

Airway Challenges in Thyroid Surgery

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Abstract

Huge goiters can lead to tracheal compression and, hence, difficulty in endotracheal intubation. This along with retro-sternal extension makes it an anticipated difficult airway scenario. In this report, we present a case of huge goiter (papillary carcinoma) compromising the airway, which presented with difficult airway for total thyroidectomy. CT scan of neck revealed retro-sternal extension with the pretracheal plane fixed to the trachea. Trachea was completely pushed to the right. We successfully performed an awake direct laryngoscopy and successful intubation by locally anesthetizing the airway. Plan B was ready with fiberoptic bronchoscopy and rigid bronchoscopy. Patient was successfully extubated in the intensive care unit (ICU).

Key words: Awake intubation, difficult airway, fiberoptic bronchoscopy, huge goiter, tracheomalacia

INTRODUCTION

Goiters (from the Latin word *guttur* meaning throat), which are defined as an enlargement of the thyroid, have been a recognized medical condition since 2700 BC. The name thyroid gland (from the Greek word *thyreoides* meaning shield-shaped) was, however, given by Thomas Wharton in *Adenograpia* (1656).^[1] Enlarged thyroid gland can lead to compromised airway with difficulty in tracheal intubation. Amathieu *et al.* reported that the overall incidence of difficult intubation in thyroid surgery was 11.1%.^[2] Patients with thyroid enlargements are at risk of difficult tracheal intubation, particularly if the goiter has produced tracheal deviation or retro-sternal extension.^[3]

The anesthesiologist approaching the patient with a difficult airway has a vast armamentarium of techniques and instruments that can be applied to securing and maintaining oxygenation and ventilation.^[4] We report here the airway management of a patient with huge goiter with retro-sternal extension.

CASE REPORT

An elderly female patient of American Society of Anesthesiologists (ASA) Grade II, aged 55 years, of Indian origin, and weighing 50 kg presented with a 10-year history of neck swelling and with a rapid increase since 1 month.

She had no concomitant morbidity, no past history (surgical or medical), and no relevant family medical history. She had not been

on any anti-thyroid medications in the past. She was diagnosed as multinodular goiter in June 2014. She had history of change in voice (hoarseness) and respiratory symptoms like inspiratory stridor on lying supine since 1 month before admission. She was planned for total thyroidectomy after thorough workup was done.

On examination, patient was conscious and cooperative. Pulse was 90/min and blood pressure 130/90 mmHg. ECG showed sinus rhythm. She had inspiratory stridor on lying down. The neck swelling was 12 × 10 × 12 cm in size, nodular, extending from the lower jaw to sternal notch. The lower limit of the swelling was neither visualized nor palpable. There were no distended veins on chest. The swelling did not move with deglutition. On palpation, it was firm, immobile, and nodular, and the skin above it was tense, shiny, erythematous, and dilated veins were seen. Airway examination showed mouth opening of three fingers breadth, Mallampati scoring was Grade II, but there was limited neck extension and severely restricted neck flexion in this patient [Figures 1 and 2]. Level II and Level III lymph nodes were palpable clinically in the neck. A thyroid hormone profile confirmed the euthyroid status of the patient during routine preoperative tests. Coagulation profile with prothrombin time and international normalized ratio (INR) status of the patient were normal.

Indirect laryngoscopy revealed mild restriction of left vocal cord mobility suggestive of left recurrent laryngeal compression by the swelling.

Radiological examination revealed lateral displacement of the trachea to the right on the posteroanterior view and no compression of trachea in the lateral view

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[Figures 3 and 4]. USG thyroid showed nodular papillary projections with level II and level III extensions. CT scan neck showed huge multinodular goiter with the pretracheal plane fixed to the trachea (retro-sternal extension) and no decrease in the tracheal lumen. Free T3, T4, and thyroid stimulating hormone (TSH) levels were within normal limits. Fine needle aspiration cytology (FNAC) of the swelling showed features suggestive of papillary carcinoma of thyroid.

The patient was planned to undergo total thyroidectomy. The procedure was explained to the patient and she agreed to cooperate. On the day of surgery, no preoperative sedation was prescribed. Difficult airway management cart was kept ready with McCoy blade, intubating stylet, bougie, both flexible and rigid bronchoscopes, and tracheostomy tubes in case of surgical invasive airway for Cannot Intubate Cannot Ventilate (CICV) scenario, and the patient was shifted onto the OT table. Plan A was to do an awake smooth conventional direct laryngoscopy and try securing the airway, whereas the alternate plan B was to use flexible fiberoptic or rigid bronchoscopes, which were ready and easily accessible.

Anesthetic management

After securing an IV line with 18 G IV cannula in the left upper limb, standard monitors [ECG, pulse oximeter, non-invasive blood pressure (NIBP), end-tidal carbon dioxide (ETCO₂)] were attached and the baseline vitals recorded. Inj. Glycopyrrolate 0.2 mg IV was administered.

The patient's airway was anesthetized with lignocaine viscous 2% gargles and lignocaine spray (10%) into the laryngo-pharynx. Nasal prongs were connected and a constant flow of oxygen was given at 3 l/min. Just 3 min before intubation, Inj. Fentanyl 150 mcg was administered IV; a smooth direct laryngoscopy was performed and a flexometallic tube of size 7 mm with an intubating stylet was inserted into the vocal cords. Confirmation was established by reservoir bag movement and capnography. Bilateral air entry was checked and confirmed. Immediately once the airway was secured, general anesthesia was induced with Inj. Propofol 80 mg along with Inj. Vecuronium bromide 6 mg IV for skeletal muscle relaxation. Inj. Diclofenac 75 mg was administered as IV infusion for analgesia.



Figure 1: Patient post-intubation



Figure 2: Thyroid swelling in anterior view

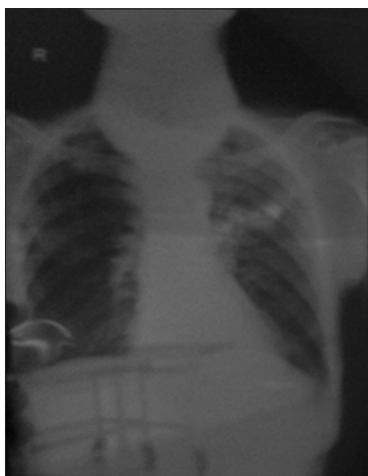


Figure 3: Chest X ray PA view



Figure 4: Neck X ray lateral view

Maintenance was continued with nitrous oxide and oxygen in the ratio of 5:3 in Bain's circuit along with propofol infusion at a steady rate of 100 mcg/kg/min. One liter of Ringer's lactate and 1 Unit of whole blood were administered intraoperatively. Urine output was monitored intraoperatively. The surgical procedure was uneventful.

At the end of the surgery, patient's muscle relaxation was antagonized using 2.5 mg of Inj. Neostigmine and 0.4 mg of Inj. Glycopyrrolate. Before extubation, leak test was performed which did not show any leakage to positive pressure ventilation. Extubation was deferred and the patient was transferred to the intensive care unit (ICU) with endotracheal tube *in situ* for a further period of 48 h to avoid airway obstruction secondary to tracheomalacia. Fiberoptic examination of the airway was done on the 3rd day to rule out collapse of tracheal rings. As there was no collapse of tracheal rings, the patient was extubated uneventfully.

DISCUSSION

Preoperative risk factors in a patient with large and long-standing goiter (more than 3 years) are significant tracheal narrowing and/or deviation, retro-sternal extension, preoperative recurrent laryngeal nerve palsy, difficult tracheal intubation and thyroid cancer.^[5]

Difficulty with intubation may be caused by an enlarged thyroid gland producing tracheal deviation, compression, or both.^[6] Amathieu *et al.*^[2] concluded that classical predictive criteria like mouth opening <35 mm, Mallampati III or IV, limited neck movements <80°, and thyromental distance were reliable predictors of difficult airway. Management of the difficult airway presents a great dilemma for the anesthesiologist. Practice guidelines and algorithms may help in such situations. However, the anesthesiologist's judgment and vigilance remain the primary means to safe airway management.

This case had five of the six predictors for difficult airway. These factors help in predicting the difficulty associated with intubation.

Induction of general anesthesia could be risky because it may precipitate complete airway closure and make facemask ventilation and tracheal intubation impossible due to chronic pressure. Some patients with huge thyroid do not tolerate supine position due to stridor and tracheal compression. Tracheostomy may not be feasible due to anatomical distortion of the anterior neck as well as the inability to tolerate supine position in a few patients.^[7] For the same reason, tracheostomy was not preferred in our case.

It is recommended that an initial fiberoptic bronchoscopy be done to define the extent of retro-sternal extension of the thyroid mass and to rule out obstruction of the airway.^[8] Though awake fiberoptic intubation could also be feasible under the effect of mild sedation and topical anesthesia, it was not planned in our case. It was kept as plan B along with rigid bronchoscopy. Awake intubation should be planned if obstruction seems significant. So, this was planned in our case as she had history of stridor and respiratory difficulty in the

supine position. Plan A was to perform an awake smooth and swift direct laryngoscopy, as mouth opening was adequate.

Another concern is tracheomalacia in these patients, which can complicate both intubation and extubation. Pressure on the trachea exerted by the neck mass can cause necrosis to parts of the tracheal wall, which can lead to complete collapse of the airway with muscle relaxation. To rule out tracheomalacia, leak test is performed. After deflating the cuff of endotracheal tube, note whether there is any leak on positive pressure ventilation. If despite the cuff deflation, there is no leakage of gases to gentle positive pressure ventilation, there is probability of tracheal collapse around the endotracheal tube. For extubation in such cases, direct visualization of airway patency is suggested. The fiberoptic bronchoscope can be used to assess for airway collapse and vocal cord movement as the endotracheal tube and bronchoscope together are slowly pulled back. If tracheal collapse is noted, the endotracheal tube and bronchoscope should be immediately readvanced and it is advisable to defer extubation.

In our case, patient was electively kept intubated for 36 h in view of chances of tracheomalacia. The patient was extubated after cuff deflation demonstrated adequate leak around the tracheal tube while she was awake and breathing spontaneously.

CONCLUSION

In conclusion, proper preoperative planning and discussion with the surgeon, along with proper intraoperative management and postoperative ventilatory care decreases the morbidity in such huge thyroid cases.

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