into improving outcomes for these patients. The present case serves as a reminder of the complexities involved in managing patients with thyroid cancer and the necessity of a multidisciplinary approach to optimise patient care.

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